Rye Park Wind Farm

View north from Rye Park-Dalton Road toward the proposed Rye Park Wind Farm

LANDSCAPE & VISUAL IMPACT ASSESSMENT

Prepared for:

RYE PARK WIND FARM PTY LTD

Prepared by:

GREEN BEAN DESIGN
landscape architects

November 2013

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Green Bean Design – Capability Statement

Green Bean Design 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 variety 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 twenty one wind energy projects across New South Wales, Victoria, South Australia 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

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Executive summary

Green Bean Design (GBD) was commissioned by Rye Park Wind Farm Pty Ltd (the Proponent), a wholly owned subsidiary of Epuron Pty Ltd, to undertake a Landscape and Visual Impact Assessment (LVIA) for the Rye Park wind farm and associated development infrastructure (the project).

The project would have up to 126 wind turbines, and for the purpose of this LVIA, the proposed wind turbines have been assessed with a maximum blade tip height of 157 m from ground level to tip of blade and a maximum rotor size of up to 112 m. Associated electrical works include a proposed 330 kV overhead powerline connection to an existing 330 kV powerline to the south 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/medium to high sensitivity to change. The existing landscape character 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/medium to high sensitivity to change, some recognisable characteristics of the landscape character will be altered by the proposed project, and result in the introduction of visually prominent elements that will alter the perceived characteristics of the landscape; however, the degree of alteration 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 Rye Park wind farm visibility was determined within the 10 km project viewshed and illustrated by a series of panoramic photographs and 3 Zone of Visual Influence (ZVI) diagrams (up to a distance of 20 km). 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 significance of the Rye Park wind farm for uninvolved and involved residential dwellings within the projects 10 km viewshed, as well as potential visual impacts from publically accessible areas in the surrounding landscape.

A total of 51 involved and uninvolved residential dwellings have been identified within 2 km of the proposed Rye Park wind turbines. Ten residential dwelling locations within the 2 km viewshed have been determined to have a low visual significance, and ten with a low to medium visual significance. Twelve residential dwellings within the 2 km viewshed have been determined to have a medium visual significance, and seventeen a medium to high visual significance (comprising eight involved and nine uninvolved residential dwellings). Two residential dwellings locations would have a high visual significance (comprising one involved and one uninvolved residential dwelling). The uninvolved residential dwelling (R1) is involved with the proposed Rugby wind farm project to the north of the Rye Park wind farm site boundary.

This LVIA assessed the potential visual impact associated with the proposed 330 kV powerline, three substations and associated electrical infrastructure. The LVIA determined that the overall visual significance of these elements would be low due to their location relative to existing residential locations together with the screening influence of surrounding topography and vegetation.

A cumulative assessment identified two proposed wind farm developments (the Bango and Rugby wind farm projects) within the Rye Park wind farm 10 km viewshed. This LVIA determined that there would be some level of wind turbine intervisibility between the Rye Park wind farm and other wind farm developments with potential 'direct' and 'indirect' visibility within the Rye Park wind farm viewshed from residential dwellings, and 'sequential' views from some surrounding road corridors.

Night time obstacle lighting, if implemented, would have the potential to create a visual impact on residential dwelling locations surrounding the Rye Park wind farm. This LVIA notes that further to the withdrawal of the CASA Advisory Circular there are no guidelines by which to define criteria for wind farm night time obstacle lighting. 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 east of Yass.

Executive summary

Although some mitigation measures are considered appropriate to minimise the visual effects for a number of the elements associated with the wind farm, it is acknowledged that the degree to which the wind turbines would 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 Rye Park wind farm Environmental Assessment (EA) to be submitted and assessed under Part 3A of the Environmental Planning & Assessment Act 1979 (EP&A Act).

This LVIA methodology adopted by GBD has been applied to a number of similar LVIA for large scale infrastructure projects prepared by GBD, which have been assessed and approved by the New South Wales Department of Planning under Part 3A of the EP&A Act.

This LVIA addresses and responds to the Director General's Requirements (DGR's) dated 14th February 2011, 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	Report 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 an assessment of the significance of landscape values and character in a local and regional context. 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.	Refer LVIA **Sections 6** and **14**
• assess the impact of shadow "flicker", blade "glint" and night lighting from the wind farm.	Refer Rye Park wind farm EA **Section 14**,
• identify the zone of visual influence including consideration of night lighting (no less than 10 kilometres) and assess the visual impact of all project components on this landscape.	Refer LVIA **Sections 7** and **11**.
• Include an assessment of any cumulative visual impacts from powerline infrastructure.	Refer LVIA **Section 9**.
• 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 powerline. The photomontages	Refer LVIA **Sections 10** and **15**.

DGR's	Report Reference
must include representative views of turbine night lighting if proposed.	
• 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 15**.

The Rye Park wind farm would be located across three Local Government Areas:

- Boorowa Shire;
- Yass Valley Shire; and
- Upper Lachlan Shire Council.

Although not directly applicable to the Rye Park EA, GBD has also reviewed the Upper Lachlan Shire Council's Development Control Plans (DCP) for Wind Power Generation and GBD confirm that this LVIA addresses a number of key DCP requirements with regard to consideration of visual assessment, including provision for:

- the assessment of visual impact and scenic value;
- the assessment of cumulative impact;
- shadow flicker assessment;
- viewshed mapping; and
- photomontages.

The assessment of potential visual impact associated with shadow flicker has been assessed and included in **Section 14** of the EA.

GBD is not aware of any landscape areas within the immediate wind farm viewshed that are subject to any Local, State or Federal statutory designations for high landscape values or scenic quality and/or scenic protection.

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, June 2007, and have encompassed the general assessment framework outlined in the National Assessment Framework

within the LVIA methodology. In addition to the National Assessment Framework, the preparation of this LVIA has also included a review of the Draft NSW Planning Guidelines Wind Farms (December 2011)

This LVIA involved a comprehensive evaluation of the landscape character in which the Rye Park wind farm 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 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 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.

The 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.

Whilst no supplementary DGRs have been issued for the Rye Park wind farm requiring compliance with the NSW draft guidelines, this LVIA has considered and given regard to the NSW draft guidelines to the extent practicable, including information and issues outlined in the NSW draft guidelines Appendix A – 'Meeting assessment requirements, landscape and visual amenity'. This LVIA has included the preparation of photomontages from 22 uninvolved residential dwellings located within 2 km of the proposed Rye Park wind turbines. Three landowners with residential dwellings within 2 km of the Rye Park wind farm turbines chose not to have a photomontage.

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. **Table 2** outlines the relevant requirements of the NAF and the corresponding section in which they are addressed within this LVIA report.

Table 2 NAF Recommendations

NAF Tasks (through Steps 1 to 4)	LVIA Reference/Response
Step 1 Assess the Landscape Values **1A Preliminary Landscape Assessment** • 1A.1 Desktop Review • 1A.2 Seek information from Local Authority • 1A.3 Identify potential community and stakeholder interests • 1A.4 Site survey • 1A.5 Preliminary assessment of landscape values **1B Full Landscape Assessment** • 1B.1 Define the study area for assessment, including the zone of visual influence • 1B.2 Landscape Character Analysis • 1B.3 Natural and cultural values analysis • 1B.4 Involve communities and stakeholders in identifying landscape values • 1B.5 Document values and analyse significance	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 10km viewshed. Early telephone discussions with the relevant Local Authorities determined that no additional wind farm developments were current other than those notified on the DoP&I website: (http://majorprojects.planning.nsw.gov.au/page/project-sectors/transport--communications--energy---water/generation-of-electricity-or-heat-or-co-generation/) 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**. 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 DoP&I DGR's. This LVIA addresses the requirements of Step 1B and presents an analysis of key considerations included in

NAF Tasks (through Steps 1 to 4)	LVIA Reference/Response
	the NAF.
Step 2 Describe and Model the Wind Farm in the Landscape • 2.1 Describe the development • 2.2 Model the development • 2.3 Prepare a visual assessment report	This LVIA has described and modelled the Rye Park wind farm development and selected view points from a range of view locations including uninvolved residential dwellings and road corridors within the 10km viewshed.
Step 3 Assess the Impacts of the Wind Farm on Landscape Values • 3.1 Seek community input to potential impacts • 3.2 Identify and describe impacts • 3.3 Identify potential cumulative impacts • 3.4 Identify other relevant factors • 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**. This LVIA has identified and described potential landscape and visual impacts associated with the Rye Park wind farm 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 • 4.1 Changes to location or siting of the wind farm or ancillary infrastructure • 4.2 Layout and design considerations • 4.3 Minor changes and mitigation measures • 4.4 Recommend changes to the development	The development of the Rye Park wind farm 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. Significant changes have occurred throughout the development of the preferred design layouts including the removal and repositioning of turbines within site boundary.

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 of significance of visual impact; and
- preparation of photomontages and illustrative figures.

1.6 Desktop study

A desktop study was carried out to identify an indicative viewshed for the Rye Park wind farm. 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 10km 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

The Proponent prepared ZVI Diagrams to illustrate the potential visibility of the wind turbines within the Project 10km viewshed. ZVI Diagrams included visibility from tip of blade, hub height and whole turbine. The ZVI are illustrated in **Figures 24, 25**, and **26** and detailed in **Section 7** of this LVIA.

1.8 Fieldwork and photography

GBD undertook a total three and a half days of fieldwork associated with the Rye Park 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 powerline; and
- one and a half days of site photography for the public photomontages locations.

The Proponent undertook separate fieldwork to capture panorama photographs from residential dwellings within 2 km of the proposed wind turbine 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 such as:

- 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

Photomontages have been prepared from 32 locations to illustrate the potential visibility of the Rye Park wind farm following construction. The photomontages locations included uninvolved residential dwellings within 2 km of the Rye Park wind turbines, in accordance with the requirements of the NSW Draft Guidelines.

The public photomontage locations were selected and photographed by GBD. The public photomontage locations were selected to provide representative views from the vicinity of residential dwellings as well as publically accessible areas and road corridors. The public photomontage locations are illustrated in **Figure 31** and the public photomontages in **Figures 32** to **40**. The photomontages prepared for uninvolved residential dwellings within 2 km of the Rye Park wind turbines are illustrated in **Figures 41** to **62** and located in **Figures 28a** and **28b**. The heights of proposed turbines within the photomontages prepared by the Proponent were subject to peer review and verification by GBD. The photomontage methodology verification is illustrated in **Figures 63** and **64**.

1.12 Shadow flicker & blade glint

The Proponent prepared a shadow flicker assessment and report for the Rye Park wind farm. The results of the shadow flicker assessment are included in **Section 14** of the EA.

Location

Section 2

2.1 Location

The Rye Park wind farm would be located on the edge of the Southern Tablelands and the South West Slopes in the NSW/ACT Border Region Renewable Energy Precinct.

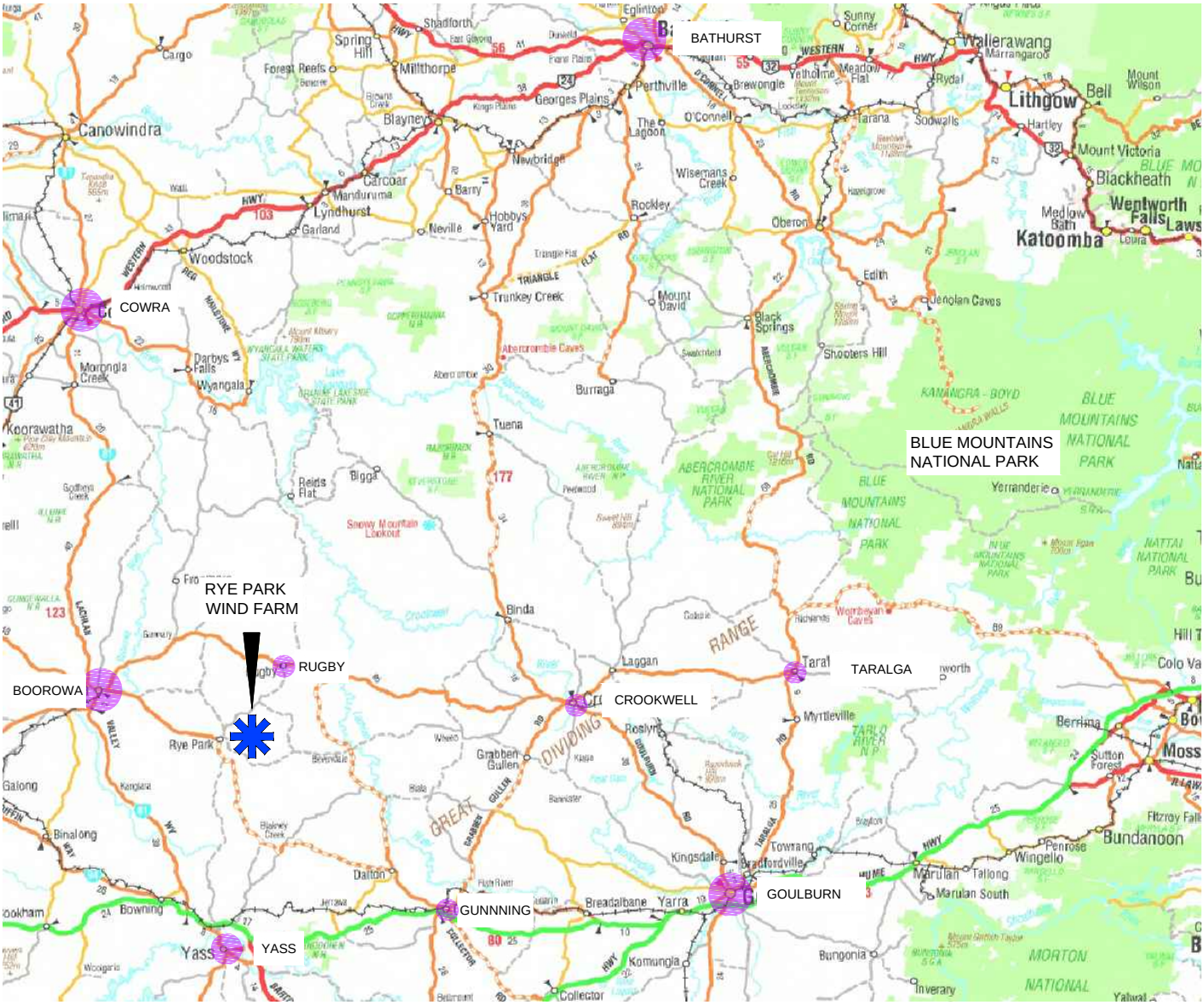
The project would extend in an approximate north south alignment along a series of hills and ridgelines between 700 to 800 m in elevation. The project area would incorporate around 40 participating rural residential and farming properties covering an area around 14,800 hectares portions of the Upper Lachlan Shire, Yass Valley Shire and Boorowa Shire Local Government Areas.

A small number of towns and localities occur within and beyond the 10 km viewshed and include:

- Rye Park (approximately 3.3 km to the west)
- Rugby (approximately 9.3 km to the north east)
- Yass - outlying north east portion (approximately 9.3 km to the south west)
- Bevendale (approximately 8.5 km to the east); and
- Jerrawa (approximately 6.9 km to the south east).

The Main Southern Railway and Hume Highway corridors extend east to west below the south boundary of the project site.

The location of the Rye Park wind farm is illustrated in **Figure 1**.



RYE PARK WIND FARM -
LOCATION PLAN, REGIONAL CONTEXT (Not to scale)

RYE PARK WIND FARM -
LOCATION PLAN, STATE CONTEXT (Not to scale)

Figure 1
Location Plan

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Project description

Section 3

3.1 Project description

The key visual components of the Rye Park wind farm would comprise:

- up to 126 wind turbines;
- up to 126 individual 33kV external kiosk transformers and switchgear with associated control systems to be located in the vicinity of the wind turbine towers (in some turbine models transformer equipment will be integrated within the tower or nacelle);
- underground and overhead electrical and communication cable network linking turbines to each other within the project boundary;
- a new 330 kV wind farm connection substation located adjacent to the existing TransGrid 330 kV powerline (Yass – Bannaby) that traverses the southern section of the site;
- up to two new 22 or 33/330 kV collection substations located across the wind farm;
- a new overhead powerline approximately 35 km in length, rated at up to 330 kV (nominal) capacity, running north-south along the length of the wind farm site to the two collection substations. The new powerline would be mounted on a single pole type structure and may be single-circuit or double-circuit as required;
- up to 6 permanent wind monitoring masts. The permanent monitoring masts may be either static guyed or un-guyed structures and will be to a minimum height of the wind turbine hubs;
- on site access tracks for construction, operation and ongoing maintenance; and
- Rye Park wind farm signage and maintenance facilities.

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

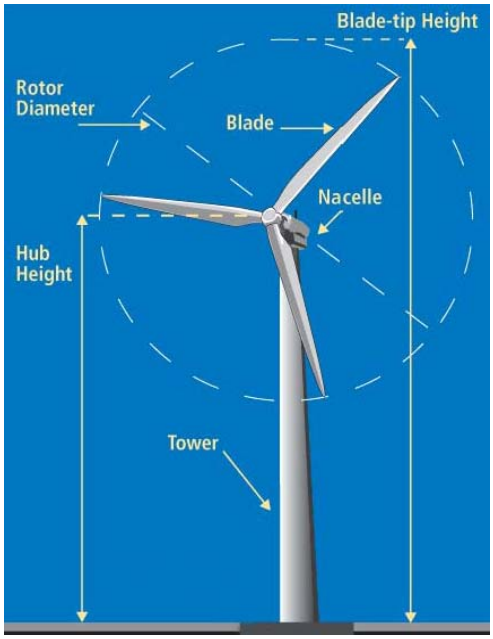
- crane hardstand areas; and
- mobile concrete batching plant and rock crushing facilities.

3.2 Wind turbines

The specific elements of the wind turbines comprise:

- concrete foundations;
- tubular tapering steel or concrete towers;
- nacelles at the top of the tower housing the gearbox and electrical generator;
- rotors comprising a hub (attached to the nacelle) with three blades; and
- three fibreglass / carbon fibre blades attached to each hub.

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



Configuration and components of a typical wind turbine

Table 3 outlines the main design parameters for the proposed Rye Park wind turbine layout:

Table 3 Rye Park wind turbine details:

Element	Description
Tower height	101 m
Rotor Diameter	112 m
Overall height from ground level to tip of blade	157 m
Proposed number of Rye Park wind turbines	**126 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 Rye Park wind farm design layout is illustrated in **Figure 2.**

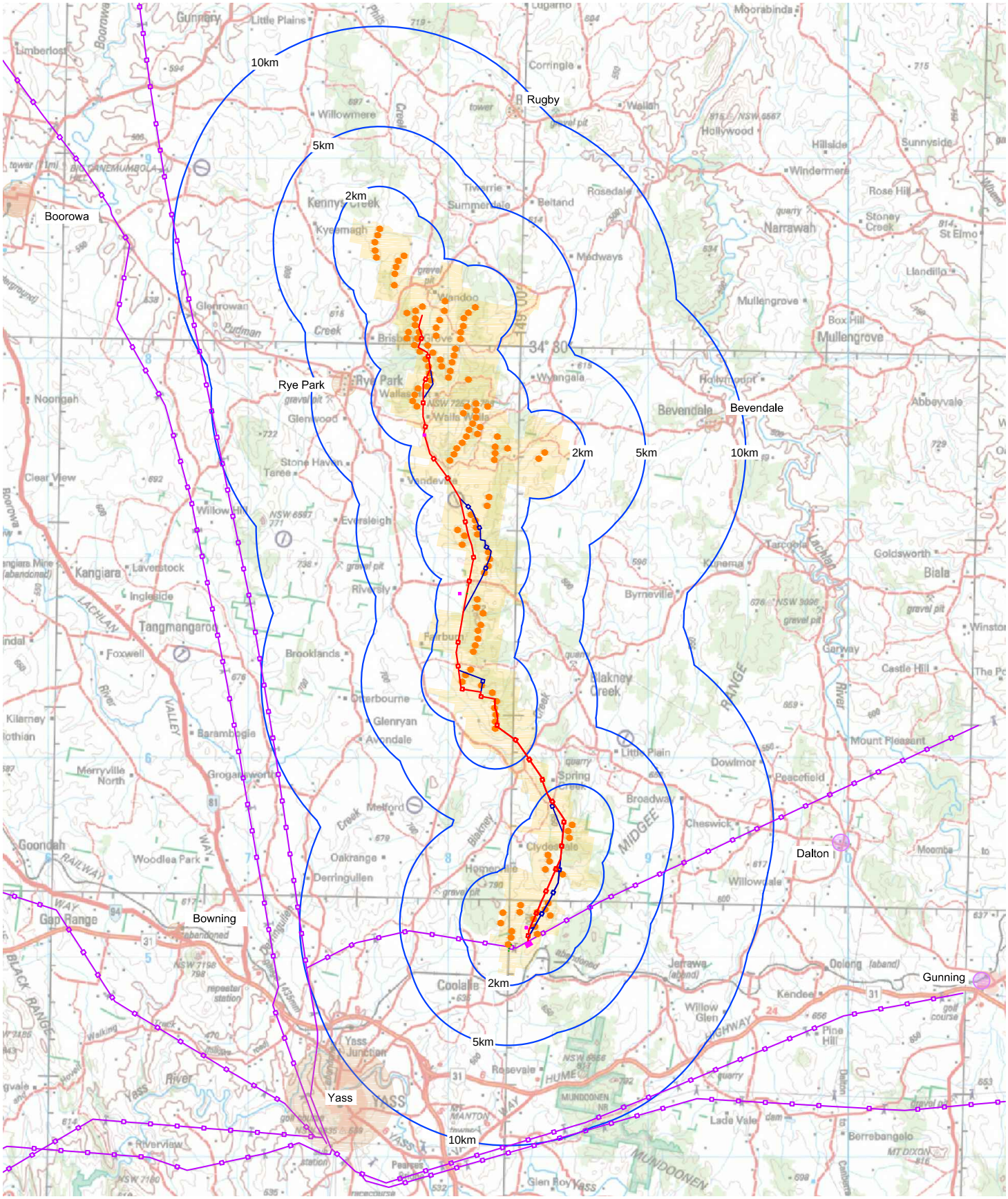


Figure 2
Site layout

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3.3 Wind monitoring masts

Up to 6 permanent wind monitoring masts would be installed on-site, extending to a minimum height of the wind turbine hubs (around 101 m in height). The wind monitoring masts would be of a guyed or un-guyed, narrow lattice or tubular steel design. The wind monitoring masts 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 5-6 m wide (wider at bends) 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 majority of cabling works, including the installation of control cables linking the turbines to the control building would be installed underground. For electrical reasons some cabling may be required to be installed on medium voltage overhead powerline supported by single low profile tubular poles.

Grid connection would be achieved via a connection to the existing 330 kV powerline which bypasses the southern portion of the wind farm site. The wind farm turbines would be connected to on-site substations, control room and facilities for the grid connection.

The proposed electrical works are described in **Section 12** and illustrated in **Figures 68** and **69**.

Local environmental factors

Section 4

4.1 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.

Meteorological data collected over the past 113 years at Yass (Linton Hostel) indicates that there are:

- 92 clear days (annual mean average);
- 109 cloudy days (annual mean average); and
- 74 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 3**.

4.2 Topography and drainage

The topography of the landscape within the New South Wales Southern 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 and low rolling hills cut by drainage lines.. The elevation of the wind farm site falls gently from the north to the south. A number of ephemeral drainage lines occur across the project site, draining to broader valleys west and east of the wind farm site.

Landform elevation within and surrounding the project site is illustrated in **Figure 4**.

4.3 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 **Section 11** of 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.

Timbered areas have some potential to provide partial or full screening toward the project area from surrounding public and residential view locations. The screening potential tends to increase when combined with the local topography of hills and undulating landform. The distribution of timbered areas within and beyond the project site is illustrated in **Figure 5**.

The landscape within and surrounding the project site is illustrated in the panorama photographs presented in **Figures** 12 to 2**7.**

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

PHOTOGRAPH 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.

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

PHOTOGRAPH 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.

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

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

Figure 3
Visibility & weather

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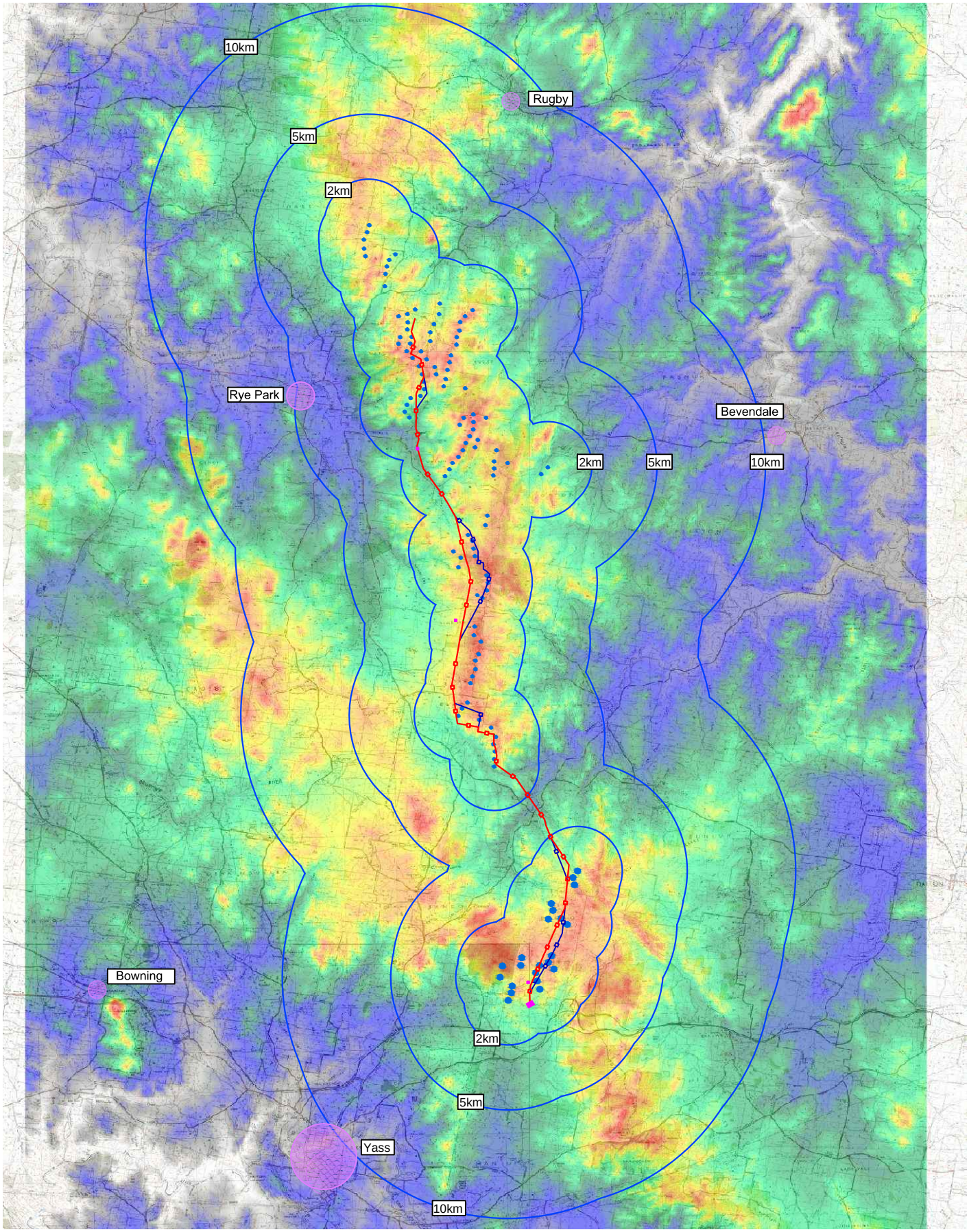

Legend

Elevation

- 800 m
- 760 m
- 700 m
- 670 m
- 640 m
- 600 m
- 560 m
- 500 m

Proposed Rye Park wind turbine (indicative layout)

Distance from proposed Rye Park wind turbine

Preferred 330 kV powerline route

Alternative 330 kV powerline route

0km 5km

Figure 4
Topography

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Rye Park Wind Farm Pty Ltd

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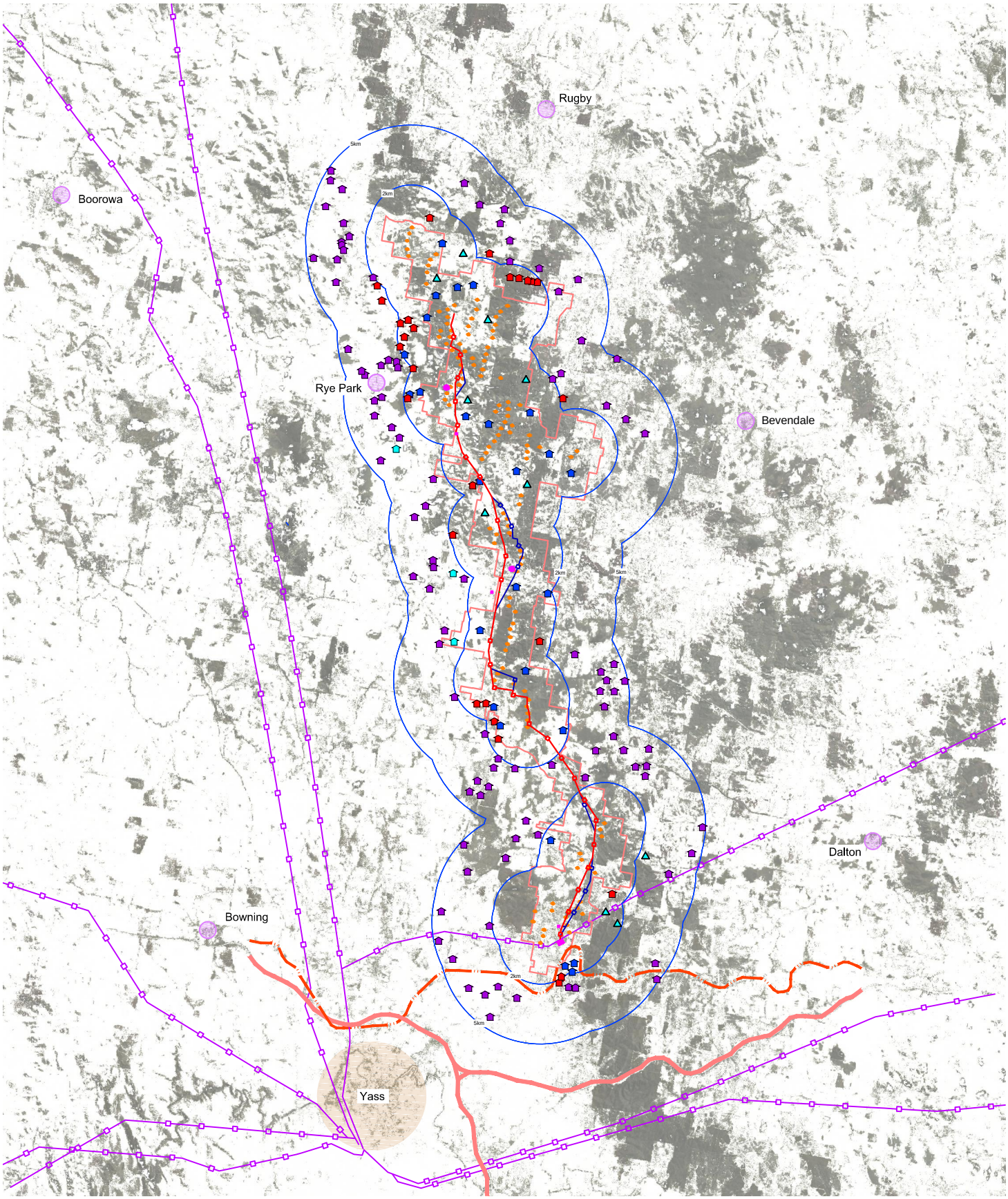
landscape architects

RYE PARK WIND FARM



Legend

- Associated residential dwelling within 2 km of wind turbine
- Non associated residential dwelling within 2 km of wind turbine
- Residential dwelling between 2 km and 5 km of wind turbine
- Non residential structure
- Proposed Rye Park wind turbine (indicative layout)
- Proposed 330 kV power line (preferred route)
- Proposed 330 kV power line (alternative route)
- Distance from proposed Rye Park wind turbine
- Existing transmission line
- Hume & Barton Highway
- Main Southern Railway
- Tree cover

0 km 5 km

Figure 5
Indicative tree cover within 10 km viewshed

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Rye Park Wind Farm Pty Ltd

RYE PARK WIND FARM

GREEN BEAN DESIGN
landscape architects

Panoramic photographs

Section 5

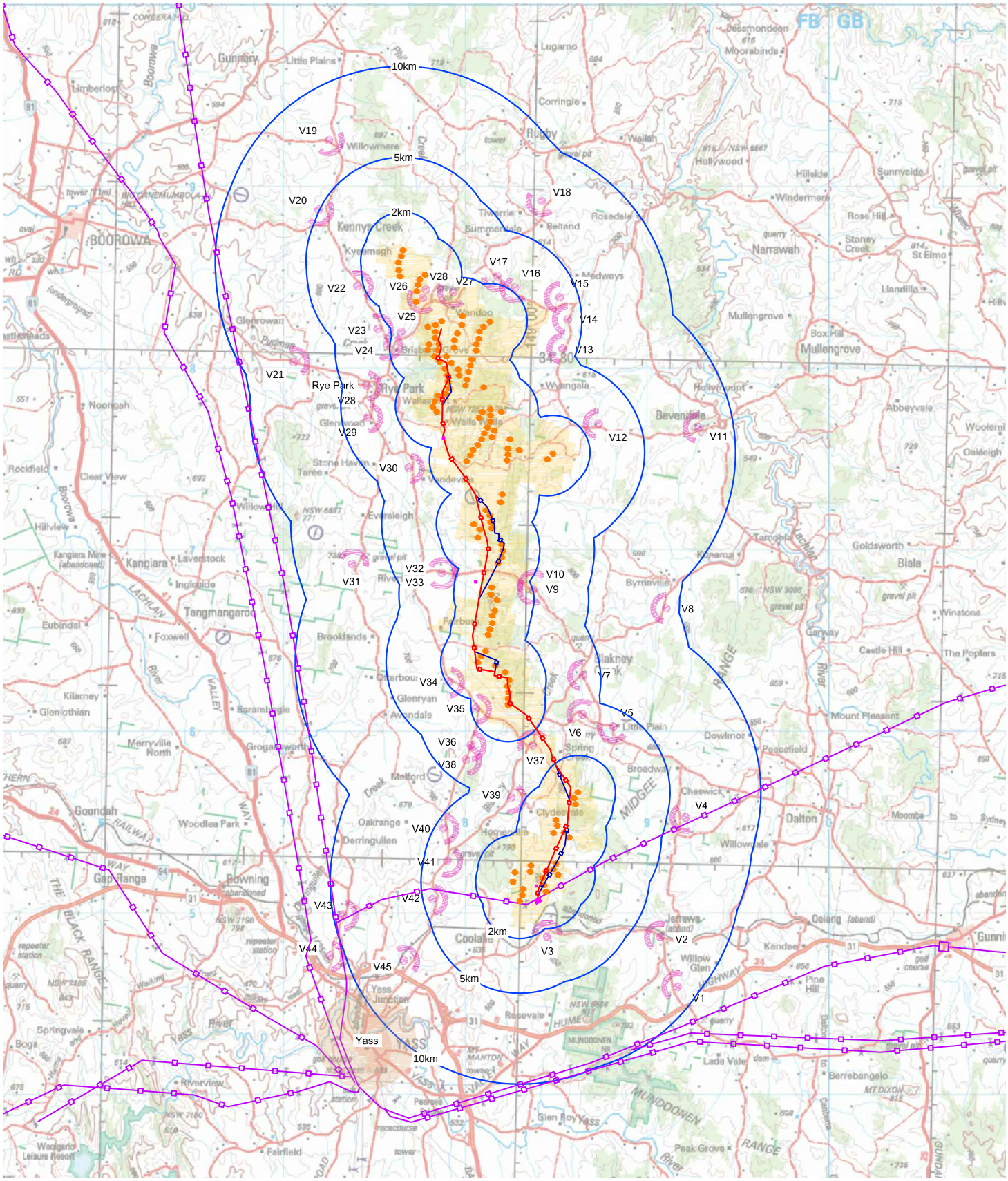
5.1 Panoramic Photographs

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.

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 6**, and the panoramic photographs illustrated in **Figures 7** to **22**.

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 31** to **62**.



Legend

- Proposed Rye Park wind turbine
- Rye Park wind farm project area
- Existing powerline
- Distance from proposed Rye Park wind turbine
- Photograph location (from publicly accessible area) (refer figures 7 - 22)
- Preferred 330 kV powerline route
- Alternative 330 kV powerline route

Figure 6
Photograph locations (from publicly accessible areas)

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RYE PARK WIND FARM

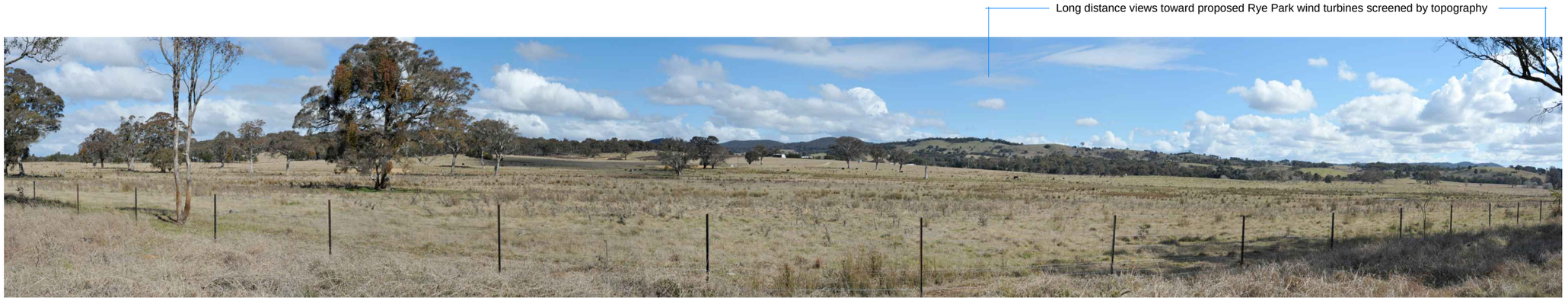

Photo Location V1- View north west Jerrawa Road (Approximate distance to closest wind turbine 8.7 km)
Photo coordinate Easting:691330 Northing:6146330

Photo Location V2- View north west from Coolalie Road (Approximate distance to closest wind turbine 6.6 km)
Photo coordinate Easting:690794 Northing:6148863

Photo Location V3 - View west to north from Coolalie Road toward southern extent of Rye Park wind farm (Approximate distance to closest wind turbine 2 km)
Photo coordinate Easting:684403 Northing:6149148

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 7
Photo Sheet 1

EPURON

Rye Park Wind Farm Pty Ltd

RYE PARK WIND FARM

GREEN BEAN DESIGN
landscape architects

Existing 330 kV supporting structure

Long distance views toward proposed Rye Park wind turbines partially screened by topography

(Image source GBD 2012)

Photo Location V4- View south west to west from Flacknell Creek Road (Approximate distance to closest wind turbine 5.8 km)
Photo coordinate Easting:691757 Northing:6155403

Mid distance views toward proposed Rye Park wind turbines (south cluster) partially screened by topography

Rye Park-Dalton Road

Mid distance views toward proposed Rye Park wind turbines (middle cluster)

(Image source GBD 2012)

Photo Location V5- View west from Rye Park-Dalton Road (Approximate distance to closest wind turbine 4.3 km)
Photo coordinate Easting:688018 Northing:6160381

Mid distance views toward proposed Rye Park wind turbines (middle cluster)

Rye Park-Dalton Road

(Image source GBD 2012)

Photo Location V6- View north west from Rye Park-Dalton Road (Approximate distance to closest wind turbine 4.1 km)
Photo coordinate Easting:686557 Northing:6160902

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 8
Photo Sheet 2

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RYE PARK WIND FARM

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Photo Location V7- View south from Blakney Creek North Road/Little Plains Road (Approximate distance to closest wind turbine 4.2 km)
Photo coordinate Easting:686436 Northing:6163108

Photo Location V8 - View south to west from Blakney Creek North Road (Approximate distance to closest wind turbine 9.5 km)
Photo coordinate Easting:690909 Northing:6166715

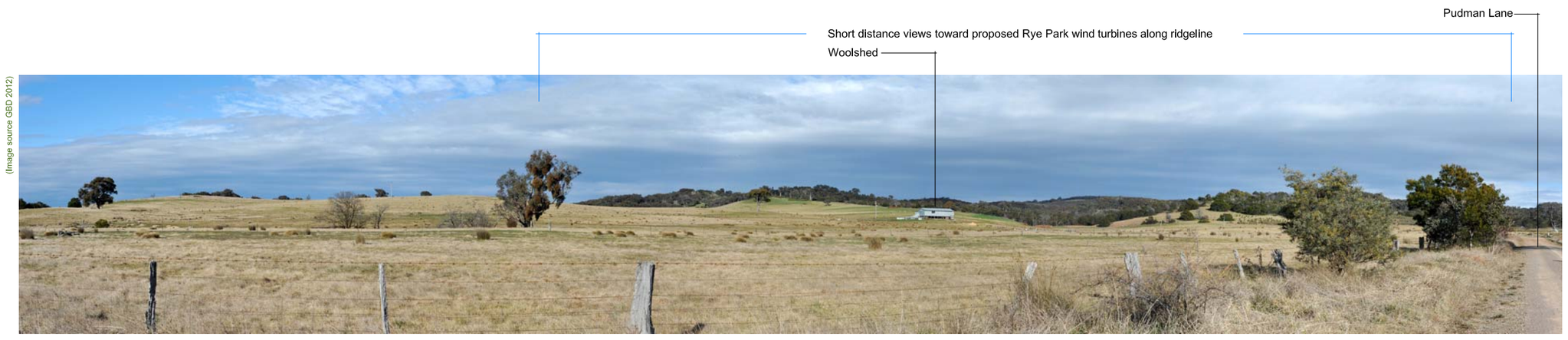

Photo Location V9 - View west from Pudman Lane (Approximate distance to closest wind turbine 2 km)
Photo coordinate Easting:683685 Northing:6167805

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 9
Photo Sheet 3

EPURON

Rye Park Wind Farm Pty Ltd

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RYE PARK WIND FARM

Short distance views toward proposed Rye Park wind turbines (middle cluster)

Pudman Lane

Associated dwelling

(Image source GBD 2012)

Photo Location V10 - View west to north west from Pudman Lane (Approximate distance to closest wind turbine 2.4 km)
Photo coordinate Easting:683685 Northing:6167805

Long distance views toward proposed Rye Park wind turbines blocked by topography and vegetation

(Image source GBD 2012)

Photo Location V11- View west from unamed road (Approximate distance to closest wind turbine 8.1 km)
Photo coordinate Easting:692476 Northing:6176356

Short to mid distance views toward proposed Rye Park wind turbines (middle cluster)

(Image source GBD 2012)

Photo Location V12- View west from unamed road (Approximate distance to closest wind turbine 2.9 km)
Photo coordinate Easting:687550 Northing:6176712

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 10
Photo Sheet 4

EPURON

Rye Park Wind Farm Pty Ltd

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landscape architects

RYE PARK WIND FARM

Mid distance views toward proposed Rye Park wind turbines (north cluster)

(Image source GBD 2012)

Photo Location V13- View west from unamed road (Approximate distance to closest wind turbine 4.8 km)
Photo coordinate Easting:685228 Northing:6178967

Mid distance views toward proposed Rye Park wind turbines (north cluster)

(Image source GBD 2012)

Photo Location V14 - View west from unamed road (Approximate distance to closest wind turbine 4.3 km)
Photo coordinate Easting:685630 Northing:6181304

Mid distance views toward proposed Rye Park wind turbines (north cluster)

(Image source GBD 2012)

Photo Location V15- View west from unamed road (Approximate distance to closest wind turbine 4 km)
Photo coordinate Easting:684474 Northing:6183209

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 11
Photo Sheet 5

EPURON

Rye Park Wind Farm Pty Ltd

RYE PARK WIND FARM

GREEN BEAN DESIGN
landscape architects

Short distance views toward proposed Rye Park wind turbines (north cluster) largely screened by topography and woodland vegetation

(Image source GBD 2012)

Photo Location V16 - View south from unamed road (Approximate distance to closest wind turbine 2.2 km)
Photo coordinate Easting:682919 Northing:6184033

Short distance views toward proposed Rye Park wind turbines (north cluster) largely screened by topography and woodland vegetation

(Image source GBD 2012)

Photo Location V17- View south from unamed road (Approximate distance to closest wind turbine 2.3 km)
Photo coordinate Easting:682117 Northing:6184510

Short distance views toward proposed Rye Park wind turbines (north cluster)largely screened by topography and woodland vegetation

(Image source GBD 2012)

Photo Location V18 - View south to south west from the Rugby - Rye Park Road (Approximate distance to closest wind turbine 7 km)
Photo coordinate Easting:684327 Northing:6188644

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 12
Photo Sheet 6

EPURON

Rye Park Wind Farm Pty Ltd

GREEN BEAN DESIGN
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RYE PARK WIND FARM

Photo Location V19- View south from Rye Park - Frogmore Road (Approximate distance to closest wind turbine 6.8 km)
Photo coordinate Easting:673026 Northing:6192062

Photo Location V20 - View south to south east from Rye Park - Frogmore Road (Approximate distance to closest wind turbine 4.8 km)
Photo coordinate Easting:672472 Northing:6188468

Photo Location V21- View north to east from Boorowa Road (Approximate distance to closest wind turbine 7.3 km)
Photo coordinate Easting:671077 Northing:6180163

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 13
Photo Sheet 7

EPURON

Rye Park Wind Farm Pty Ltd

GREEN BEAN DESIGN
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RYE PARK WIND FARM

Mid distance views toward proposed Rye Park wind turbines (north cluster)

(Image source GBD 2012)

Photo Location V22- View east to south east from Rye Park - Frogmore Road (Approximate distance to closest wind turbine 2.3 km)
Photo coordinate Easting:674522 Northing:6184073

Short to mid distance views toward proposed Rye Park wind turbines (north cluster)

Rye Park - Frogmore Road

(Image source GBD 2012)

Photo Location V23- View south from Rye Park - Frogmore Road (Approximate distance to closest wind turbine 2.6 km)
Photo coordinate Easting:675541 Northing:6181812

Short to mid distance views toward proposed Rye Park wind turbines (north cluster)

(Image source GBD 2012)

Photo Location V24- View east to south east from Rugby - Rye Park Road (Approximate distance to closest wind turbine 0.91 km)
Photo coordinate Easting:676006 Northing:6180979

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 14
Photo Sheet 8

EPURON

Rye Park Wind Farm Pty Ltd

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RYE PARK WIND FARM

Photo Location V25- View east to south east from Rye Park - Rugby Road (Approximate distance to closest wind turbine 1.4 km)
Photo coordinate Easting:676520 Northing:6181594

Photo Location V26- View south to west from Rye Park - Rugby Road (Approximate distance to closest wind turbine 0.61 km)
Photo coordinate Easting:677944 Northing:6183569

Photo Location V27- View south to west from Rye Park - Rugby Road (Approximate distance to closest wind turbine 1.1 km)
Photo coordinate N:679594 E:6183775

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 15
Photo Sheet 9

EPURON

Rye Park Wind Farm Pty Ltd

GREEN BEAN DESIGN
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RYE PARK WIND FARM

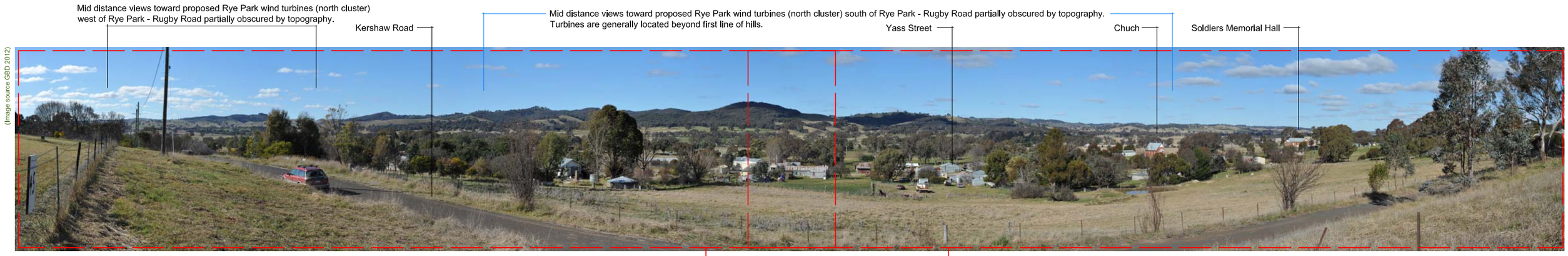

Photo Location V28- View north to south from Kershaw Street, Rye Park (Approxmiate distance to closest wind turbine 3.7 km)
Photo coordinate Northing:674906 Easting:6178797

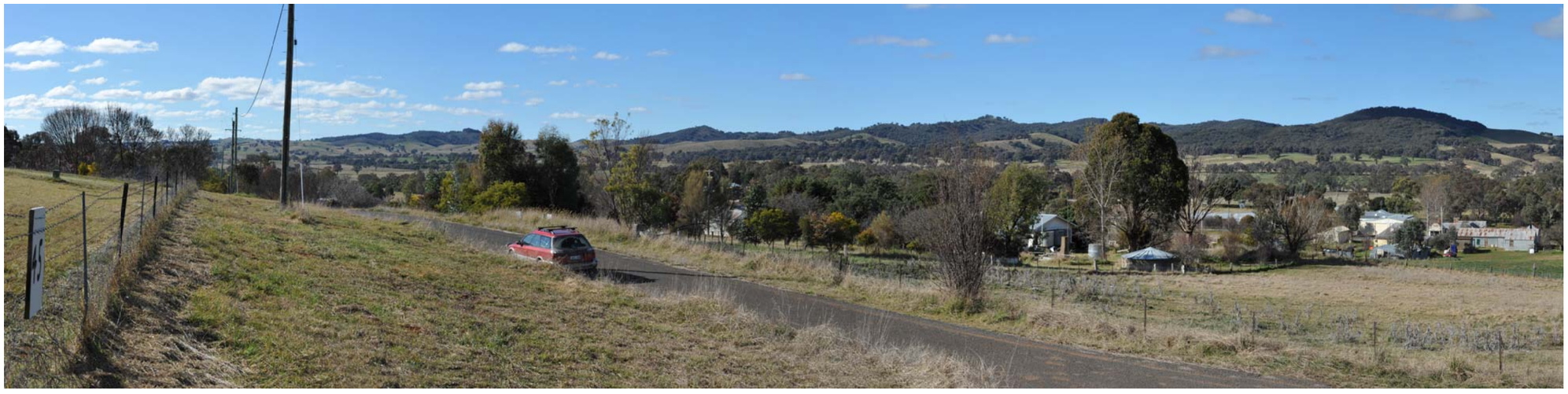

Photo Location V28 - Detail A

Photo Location V28 - Detail B

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 16
Photo Sheet 10

EPURON

Rye Park Wind Farm Pty Ltd

GREEN BEAN DESIGN
landscape architects

RYE PARK WIND FARM

Photo Location V29- View north to south east from Rye Park - Dalton Road (Approximate distance to closest wind turbine 3.5 km)
Photo coordinate Easting:674941 Northing:6177188

Photo Location V30- View east to south east from Rye Park - Dalton Road (Approximate distance to closest wind turbine 3.1 km)
Photo coordinate Easting:677146 Northing:6174399

Photo Location V31- View south to west from Rye Park - Rugby Road (Approximate distance to closest wind turbine 7 km)
Photo coordinate Easting:674150 Northing:6169341

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 17
Photo Sheet 11

EPURON

Rye Park Wind Farm Pty Ltd

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landscape architects

RYE PARK WIND FARM

Photo Location V32- View north to east from Blakney Creek Road (Approximate distance to closest wind turbine 2.7 km)
Photo coordinate Easting:678863 Northing:6168748

Photo Location V33- View east to south from Blakney Creek Road (Approximate distance to closest wind turbine 2.7 km)
Photo coordinate Easting:678863 Northing:6168748

Photo Location V34- View north to east from Rye Park - Dalton Road (Approximate distance to closest wind turbine 1.8 km)
Photo coordinate Easting:679482 Northing:6162712

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 18
Photo Sheet 12

EPURON

Rye Park Wind Farm Pty Ltd

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RYE PARK WIND FARM

Photo Location V35- View north east to east from Rye Park - Dalton Road (Approximate distance to closest wind turbine 1.7 km)
Photo coordinate Easting:680725 Northing:6161382

Photo Location V36- View north to east from Cooks Hill Road (Approximate distance to closest wind turbine 2.8 km)
Photo coordinate Easting:680395 Northing:6159432

Photo Location V37- View north to east from Rye Park - Dalton Road (Approximate distance to closest wind turbine 2.5 km)
Photo coordinate Easting:683768 Northing:6159421

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 19
Photo Sheet 13

EPURON

Rye Park Wind Farm Pty Ltd

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landscape architects

RYE PARK WIND FARM

Photo Location V38- View north to east from Cooks Hill Road (Approximate distance to closest wind turbine 2.7 km)
Photo coordinate Easting:678863 Northing:6168748

Photo Location V39- View north to east from Blakney Creek South Road (Approximate distance to closest wind turbine 2.9 km)
Photo coordinate Easting:682657 Northing:6156802

Photo Location V40- View north to east from Cooks Hill Road (Approximate distance to closest wind turbine 4.4 km)
Photo coordinate Easting:678995 Northing:6154716

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 20
Photo Sheet 14

EPURON

Rye Park Wind Farm Pty Ltd

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RYE PARK WIND FARM

Views toward the proposed Rye Park wind turbines screened by topography

Cooks Hill Road

(Image source GBD 2012)

Photo Location V41- View east to south from Cooks Hill Road (Approximate distance to closest wind turbine 3.8 km)
Photo coordinate Easting:679118 Northing:6153227

Views toward the proposed Rye Park wind turbines screened by topography

Existing 330 kV transmission line

(Image source GBD 2012)

Photo Location V42- View east to south from Cooks Hill Road (Approximate distance to closest wind turbine 3.8 km)
Photo coordinate Easting:679118 Northing:6153227

Views toward the proposed Rye Park wind turbines screened by topography

Existing 330 kV transmission line

(Image source GBD 2012)

Photo Location V43- View east to south from Wargeila Road (Approximate distance to closest wind turbine 9.4 km)
Photo coordinate Easting:673501 Northing:6150331

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 21
Photo Sheet 15

EPURON

Rye Park Wind Farm Pty Ltd

GREEN BEAN DESIGN
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RYE PARK WIND FARM

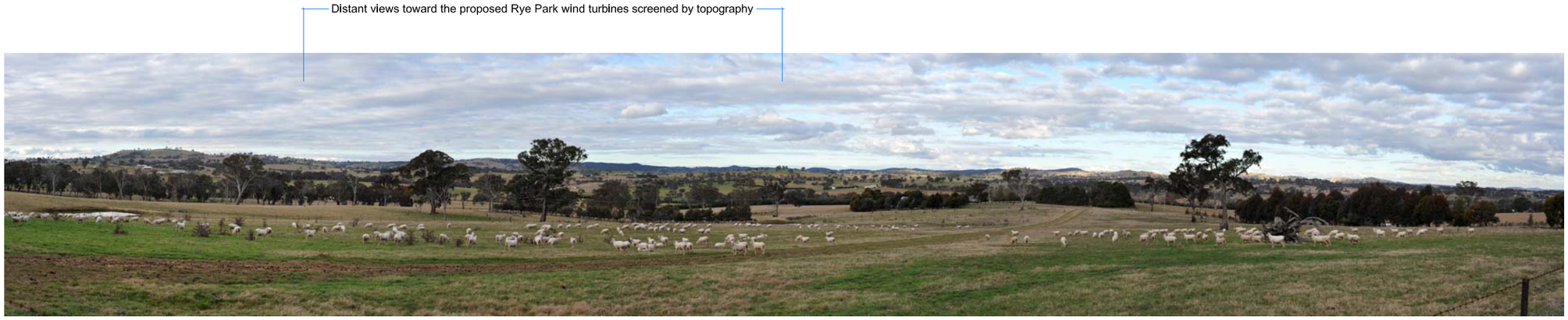

Photo Location V44- View north to east from Wargeila Road (Approximate distance to closest wind turbine 10.1 km)
Photo coordinate Easting:673248 Northing:6148011

Photo Location V45- View north to north east from Cooks Hill Road (Approximate distance to closest wind turbine 7.0 km)
Photo coordinate Easting:677560 Northing:6148645

Photo Location V46- View north to north east from Cooks Hill Road (Approximate distance to closest wind turbine 8.2 km)
Photo coordinate Easting:676301 Northing:6145925

Notes

Individual photographs taken with a Nikon D700 camera with a 50 mm 1:1.4D prime lens. Composite digital stitching results in a panorama with an approximate view angle between 110° and 130°.

Individual panorama photo coordinate map datum is in GDA94 to ± 5 m accuracy.

Extent of potential wind turbine visibility and illustrated on each panorama photograph is indicative only.

Figure 22
Photo Sheet 16

EPURON

Rye Park Wind Farm Pty Ltd

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RYE PARK WIND FARM

Landscape character areas

Section 6

6.1 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 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 grassland;
- LCA 2 – Drainage lines;
- LCA 3 – Hills and ridgelines;
- LCA 4 – Timbered areas; and
- LCA 5 – Rural dwellings.

6.2 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 6** and based on current good practice employed in the assessment of wind farm developments. This LVIA draws on the Land Use Consultants report on landscape sensitivity for wind farm developments on the Shetland Islands (March 2009) as well as the Western Australian Planning Commission manual for Visual Landscape Planning (2007). 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 Southern Tablelands region.

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 values on the local landscape. These values could transcend preferences (likes and dislikes) and include personal, cultural as well as other parameters.

Table 4 – Landscape Sensitivity Criteria

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 • Simple • Featureless • Absence of strong topographical variety	↔	• Small scale landform • Distinctive and complex • Human scale indicators • Presence of strong topographical variety
Landcover: patterns, complexity and consistency	• Simple • Predictable • Smooth, regular and uniform	↔	• Complex • Unpredictable • Rugged and irregular
Settlement and human influence	• Concentrated settlement pattern • Presence of contemporary structures (e.g. utility, infrastructure or industrial elements)	↔	• Dispersed settlement pattern • Absence of modern development, presence of small scale, historic or vernacular settlement

Landscape Sensitivity Assessment Criteria			
Characteristic	**Aspects indicating lower sensitivity to the wind farm development**	↔	**Aspects indicating higher sensitivity to the wind farm development**
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 • Neighbouring landscapes of low sensitivity • Weak connections, self contained area and views • Simple large scale backdrops	↔	• Prospects into and out from high ground or open landscape • Neighbouring landscapes of high sensitivity • Contributes to wider landscape • Complex or distinctive backdrops

The landscape sensitivity assessment criteria set out in **Table 4** 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 5** to **9** and is set out against each characteristic identified in **Table 4**.

The overall landscape sensitivity for each LCA is a summation of the scale for each characteristic identified in **Tables 5** to **9**. 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.

6.3 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.

6.3.1 LCA 1 Undulating grassland

Plate 1 – Typical view across undulating grassland landscape

Table 5 – LCA 1 - Undulating grassland -Landscape Sensitivity

	Lower Sensitivity		↔		Higher Sensitivity
	Low	Low to Med	Medium	Med to High	High
Rating	1	2	3	4	5
Landform and Scale		2			
	The undulating grassland is a medium to large scale open landscape with a gently undulating landform. The structure of the landform is simple containing few distinct features and has a general absence of any strong topographical elements.				
Landcover		2			
	Landcover is predominantly simple and predictable within the context of widespread pasture areas across the regional area of the Southern Tablelands. The overall landscape pattern created by the grass pasture is smooth, regular and uniform. Areas of cultural planting surround many rural dwellings in the form of evergreen windbreaks.				
Settlement and human influence			3		
	A dispersed settlement pattern occurs across the landscape and comprises rural farm homesteads including documented local historical structures. There is a general absence of modern development throughout this landscape, excluding agricultural structures and local roads and access tracks.				
Movement			3		
	Movement is generally restricted to occasional passing traffic, livestock as well as agricultural machinery.				
Rarity		2			
	Undulating grassland is generally well represented and a common feature across the regional area of the Southern Tablelands.				
Intervisibility			3		
	Undulating grassland areas appear as a simple backdrop in views from surrounding elevated areas. Undulating landform can retain and constrict views within the landscape, but generally contributes to the wider landscape.				
Overall Sensitivity Rating	Medium (Score 15 out of 30)				

6.3.2 LCA 2 Drainage Lines

Plate 2 – Typical view across drainage lines landscape

Table 6 – LCA 2 - Drainage Lines - Landscape Sensitivity

	Lower Sensitivity		↔		Higher Sensitivity
	Low	Low to Med	Medium	Med to High	High
Rating	1	2	3	4	5
Landform and Scale		2			
	Drainage line areas are generally contained by the gently sloping landform resulting in a small to moderate scale landform. The landform is simple containing few distinct features and has an absence of any strong topographical elements.				
Landcover		2			
	Landcover is predominantly simple and predictable within the context of widespread drainage areas across the broader regional area of the Southern Tablelands. The overall landscape pattern created by grass pasture within this landscape is smooth, regular and uniform, although mosaics of timbered stands on adjoining slopes and hillsides create some diversity and contrast in pattern.				
Settlement and human influence			3		
	There is a general absence of settlement within this landscape with a small and dispersed number of agricultural structures (some abandoned), minor access tracks and fences occurring throughout. Some modifications to landscape have been carried out to accommodate road access and the former railway line.				
Movement			3		
	A lack of any significant movement gives this landscape an overall still character.				
Rarity		2			
	Drainage lines and their surrounding landscape are generally well represented and a common feature across the broader regional area of the Southern Tablelands.				
Intervisibility			3		
	Intervisibility is limited as views from within this landscape are often contained by sloping landform rising above drainage lines. Views along drainage lines, as well as views from areas above and across drainage lines provide links with adjoining landscape areas.				
Overall Sensitivity Rating	Medium (Score 15 out of 30)				

6.3.3 LCA 3 Hills and ridgelines

Plate 3 – Typical views along hills and ridgeline landscape

Table 7 – LCA 3 - Hills and ridgelines - Landscape Sensitivity

	Lower Sensitivity		↔		Higher Sensitivity
	Low	Low to Med	Medium	Med to High	High
Rating	1	2	3	4	5
Landform and Scale		2			
	Hill and ridgeline areas are represented by a generally open and large scale landform with distant views available from elevated areas within this landscape. The landform is simple containing few distinct features and has a general absence of any strong topographical elements.				
Landcover		2			
	Landcover is predominantly simple and predictable within the context of similar areas across the Southern Tablelands. The overall landscape pattern created by grass pasture within this landscape is smooth, regular and uniform, although mosaics of timbered areas on surrounding slopes and cultural planting surrounding dwellings create some diversity and contrast in pattern.				
Settlement and human influence			3		
	Settlement is occasional and dispersed within this landscape and does not generally occur along the top of ridgelines or on elevated and exposed slopes. The main influences of human activity are the effects of agricultural improvement within the landscape.				
Movement				3	
	Movement is generally limited to local roads and access tracks.				
Rarity		2			
	Simple slopes and ridgelines are generally well represented and a common feature across the broader regional area of the Southern Tablelands.				
Intervisibility			3		
	Intervisibility is limited as views from within this landscape are often contained by undulating or sloping landform rising to ridgelines, however, potential distant views do occur from elevated landform to provide links to adjoining landscape areas.				
Overall Sensitivity Rating	Medium to high (Score 16 out of 30)				

6.3.4 LCA 4 Timbered Areas

Plate 4 – Typical views across timbered areas

Table 8 – LCA 4 - Timbered Areas- Landscape Sensitivity

	Lower Sensitivity		↔		Higher Sensitivity
	Low	Low to Med	Medium	Med to High	High
Rating	1	2	3	4	5
Landform and Scale		2			
	Timbered areas occur across a range of landform types that are generally defined by gently sloping or undulating landform resulting in a moderate scale landform. The landform is simple containing few distinct features and has an absence of any strong topographical elements.				
Landcover		2			
	Landcover is predominantly simple and predictable within the context of similar timbered areas across the Southern Tablelands. The overall landscape pattern created by timbered areas creates diversity and contrast to the smooth, regular and uniform grass pasture and cultivated areas within this landscape. The darker coloured foliage of timbered areas contrast against the surrounding backdrop of lighter toned pasture and cultivated areas.				
Settlement and human influence			3		
	Settlement is occasional and dispersed within timbered areas with the majority of dwellings visually screened from surrounding landscape areas. The main influences of human activity are the effects of agricultural improvement within the landscape.				
Movement				4	
	Movement is generally limited to local roads and access tracks.				
Rarity		2			
	Timbered areas are reasonably well represented and an established feature across broader regional areas of the New South Wales Southern Tablelands.				
Intervisibility			3		
	The level of intervisibility between this landscape and adjoining areas is generally determined by the location and extent of timbered area relative to view locations, but on the whole is limited as views from within this landscape are constrained by vegetation, combined with sloping landform. Views from scattered or lightly timbered areas provide links to adjoining landscape areas.				
Overall Sensitivity Rating	Medium to high (Score 16 out of 30)				

6.3.5 LCA 5 Settlement

Plate 5 – Typical view across settlement area

Table 9 – LCA 5 – Settlement - Landscape Sensitivity

	Lower Sensitivity		↔		Higher Sensitivity
	Low	Low to Med	Medium	Med to High	High
Rating	1	2	3	4	5
Landform and Scale				4	
	Rural settlement is generally surrounded and contained by gently sloping and low undulating landform resulting in an overall small scale rural urban environment.				
Landcover		2			
	The overall landscape pattern is defined by human scale indicators including houses, shops and roads together with a variety of urban structures which create some diversity and contrast in pattern. There are generally no elements that result in the presence of strong topographical variety.				
Settlement and human influence			3		
	Dwellings are dispersed beyond village settlement areas (such as Rye Park) and are generally associated with individual farms and rural structures.				
Movement				4	
	Movement is generally limited to local roads and access tracks.				
Rarity		2			
	Small scale urban settlements are dispersed across the landscape, as well as the broader regional area of the Southern Tablelands.				
Intervisibility			3		
	Intervisibility is limited where views are partially contained by buildings and structures, although views from elevated areas of the settlement extend beyond and across adjoining landscape areas.				
Overall Sensitivity Rating	Medium to high (Score 18 out of 30)				

6.4 Landscape values (local and regional)

6.4.1 What are landscape values?

For the purpose of this LVIA landscape values have been considered as a set of professional judgements on the importance to society of the local and regional landscape surrounding the proposed wind farm development. Societal landscape values may extend across a range of specific interests such as historic, ecological or cultural issues. The purpose of identifying local and regional landscape values is to consider what, if any, losses to landscape features or characteristics may result from the construction and operation of the wind farm development, and how this may impact upon local and regional landscape values.

6.4.2 Historical landscape values

Both the local and regional landscape has a strong association with early European settlement and agricultural production and specifically the establishment of pastoral properties. The European historical and cultural association with settlement and agrarian transition is set against a backdrop of indigenous populations being relocated and ultimately removed from the landscape. The removal of the indigenous population resulted in long held landscape cultural values and practices being replaced by those employed by early settlers in the mid to early 19th century. Landscape change resulting from the abrupt replacement of landscape values (from subsistence to industrial agriculture) has wrought significant alteration to the landscape; however the existing landscape pattern is one that most people at the local and regional scale would recognise as typical and representative of a rural agricultural landscape. A detailed consideration and assessment of the relationship between landscape and indigenous populations is described in the Aboriginal Cultural Heritage Assessment Report within the EA.

6.4.3 Existing landscape values

Whilst the landscape is likely to hold more significant value at a local level, for those who both work and reside within the landscape surrounding the proposed wind farm development, there are no specific references to designations or policies which indicate or recognise a ‘high value’ landscape. There are no ‘iconic’ landscape elements (including constructed or natural features) that occur within

the local or regional landscape which have a broader public value or that are recognised at a national level. The majority of land within and surrounding the wind farm development is privately owned and, at a local and regional scale, opportunities for the broader public to access and explore the landscape and obtain distant and panoramic views are largely limited to existing rights of way such as road corridors. The proposed wind farm development is not considered to have the potential to have a significant impact on existing landscape values.

6.5 Summary

In terms of overall landscape sensitivity and value, this LVIA has determined that the landscape within the viewshed of the proposed Rye Park wind farm has a medium/medium to high sensitivity to accommodate change, and represents a landscape that is reasonably typical of landscape types found in surrounding areas of the Southern Tablelands.

As a landscape with an overall medium/medium to high sensitivity to accommodate change, some characteristics are likely to be altered by the wind farm; however, the landscape will have some capability to accommodate change. This capability is largely derived from the presence of predominantly large scale and open landscape across portions of the wind farm, together with the relatively low settlement density within the Rye Park 10km viewshed.

This LVIA has determined that the wind farm would not be an unacceptable development within the Rye Park wind farm viewshed, which in a broader context also contains built elements such as roads, agricultural industry, aircraft landing strips, communication towers, powerlines as well as operating and approved wind farms within the vicinity of the Rye Park wind farm site.

Despite being ‘naturalistic’ in appearance large portions of the Southern Tablelands landscape have been heavily modified by agricultural improvement for pasture and arable production post European settlement. 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.

Viewshed, zone of visual influence and visibility Section 7

7.1 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 10**.

Table 10 – 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.

7.2 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 157 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 distances.

7.3 Zone of Visual Influence

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 to include:

- ZVI Diagram 1 from tip of blade;
- ZVI Diagram 2 from hub height; and
- ZVI Diagram 3 toward the whole turbine.

The extent to which the wind turbines may be visible are illustrated in **Figure 23**, and the ZVI Diagrams in **Figures 24, 25** and **26**.

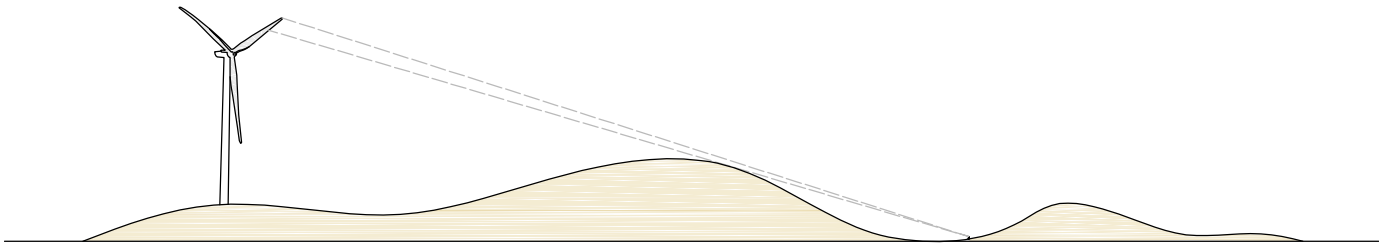
7.4 ZVI methodology

The methodology adopted for the ZVI 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:

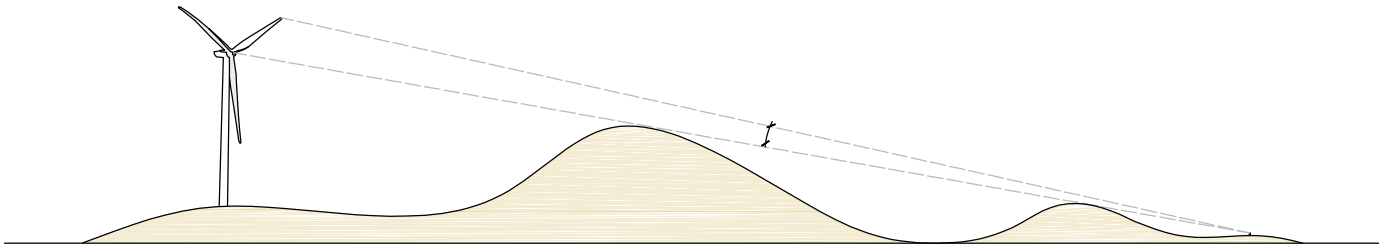
- to blade tips (essentially a view toward any part of the wind turbine rotor, including views toward the tips of blades above ridgelines);
- to hub height (essentially a view toward half the swept path of the wind turbine blades); and
- to the whole turbine (essentially a view toward the whole turbine).

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



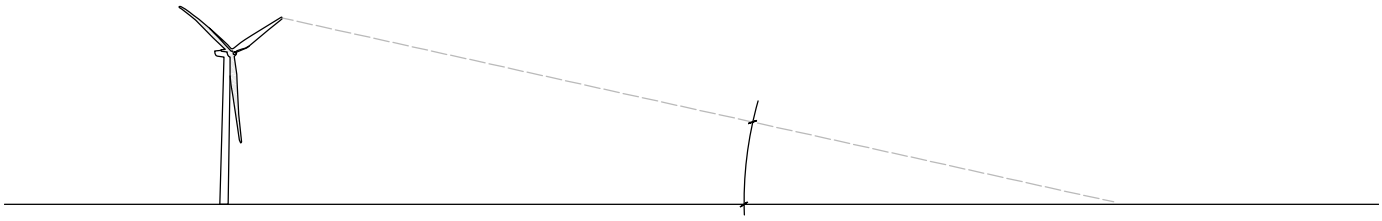
'Tip of blade'

View toward 'tip of blade' - where views extend toward the tip of blades above hill and ridgelines.



'Hub height'

View toward 'hub height' - where views extend toward the upper half of the wind turbine rotor with views toward the lower half of the rotor face and tower screened by landform.



'Whole turbine'

View toward 'whole turbine' - where views extend from the base of the tower to the tip of the rotor blade.

Figure 23
ZVI visibility zones

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NOTES:

The ZVI methodology is a purely geometric assessment where the visibility of the proposed Rye Park wind farm is determined from carrying out calculations based on a digital terrain model of the site and the surrounding terrain.

This assessment methodology is assumed to be conservative as the screening affects of any structures and vegetation above ground level are not considered in any way. Therefore the wind farm may not visible at many of the locations indicated on the ZVI maps due to the local presence of trees, vegetation or other screening potential. While the ZVI maps are a useful visualisation tool, they are very conservative in nature.

Additionally, the number of turbines visible at any one time is also affected by the weather condition at the time. Inclement or cloudy weather tends to mask the visibility of the proposed wind project.

LEGEND:
Number of wind turbine tip of blade visible

- 121 - 126
- 101 - 120
- 81 - 100
- 61 - 80
- 41 - 60
- 21 - 40
- 1 - 20

- Involved residential dwelling within 2 km of wind turbine
- Involved residential dwelling beyond 2 km of wind turbine
- Uninvolved residential dwelling within 2 km of wind turbine
- Uninvolved residential dwelling between 2 km and 5 km of wind turbine
- Uninvolved residential dwelling between 5 km and 10 km of wind turbine
- Non residential structure
- Proposed Rye Park wind turbine (indicative layout)
- Distance from proposed Rye Park wind turbine

Figure 24
ZVI Diagram 1 tip of blade

0km 5km 10km

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- 121 - 126
- 101 - 120
- 81 - 100
- 61 - 80
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- 21 - 40
- 1 - 20

- Involved residential dwelling within 2 km of wind turbine
- Involved residential dwelling beyond 2 km of wind turbine
- Uninvolved residential dwelling within 2 km of wind turbine
- Uninvolved residential dwelling between 2 km and 5 km of wind turbine
- Uninvolved residential dwelling between 5 km and 10 km of wind turbine
- Non residential structure
- Proposed Rye Park wind turbine (indicative layout)
- Distance from proposed Rye Park wind turbine

0km 5km 10km

Figure 25
ZVI Diagram 2 Hub height

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NOTES:

The ZVI methodology is a purely geometric assessment where the visibility of the proposed Rye Park wind farm is determined from carrying out calculations based on a digital terrain model of the site and the surrounding terrain.

This assessment methodology is assumed to be conservative as the screening affects of any structures and vegetation above ground level are not considered in any way. Therefore the wind farm may not visible at many of the locations indicated on the ZVI maps due to the local presence of trees, vegetation or other screening potential. While the ZVI maps are a useful visualisation tool, they are very conservative in nature.

Additionally, the number of turbines visible at any one time is also affected by the weather condition at the time. Inclement or cloudy weather tends to mask the visibility of the proposed wind project.

LEGEND:
Number of whole wind turbines visible

- 121 - 126
- 101 - 120
- 81 - 100
- 61 - 80
- 41 - 60
- 21 - 40
- 1 - 20

- Involved residential dwelling within 2 km of wind turbine
- Involved residential dwelling beyond 2 km of wind turbine
- Uninvolved residential dwelling within 2 km of wind turbine
- Uninvolved residential dwelling between 2 km and 5 km of wind turbine
- Uninvolved residential dwelling between 5 km and 10 km of wind turbine
- Non residential structure
- Proposed Rye Park wind turbine (indicative layout)
- Distance from proposed Rye Park wind turbine

Figure 26
ZVI Diagram 3 whole tubines

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0km 5km 10km

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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.

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

7.5 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.

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.

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.

7.6 Visibility

The level of wind turbine visibility within the Rye Park wind farm 10 km viewshed can result from a number of factors such as:

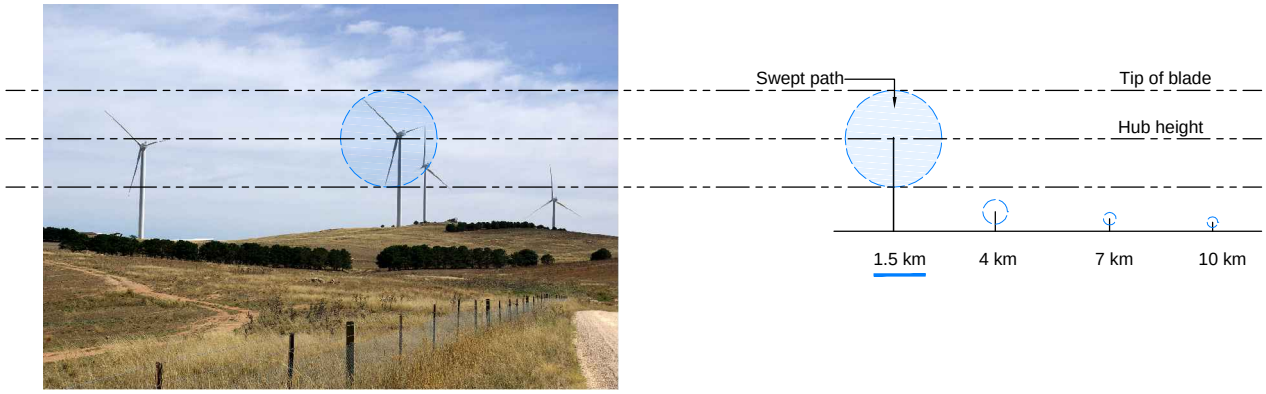
- distance effect;
- movement;
- relative position; and
- weather.

7.6.1 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 27**, 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.

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 11** outlines the relative effect of distance on visibility and has been based on empirical



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 27
Distance effect

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research conducted by the University of Newcastle (2002) as well as direct observations made during wind farm site inspections.

Table 11 – 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. 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. 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. 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. 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. 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).

7.6.2 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.

7.6.3 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.

Significance of visual impact

Section 8

8.1 Introduction

The significance of visual impact resulting from the construction and operation of the Rye Park 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 12 – View Location Sensitivity

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

Table 13 – 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 14** below:

Table 14 – 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	

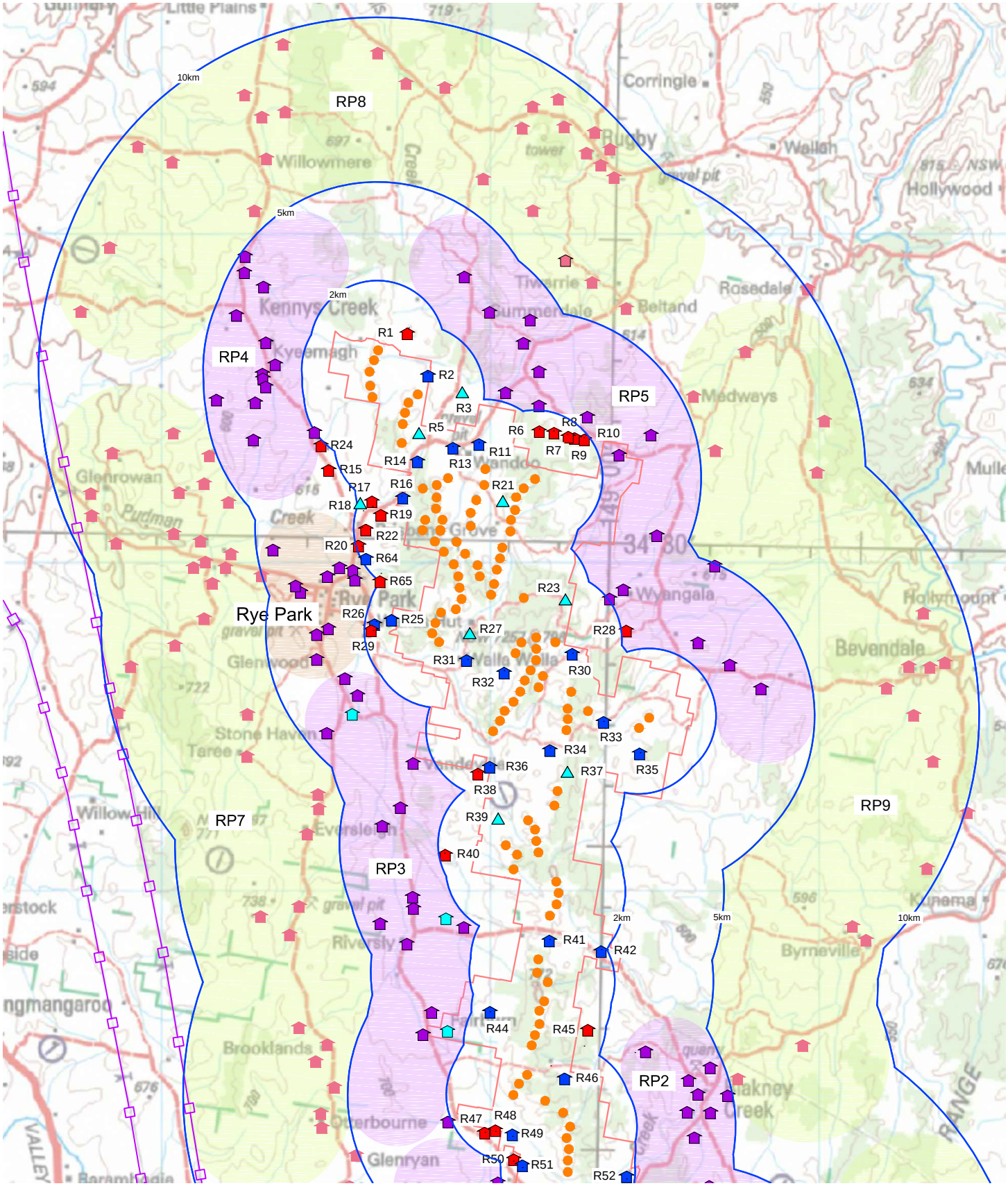
Criteria	Definition
High	81 -126 wind turbines visible
Medium	41 – 80 wind turbines visible
Low	21 – 40 wind turbines
Very low	1 – 20 wind turbines visible

The levels of view sensitivity and scale or magnitude of change outlined in **Table 15** is used **as a guide** to determine levels of visual significance.

Table 15 Visual significance 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.



Legend

- Involved residential dwelling within 2 km of wind turbine
- Involved residential dwelling beyond 2 km of wind turbine
- Uninvolved residential dwelling within 2 km of wind turbine
- Uninvolved residential dwelling between 2 km and 5 km of wind turbine
- Uninvolved residential dwelling between 5 km and 10 km of wind turbine
- Non residential structure
- Proposed Rye Park wind turbine (indicative layout)
- Distance from proposed Rye Park wind turbine
- Existing powerline
- Area between 2 km and 5 km of wind turbines
- Area between 5 km and 10 km of wind turbines

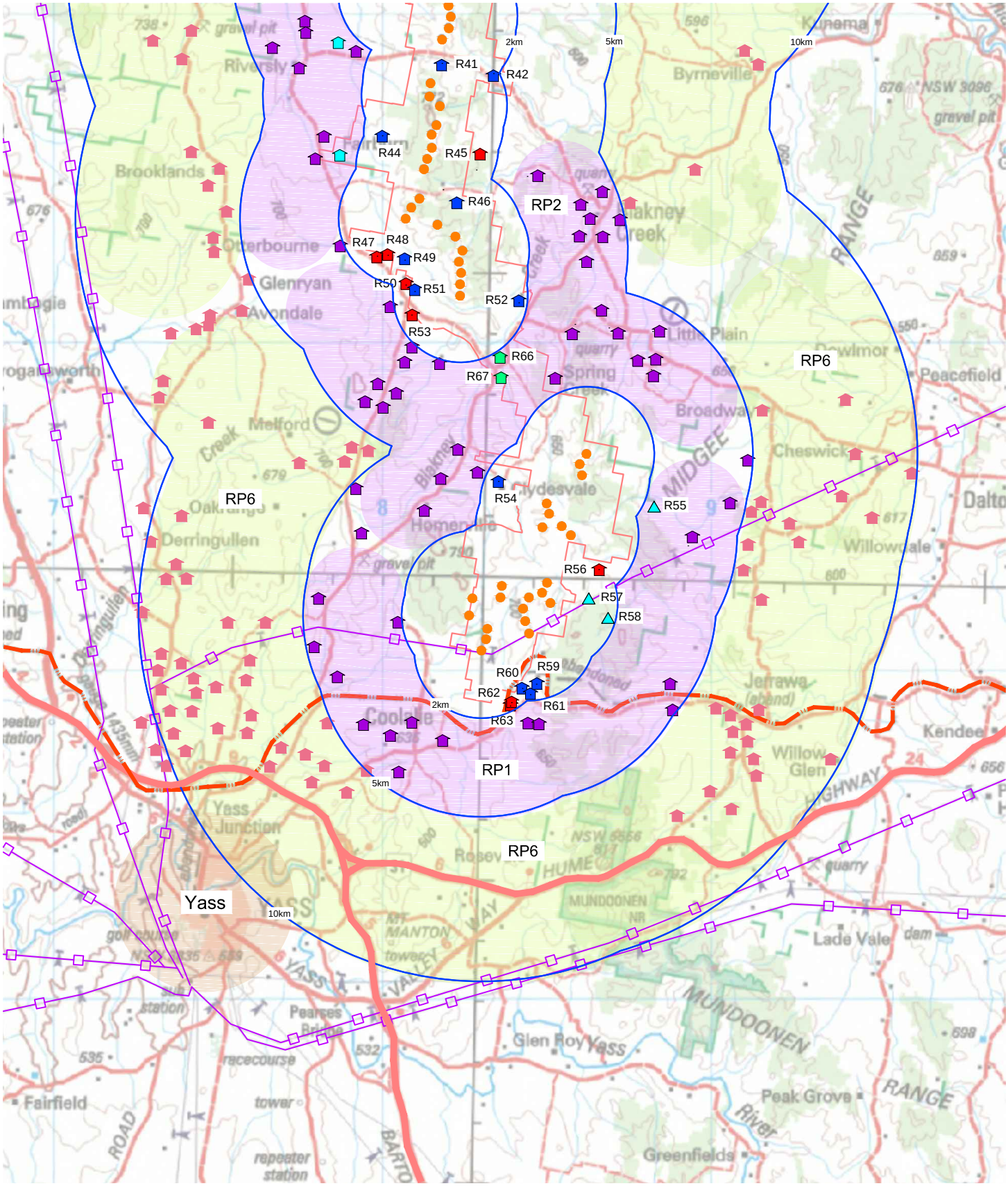
0km 2.5km

Figure 28a
Residential view locations north

EPURON
Rye Park Wind Farm Pty Ltd

RYE PARK WIND FARM

GREEN BEAN DESIGN
landscape architects



Legend

- Involved residential dwelling within 2 km of wind turbine
- Involved residential dwelling beyond 2 km of wind turbine
- Uninvolved residential dwelling within 2 km of wind turbine
- Uninvolved residential dwelling between 2 km and 5 km of wind turbine
- Uninvolved residential dwelling between 5 km and 10 km of wind turbine
- Non residential structure
- Proposed Rye Park wind turbine (indicative layout)
- Distance from proposed Rye Park wind turbine
- Existing powerline
- Area between 2 km and 5 km of wind turbines
- Area between 5 km and 10 km of wind turbines

0km 2.5km

Figure 28b
Residential view locations south

EPURON
Rye Park Wind Farm Pty Ltd

RYE PARK WIND FARM

GREEN BEAN DESIGN
landscape architects

8.2 Residential visual significance matrix (dwellings within 2 km of wind turbines)

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
R1	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,100 m	High	Medium to High	Views extend south toward wind turbines along the northern portion of the project area. Short distance views extend toward a medium to high extent of wind turbines within the project site which occupy a significant proportion of the existing skyline view.	High
R2	Involved landowner Residential dwelling High sensitivity	Very low	Very short 630 m	High	Medium to High	Very short distance views extend toward wind turbines elevated on steep sided hills as well as more distant views toward wind turbines along ridgelines across the northern portion of the project area.	High
R3	Non residential structure	n/a	n/a	n/a	n/a	n/a	n/a
R5	Non residential structure	n/a	n/a	n/a	n/a	n/a	n/a
R6	**Uninvolved landowner** Residential dwelling High	Very low	Short 1,400 m	High	Medium	Foreground tree cover largely screens views south east to south west. Proximate wind turbine visibility will be restricted to upper portion views.	Low

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
	sensitivity						
R7	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,500 m	High	Medium	Short distance views will extend to wind turbines within the northern portion of the project area. Generally located on low hills above timbered slopes, the wind turbines will occupy a large proportion of the existing skyline view.	Medium to High
R8	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,680	High	Low	Views toward the wind turbines within the northern portion of the project area will be mostly screened by timbered areas beyond the residential dwelling. Occasional tip of blade movement may be visible above tree canopies.	Low
R9	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,760 m	High	Low	View south toward proximate wind turbines within the northern portion of the project area will be screened by landform and tree cover. The closest (and partially visible wind turbine) will be located approximately 8 km south from dwelling.	Low (Nil)
R10	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,955 m	High	Medium	View south toward proximate wind turbine will be screened by tree cover.	Low

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
R11	Involved landowner Residential dwelling High sensitivity	Very low	Very short 836 m	High	Medium	Very short distance views extend toward wind turbines will be partially screened by windbreak planting surrounding residential dwelling.	Low to Medium
R12 Not shown on Figure 28	Non residential structure	n/a	n/a	n/a	n/a	n/a	n/a
R13	Involved landowner Residential dwelling High sensitivity	Very low	Very short 980 m	High	Medium	Very short distance views extend toward wind turbines to the north and south of the residential dwelling within the northern portion of the project area.	Medium to High
R14	Involved landowner Residential dwelling High sensitivity	Low	Very short 697 m	High	Low	Very short distance views extend toward wind turbines to the north and south of the residential dwelling within the northern portion of the project area.	Medium to High
R15	**Uninvolved landowner** Residential	Very low	Short 2,416 m	High	Medium to High	Short distance view extends toward wind turbines above timbered slopes and cleared pasture hilltops. Distant views extend toward	Medium

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
	dwelling High sensitivity					turbines along the western edge of the northern project area.	
R16	Involved landowner Residential dwelling High sensitivity	Very low	Very short 680 m	High	Low to Medium	Very short distance views extend toward wind turbines to the north and south of the residential dwelling within the northern portion of the project area.	Medium to High
R17	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,960 m	High	Low to Medium	Views toward wind turbines from dwelling are partially obscured by scattered tree cover to the north east and east of the property. Views toward wind turbines will be visible on hilltops and beyond timbered slopes and ridgelines.	Medium
R18	Non residential structure	n/a	n/a	n/a	n/a	n/a	n/a
R19	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,350 m	High	Low to Medium	Short distance views extend toward wind turbines to the north and south of the residential dwelling within the northern portion of the project area.	Medium to High

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
R20	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,870 m	High	Low to Medium	Views toward wind turbines from dwelling are partially obscured by scattered tree cover to the north east and east of the property. Views toward wind turbines will be visible on hilltops and beyond timbered slopes and ridgelines.	Medium
R21	Non residential structure	n/a	n/a	n/a	n/a	n/a	n/a
R22	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,850 m	High	Low	Views north to north east will extend to wind turbines along hill top areas, with tree cover providing partial screening toward portions of the project area.	Low
R23	Non residential structure	n/a	n/a	n/a	n/a	n/a	n/a
R24	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 2,150 m	High	Medium to High	Direct views from the residential dwelling toward the proximate wind turbines are partially screened by surrounding tree cover and outbuildings; however wind turbines will be visible from garden areas surrounding the residential dwelling.	Medium to High

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
R25	Involved landowner Residential dwelling High sensitivity	Very low	Short 1,240 m	High	Low to Medium	Views toward wind turbines along the western edge of the northern project area are partially screened by vegetation and landform. Short distance and elevated views to the east of the residential dwelling will occupy a portion of the available view.	Low to Medium
R26	Involved landowner Residential dwelling High sensitivity	Very low	Short 1,800 m	High	Medium	Views toward wind turbines along the western edge of the northern project area are partially screened by vegetation and landform. Short distance and elevated views to the east of the residential dwelling will occupy a portion of the available view.	Low to Medium
R27	Non residential structure	n/a	n/a	n/a	n/a	n/a	n/a
R28	**Uninvolved landowner** Beyond 2 km	Very low	Short 2,172 m	High	Low to Medium	Views extend toward wind turbines along the eastern edge of the northern project area.	Low to Medium
R29	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,850 m	High	Medium	Views toward wind turbines along the western edge of the northern project area are partially screened by vegetation and landform. Short distance and elevated views to the east of the residential dwelling will occupy a portion of the available view.	Low to Medium

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
R30	Involved landowner Residential dwelling High sensitivity	Very low	Very short 615 m	High	Low	Elevated views toward wind turbines within the northern portion of the project area. View opportunities are generally restricted by the proximate location of the residential dwelling to the folded and bisected landform of low hills.	Medium
R31	Involved landowner Residential dwelling High sensitivity	Very low	Short 1,015 m	High	Low to Medium	Elevated views toward wind turbines within the northern portion of the project area. View opportunities are generally restricted by the proximate location of the residential dwelling to the folded and bisected landform of low hills.	Medium
R32	Involved landowner Residential dwelling High sensitivity	Very low	Very short 693 m	High	Low to Medium	Elevated views toward wind turbines within the northern portion of the project area. View opportunities are generally restricted by the proximate location of the residential dwelling to the folded and bisected landform of low hills.	Medium
R33	Involved landowner Residential dwelling High sensitivity	Very low	Very short 564 m	High	Low	Elevated views toward wind turbines within the northern portion of the project area. View opportunities are generally restricted by the proximate location of the residential dwelling to the folded and bisected landform of low hills.	Low to Medium

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
R34	Involved landowner Residential dwelling High sensitivity	Very low	Very short 725 m	High	Low	Elevated views toward wind turbines within the northern portion of the project area. View opportunities are generally restricted by the proximate location of the residential dwelling to the folded and bisected landform of low hills.	Medium
R35	Involved landowner Residential dwelling High sensitivity	Very low	Very short 745 m	High	Low to Medium	Elevated views toward wind turbines within the northern portion of the project area. View opportunities are generally restricted by the proximate location of the residential dwelling to the folded and bisected landform of low hills.	Low to Medium
R36	Involved landowner Residential dwelling High sensitivity	Very low	Short 1,033 m	High	Medium	Elevated views toward wind turbines within the northern portion of the project area. View opportunities are generally restricted by the proximate location of the residential dwelling to the folded and bisected landform of low hills.	Medium to High
R37	Non residential structure	n/a	n/a	n/a	n/a	n/a	n/a
R38	**Uninvolved landowner** Residential dwelling	Very low	Short 1,400 m	High	Medium to High	Views extend toward wind turbines across hills and ridgelines with partial screening provided by tree cover within property.	Medium to High

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
	High sensitivity						
R39	Non residential structure	n/a	n/a	n/a	n/a	n/a	n/a
R40	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,870 m	High	Low	Views toward wind turbines are framed by a series of hills and slopes with timbered and scattered tree cover.	Medium
R41	Involved landowner Residential dwelling High sensitivity	Very low	Very short 718 m	High	Medium to High	Views extend north and south toward wind turbines within the central portion of the project area. Views will be partially screened by tree planting and timbered areas surrounding and beyond the residential dwelling.	Low to Medium
R42	Involved landowner Residential dwelling High sensitivity	Very low	Short 1,873 m	High	Low to Medium	Views extend north and south toward wind turbines within the central portion of the project area. Views will be partially screened by tree planting and timbered areas surrounding and beyond the residential dwelling.	Medium
R43 Not shown on	Non residential	n/a	n/a	n/a	n/a	n/a	n/a

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
Figure 28	structure						
R44	Involved landowner Residential dwelling High sensitivity	Very low	Short 1,500 m	High	High	Views extend toward wind turbines along ridgeline within central portion of the project area. The wind turbines would occupy the skyline to the east of the residential dwelling.	Medium to High
R45	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,486 m	High	Low	View extends toward wind turbines along ridgeline beyond and above timbered slopes. Wind turbines occupy skyline view extending through north to west.	Medium to High
R46	Involved landowner Residential dwelling High sensitivity	Very low	Very short 875 m	High	Low to Medium	Elevated views toward wind turbines above timbered slopes within the central project area.	Medium
R47	**Uninvolved landowner** Residential dwelling High	Very low	Short 1,100 m	High	Low to Medium	Elevated views extend toward wind turbines on ridgeline and low hills within central portion of the project area. Landform and wind turbine enclose and occupy skyline view through north to east orientation. Views would also extend toward the 330 kV powerline	Medium to High

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
	sensitivity					along the ridgeline and between the wind turbines.	
R48	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,236 m	High	Low to Medium	Elevated views extend toward wind turbines on ridgeline and low hills within central portion of the project area. Landform and wind turbine enclose and occupy skyline view through north to east orientation. Views would also extend toward the 330 kV powerline along the ridgeline and between the wind turbines.	Medium to High
R49	Involved landowner Residential dwelling High sensitivity	Very low	Short 1,253 m	High	Medium	Elevated views extend toward wind turbines on ridgeline and low hills within central portion of the project area. Landform and wind turbine enclose and occupy skyline view through north to east orientation. Views would also extend toward the 330 kV powerline along the ridgeline and between the wind turbines.	Medium to High
R50	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,674 m	High	Medium	Elevated views extend toward wind turbines on ridgeline and low hills within central portion of the project area. Landform and wind turbine enclose and occupy skyline view through north to east orientation. Views would also extend toward the 330 kV powerline along the ridgeline and between the wind turbines.	Medium to High
R51	Involved landowner Residential dwelling High	Very low	Short 1,386 m	High	Medium	Elevated views extend toward wind turbines on ridgeline and low hills within central portion of the project area. Landform and wind turbine enclose and occupy skyline view through north to east orientation. Views would also extend toward the 330 kV powerline	Medium to High

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
	sensitivity					along the ridgeline and between the wind turbines.	
R52	Involved landowner Residential dwelling High sensitivity	Very low	Short 1,780 m	High	Very low to low	Views toward wind turbines within the central portion of the project area are partially screened by tree planting to the west of the residential dwelling.	Low to Medium
R53	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,573 m	High	Low to Medium	Views extend toward wind turbines on ridgeline within the central portion of the project area. The wind turbines occupy central field of view with potential to dominate view, Views would also extend toward portions of the 330 kV powerline along ridgeline and between wind turbines.	Medium to High
R54	Involved landowner Residential dwelling High sensitivity	Very low	Short 1,516 m	High	Very low	Elevated views extend toward wind turbines on low hills within the southern portion of the project area occupying partial and available skyline views.	Medium to High
R55	Non residential structure	n/a	n/a	n/a	n/a	n/a	n/a
R56	**Uninvolved landowner**	Very low	Short 1,364 m	High	Low	Views extend toward wind turbines within the southern portion of the project area and occupy a relatively small area of the central	Low to Medium

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
	Residential dwelling High sensitivity					field of view with some visual separation to adjacent turbines.	
R57	Non residential structure	n/a	n/a	n/a	n/a	n/a	n/a
R58	Non residential structure	n/a	n/a	n/a	n/a	n/a	n/a
R59	Involved landowner Residential dwelling High sensitivity	Very low	Short 1,559 m	High	Very low	Views extend toward a small number of wind turbines within the southern portion of the project area.	Low
R60	Involved landowner Residential dwelling High sensitivity	Very low	Short 1,695 m	High	Very low	Views extend toward a small number of wind turbines within the southern portion of the project area.	Low
R61	Involved landowner	Very low	Short 2,160 m	High	Very low	Tree planting around property provides partial screening toward southern portion of the project area.	Low

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
R62	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 1,978 m	High	Very low	Views toward turbines in the southern portion of the project area are largely screened by tree planting surrounding residential dwelling.	Low
R63	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 2,200 m	High	Very low	Views toward turbines in the southern portion of the project area are largely screened by tree planting surrounding residential dwelling.	Low
R64	Involved landowner Residential dwelling High sensitivity	Very low	Short 1,960 m	High	Low	Views toward wind turbines within the northern portion of the project area are partially screened by tree planting and shed to the east of the residential dwelling, Views will extend to broader areas of the project along the western face of the northern portion from areas surrounding the residential dwelling.	Low to Medium
R65	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	Short 2,000 m	High	Very low	Views toward the wind turbines within the northern portion of the project area are largely screened by landform and tree cover within the vicinity of the residential dwelling.	Low (Nil)

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
Assessment of residential dwelling between 2 km and 5 km of the proposed Rye Park wind turbines (Refer Figure 28a and 28b for locations)							
RP1	**Uninvolved landowners** Residential dwellings High sensitivity	Low	Short to Medium 2,000 m to 5,000 m	High	Very low	Views toward the wind turbines within the southern portion of the project area will be influenced by a combination of topography and vegetation which will tend to restrict the visibility of the wind turbines from a number of the residential dwelling locations.	Low to Medium
RP2	**Uninvolved landowners** Residential dwellings High sensitivity	Low	Short to Medium 2,000 m to 5,000 m	High	Low to Medium	Views toward the wind turbines within the southern and central portion of the project area will be influenced by a combination of topography and vegetation which will tend to restrict the visibility of the wind turbines from a number of the residential dwelling locations. Visibility will also be restricted by tree planting around residential dwellings and alongside road corridors.	Low to Medium
RP3	**Uninvolved landowners** Residential dwellings High sensitivity	Low	Short to Medium 2,000 m to 5,000 m	High	High	View will extend toward wind turbines along the west edge of the northern project area.	Medium
Rye Park	**Uninvolved landowners** Residential	Low	Short to Medium 2,000 m to	High	High	Views from the Rye Park township extend east toward the northern portion of the project area. Wind turbines would be visible	Low to Medium

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
	dwellings High sensitivity		5,000 m			above and along ridgeline areas, but generally set back from the closest hills to the township. The wind turbines would be visible from a number of locations within the township and occupy portions of the skyline view but would not tend to dominate the view. Visibility would increase around the elevated areas within the western portion of the township.	
RP4	**Uninvolved landowners** Residential dwellings High sensitivity	Low	Short to Medium 2,000 m to 5,000 m	High	Medium to High	Views will extend across generally cleared pastoral land toward wind turbines within the northern portion of the project area.	Medium
RP5	**Uninvolved landowners** Residential dwellings High sensitivity	Low	Short to Medium 2,000 m to 5,000 m	High	Medium	Views will extend toward wind turbines in the northern portion of the project area with some level of screening due to an undulating landform and areas of tree cover to hillsides and ridgeline areas.	Low to Medium
Assessment of residential dwelling between 5 km and 10 km of the proposed Rye Park wind turbines (Refer Figure 28a and 28b for locations)							
RP6	**Uninvolved landowners** Residential dwellings	Low	Long 5,000 m to 10,000 m	High	Low	Some views toward wind turbines within the southern portion of the project area would be partially screened by topography and timbered areas for a number of the residential dwellings located in the surrounding landscape. Where visible, wind turbines are	Low

Table 16 – Residential visual significance matrix (Refer **Figures 28a** and **28b** for residential view locations)

View location (Refer to Figure 28)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest turbine	Duration of effect	Extent of visibility (ZVI hub height)	Degree of visibility	Visual significance
	High sensitivity					unlikely to form a dominant element and will occupy a relatively small proportion of the available view.	
RP7	**Uninvolved landowners** Residential dwellings High sensitivity	Low	Long 5,000 m to 10,000 m	High	Medium to High	Views toward wind turbines within the central portion of the project area would, in some instances, be screened by undulating landform and tree cover surrounding dwellings, as well as tree planting along the Wargeila Road corridor. Where visible, wind turbines are unlikely to form a dominant element and will occupy a relatively small proportion of the available view.	Low
RP8	**Uninvolved landowners** Residential dwellings High sensitivity	Low	Long 5,000 m to 10,000 m	High	Low to Medium	Views toward wind turbines in the northern portion of the project area are largely blocked by an undulating and folding landform. Where visible, wind turbines are unlikely to form a dominant element and will occupy a relatively small proportion of the available view.	Low
RP9	**Uninvolved landowners** Residential dwellings High sensitivity	Low	Long 5,000 m to 10,000 m	High	Medium to High	Views toward wind turbines in the northern portion of the project area are largely blocked by an undulating and folding landform. Where visible, wind turbines are unlikely to form a dominant element and will occupy a relatively small proportion of the available view.	Low

8.3 Summary of residential visual significance (within 2 km of wind turbines)

This LVIA identified a combined total of 51 involved and uninvolved residential dwellings within the Rye Park wind farm 2 km viewshed.

An additional thirteen view locations were determined to be either uninhabitable or not a residential structure. Unoccupied residential dwellings have been included and assessed as part of this LVIA where structures and buildings were considered to be habitable at the time of the field work.

The Boorowa Shire, Yass Valley Shire and the Upper Lachlan Shire Councils have confirmed that there are no development applications for approved but not yet developed dwellings (or subdivisions with residential rights) within 2 km of the Rye Park wind farm turbines.

An assessment of each potential residential view location determined:

- 10 of the 51 residential view locations would have a low visual significance;
- 10 of the 51 residential view locations would have a low to medium visual significance;
- 12 of the 51 residential view locations would have a medium visual significance;
- 17 of the 51 residential view locations would have a medium to high visual significance; and
- 2 of the 51 residential view locations would have a high visual significance.

The field assessment for the majority of residential view locations was undertaken from the closest publicly accessible location, with a conservative approach adopted where there was no opportunity to confirm the actual extent of available view from areas within or immediately surrounding the residence. It is anticipated that some visibility ratings would be less than those determined subject to a process of verification from private property.

8.4 Summary of residential visual significance (beyond 2 km of wind turbines)

The majority of residential dwellings located beyond the 2 km wind turbine offset are unlikely to be significantly impacted by the wind farm development. The localised influence of topography, as illustrated in the ZVI diagrams, has a direct and marked impact on the extent and nature of views within the 2 km and wider viewshed.

8.5 Public view locations

A local road network extends roughly parallel to the main ridgelines and hills within the project area and provides a variety of direct and indirect view opportunities toward the wind farm turbines. Tree planting alongside road corridors to the west of the project area tends to restricts views to partial and glimpsed opportunities (including views from the Rye Park Dalton Road and the Wargeila Road). A greater range of open views tend to occur along minor roads to the east of the site. This LVIA did not identify any formalised or designated public lookout points within the Rye Park wind farm 10 km viewshed.

8.6 Towns and localities

There are a small number of towns and localities (which include a small number of dwellings), that surround the Rye Park wind farm project area and occur partially or wholly within the 10 km viewshed. Those within the 10 km viewshed include:

- Rye Park (approximately 3.3 km to the west)
- Rugby (approximately 9.3 km to the north east)
- Yass - outlying north east portion (approximately 9.3 km to the south west)
- Bevendale (approximately 8.5 km to the east); and
- Jerrawa (approximately 6.9 km to the south east).

Other than Rye Park (which is discussed in Table 16) it is not expected that the Rye Park wind farm will have any significant visual impact on towns and smaller rural localities in the landscape surrounding the project site. This is primarily due to the screening influence of undulating landform as well as the distance between the wind farm and potential view locations within residential urban and rural localities.

8.7 Future residential dwellings

In general existing residential dwellings in the vicinity of the wind farm are located below surrounding ridgelines to maximise potential for shelter from prevailing wind, and/or where exposed tend to include a degree of shelter from windbreak planting or tree planting around dwellings. The tendency

to locate residential dwellings in sheltered situations also acts to limit the extent of available views across the surrounding landscape for the majority of residential view locations, although there are a small number of dwellings that appear to have been located on properties to take advantage of distant and panoramic views.

Potential future planning considerations for residential dwellings would be able to take advantage of any approved layout design for the Rye Park wind farm 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.

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 a range of domestic infrastructure associated with it.

Cumulative assessment

Section 9

9.1 What is cumulative assessment?

A cumulative impact could result from a proposed wind farm development being constructed in conjunction with other existing or proposed wind farm developments, and could be either associated or separate to it.

Separate wind farm developments could occur within the established viewshed of the proposed wind farm, or be located within a regional context where visibility is dependent on a journey between each site or an individual project viewshed. Cumulative impacts presented by multiple wind farm developments may be presented as 'direct', 'indirect' or 'sequential' impacts.

- 'direct' cumulative visual impacts could occur where two or more winds farms have been constructed within the same locality, and could be viewed from the same view location simultaneously.
- 'indirect' cumulative visual impacts could occur where two or more winds farms have been constructed within the same locality, and could be viewed from the same view location but not within the same field of view.
- 'sequential' cumulative visual impacts could arise as a result of multiple wind farms being observed at different locations during the course of a journey (e.g. from a vehicle travelling along a highway or from a network of local roads), which could form an impression of greater magnitude and impact within the construct of short term memory.

9.2 Regional wind farm developments

There are a number of proposed, approved and operating wind farm developments within New South Wales which are illustrated in **Figure 29**. The general location of wind farms surrounding the Rye Park wind farm are illustrated in **Figure 30**. These figures illustrate the location of wind farms known at the time this LVIA was prepared. The number and location of wind farms is likely to change as more wind farm projects are announced.

There are currently around 20 existing or proposed wind farm projects at various stages of development within an approximate 70 km radius of the proposed Rye Park wind farm. Whilst 5 of

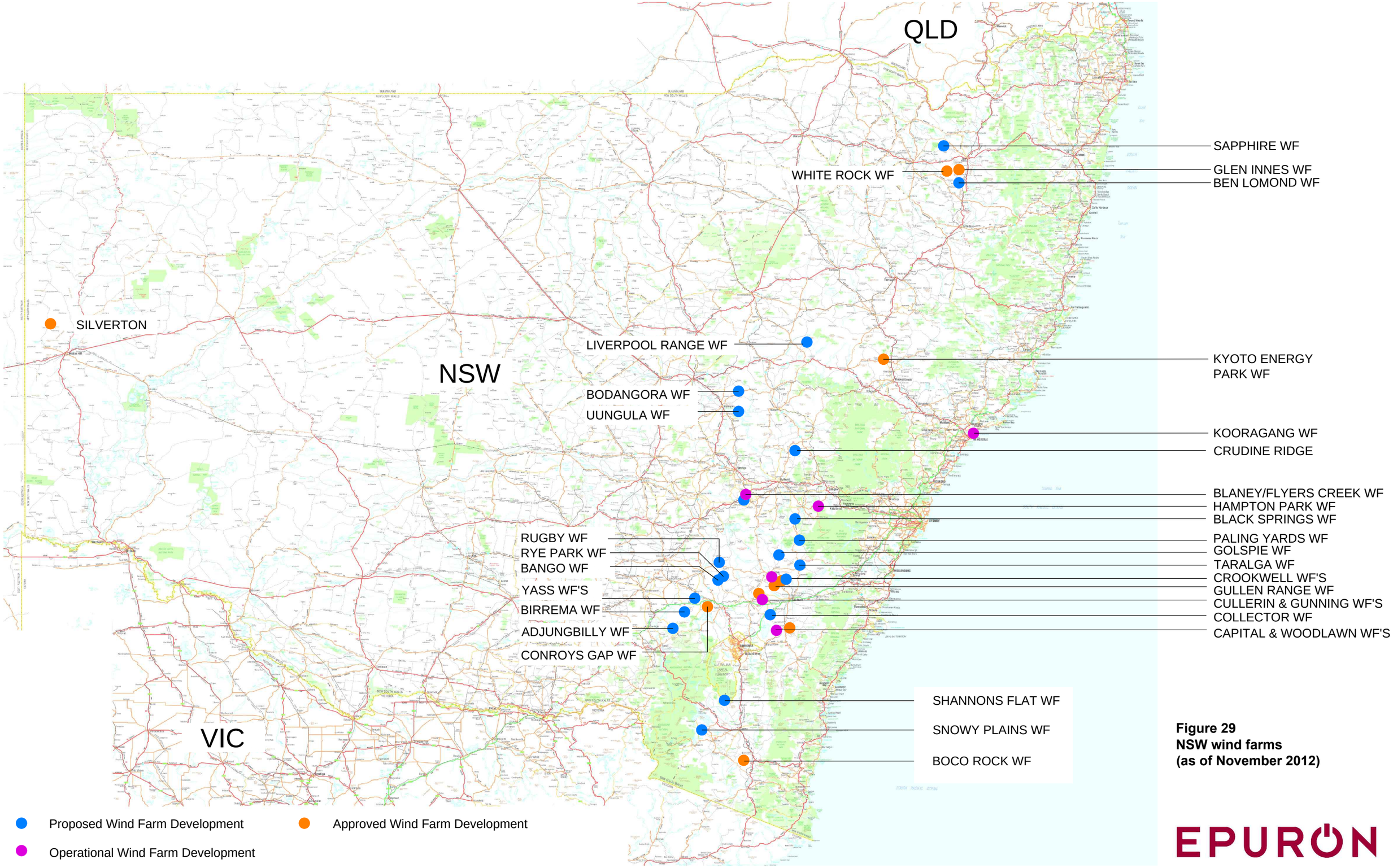


Figure 29
NSW wind farms
(as of November 2012)

RYE PARK WIND FARM

Not to scale

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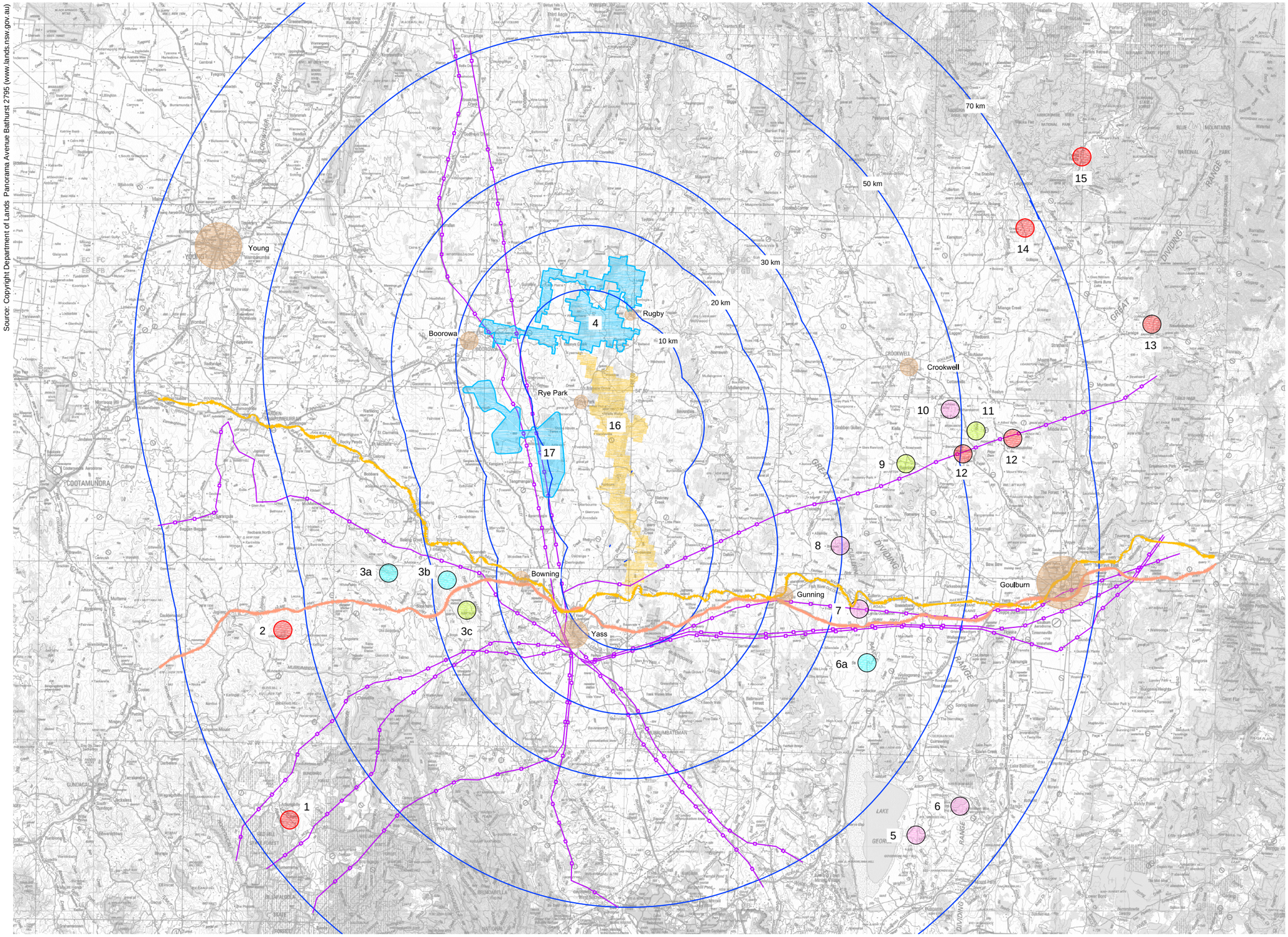

Legend

1 Adjunbilly Wind Farm
2 Birrema Wind Farm
3a Yass Wind Farm (Coppabella)
3b Yass Wind Farm (Marilba)
3c Conroys Gap Wind Farm
4 Rugby Wind Farm
5 Capital Wind Farm (I & II)
6 Woodlawn Wind Farm
6a Collector Wind Farm
7 Cullerin Wind Farm
8 Gunning Wind Farm
9 Gullen Range Wind Farm
10 Crookwell Wind Farm
11 Crookwell 2 Wind Farm
12 Crookwell 3 Wind Farm
13 Taralga Wind Farm
14 Golspie Wind Farm
15 Paling Yards Wind Farm
16 Rye Park Wind Farm
17 Bango Wind Farm

Operational wind farm
Approved wind farm (not constructed)
Proposed wind farm development beyond 50 km of the Rye Park wind farm
Proposed wind farm development between 20 km and 50 km of the Rye Park wind farm
Proposed Rye Park wind farm project boundary
Proposed Rugby and Bango wind farm investigative areas
Locality
Hume Highway
Great Southern Railway
Existing transmission line

Figure 30
Regional wind farm developments

Not to scale

RYE PARK WIND FARM

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the 21 wind farms are operational and 4 have progressed to early construction phases, the remaining 11 projects (including those that have been approved) may not necessarily progress to construction.

The existing and proposed wind farm developments within the Rye Park project 70 km radius and identified and described in **Table 17**.

Table 17 Regional wind farm developments

Wind Farm	Proponent or Owner	Status	Number of turbines
Adjungbilly	CBD Energy	Planning stage – not yet lodged	Up to 26
Birrema	Epuron	Planning stage – not yet lodged	Up to 68
Coppabella	Epuron	Planning - assessment	Up to 86
Marilba	Epuron	Planning - assessment	Up to 66
Conroy's Gap	Epuron	Approved	15
Rugby	Suzlon Energy and Windlab	Planning stage – not yet lodged	Up to 52
Capital 1	Infigen Energy	Operational	63
Woodlawn	Infigen Energy	Operational	23
Collector	RATCH	Planning - assessment	68
Cullerin	Origin Energy	Operational	15
Gunning	Acciona	Operational	31
Gullen Range	Gullen Range Wind Farm Pty Ltd	Approved - Construction Stage	73
Crookwell 1	Eraring Energy	Operational	8
Crookwell 2	Crookwell Development	Approved – Construction Stage	46

Wind Farm	Proponent or Owner	Status	Number of turbines
Crookwell 3	Crookwell Development	Planning – not approved	30
Taralga	RES Australia	Approved – Construction Stage	62
Golspie	Wind Prospect/ CWP	Planning stage – not yet lodged	up to 100
Paling Yards	Union Fenosa Wind Australia	Planning stage – not yet lodged	Up to 60
Capital 2	Infigen Energy	Approved – Construction Stage	41

Table 18 Wind farm developments within Rye Park 10 km viewshed

Wind Farm	Proponent or Owner	Status	Number of turbines
Bango	Wind Prospect	Planning stage – not yet lodged	Up to 122
Rugby	Suzlon Energy and Windlab	Planning stage – not yet lodged	Up to 52

GBD is not aware of any smaller wind farm developments that are currently lodged, or being assessed by the Upper Hunter, Yass Valley or Boorowa Shire Councils.

Long distance views (around 30 km) can be obtained toward the operational Gunning and Cullerin wind farms from elevated areas of the landscape to the south west of the Rye Park project area. Although visible, these wind farm developments are unlikely to result in any significant additional level of 'direct' and 'indirect' cumulative impact for view locations within the Rye Park 10 km viewshed due to the distance effect on overall visibility between the wind farm developments. The potential for cumulative impact will be dependent on a number of factors such as the separation distance between turbines and layout of turbines relative to the proposed Rye Park project.

9.3 Rye Park, Bango and Rugby wind farm intervisibility

The proposed Bango and Rugby wind farm developments are currently in the planning stage. The proposed location and number of turbines associated with each development was not publically known or made available during the preparation of this LVIA. The investigative areas included in the preliminary environmental assessment for each project indicate that some wind turbines are likely to be located within the Rye Park 10 km viewshed. The Bango wind farm turbines are likely to be located beyond 5 km west of the Rye Park wind turbines, and the Rugby wind farm turbines around 2 km north of the Rye Park wind turbines.

It would be expected that some level of cumulative impact will occur for some public and residential view locations to the west, north west and north of the Rye Park project area including opportunities for 'direct', 'indirect' and sequential impacts, which may result in an increase in the significance of impacts determined for individual view locations in this LVIA. View locations to the east of the Rye Park wind farm will be afforded a greater degree of screening toward other wind farm projects by the undulating landform and tree cover along the projects central north south alignment.

There will be some limited potential for 'direct' and 'indirect' views toward the Rye Park, Bango and Rugby wind farm projects from the Boorowa township and Rye Park village; however, views toward multiple projects from urban areas will be largely restricted by distance, landform and tree cover. Views toward wind turbines within other wind farm developments will generally be located away from urban areas and across rural agricultural landscape with a very low density occupation.

Whilst some degree of intervisibility between all three projects is expected for a small number of rural residential dwellings, the nature and extent of the undulating landform surrounding each of the project sites, would partially limit the overall potential for 'direct' and 'indirect' views for many of the residential dwellings located between them.

A series of 'sequential' views would also occur from local roads although the journey between the wind farms would include a range of views extending toward and beyond turbines. The extent and overall visibility of turbines would be influenced by the direction of travel relative to the alignment of the wind farm developments as well as the relatively short travel time along the local road network between wind farm developments.

Photomontages

Section 10

10.1 Photomontages

The DGR's state that the EA must "*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…*"

A total of thirty two photomontages have been prepared to illustrate views from uninvolved residential dwellings within 2km of the proposed Rye Park wind farm turbines, and public view locations from surrounding road corridors. Twenty two photomontages have been prepared from private uninvolved residential dwellings within 2 km the Rye Park wind farm turbines. The location of each photomontage taken from a private uninvolved residential dwelling was identified in consultation with the landowner. Three landowners (R50, R19 and R62) chose not to have a photomontage prepared from their residential dwelling however; photomontages from neighbouring residential dwellings provide indicative illustrations of the view within the general locality of these dwellings.

Photomontages PM 1 to PM 9 illustrate the proposed wind turbines from public view locations (such as road corridors). PM 10 illustrates a typical view toward the proposed 330 kV powerline. The public photomontages locations are illustrated in **Figure 31** and the public photomontage are presented in **Figures 32** to **40**.

The uninvolved residential dwelling photomontages locations within 2 km of the proposed Rye Park wind farm turbines are illustrated in **Figures 28a** and **28b,** and are presented in **Figures 41** to **62**. A photomontage for the proposed 330 kV powerline is illustrated in **Figure 69** in **Section 12** of this LVIA.

10.2 Photomontages preparation

The photomontages have been prepared with regard to the general guidelines set out in the Scottish Natural Heritage (2006) Visual representation of windfarms: good practice guidance and British Landscape Institute Advice Note 01/11 (March 2011) Photography and photomontage in landscape and visual impact assessment.

Photography for the photomontages was undertaken by the Proponent and GBD using tripod mounted Nikon D700 and D90 digital single-lens reflex (SLR) cameras. A 50 mm focal length prime lens was attached to the Nikon D700 and D90 SLR cameras.

The Nikon D700 has a full frame image censor (36 x 23.9 mm Nikon FX format), and when mounted with a 50mm lens results in a single photographic image with a view angle equivalent to a 35 mm SLR camera with a 50 mm lens. The Nikon D90 has a smaller image sensor than the D700 (23.6 x 15.8 mm Nikon DX format) and results in an effective picture angle with a crop factor of 1.5 x the lens focal length. Therefore a Nikon D90 when mounted with a 50mm lens results in a single photographic image with a view angle equivalent to a 35 mm SLR camera with a 75 mm lens.

Both the 50 mm and 75 mm lens are commonly utilised, and cited in landscape and visual assessment manuals and guidelines, for the preparation of landscape and visual assessment photomontages.

Following site photography each of the Rye Park photomontage was generated through the following steps:

- a digital terrain model (DTM) of the project site was created from a terrain model of the surrounding area using digital contours;
- the site DTM was loaded in the G-L Garrad Hassan 'WindFarmer' software package;
- the layout of the wind farm and 3D representation of the wind turbine was configured in WindFarmer;
- the location of each viewpoint (photo location) was configured in WindFarmer – the sun position for each viewpoint was configured by using the time and date of the photographs from that viewpoint;
- the view from each photomontage location was then assessed in WindFarmer. This process requires accurate mapping of the terrain as modelled, with that as seen in the photographs. The photographs, taken from each photomontage location were loaded into WindFarmer and the visible turbines superimposed on the photographs;
- the photomontage were adjusted using Photoshop CS3 to compensate for fogging due to haze or distance, as well as screening by vegetation or obstacles; and
- the final image was converted to JPG format and imported and annotated as the final figure.

Tables 19 and **20** identify the thirty two photomontage locations, property names (where relevant), corresponding reference number identified in the residential view matrix (**Table 16**) as well as the status of each photomontage location.

Table 19 – Public view location photomontage details

Photomontage Location	Figure Reference	Status:
PM 1 Coolalie Road	**Figure 32**	Unsealed road corridor (minor local road)
PM 2 Rye Park Dalton Road	**Figure 33**	Sealed road corridor (minor local road)
PM 3 Maryvale Road	**Figure 34**	Unsealed road corridor (minor local road)
PM 4 Maryvale Road	**Figure 35**	Unsealed road corridor (minor local road)
PM 5 Little Plains Road	**Figure 36**	Unsealed road corridor (minor local road)
PM 6 Kershaw Street, Rye Park	**Figure 37**	Sealed road corridor (minor local road) within Rye Park village
PM 7 Wargeila Road	**Figure 38**	Unsealed road corridor (minor local road)
PM 8 Rye Park Dalton Road	**Figure 39**	Unsealed road corridor (minor local road)
PM 9 Blakney Creek Road	**Figure 40**	Unsealed road corridor (minor local road)
PM10 Rye Park Dalton Road	**Figure 70**	Unsealed road corridor (minor local road)

Table 20 – Residential dwelling photomontage details

Photomontage Location (Refer Table 15 and Figures 28a and 28b)	Figure Reference	Status: Involved or uninvolved residential dwelling
R1	**Figure 41**	Uninvolved residential dwelling
R6	**Figure 42**	Uninvolved residential dwelling
R7	**Figure 43**	Uninvolved residential dwelling
R8	**Figure 44**	Uninvolved residential dwelling
R9	**Figure 45**	Uninvolved residential dwelling
R10	**Figure 46**	Uninvolved residential dwelling
R15	**Figure 47**	Uninvolved residential dwelling

Photomontage Location (Refer Table 15 and Figures 28a and 28b)	Figure Reference	Status: Involved or uninvolved residential dwelling
R17	**Figure 48**	Uninvolved residential dwelling
R20	**Figure 49**	Uninvolved residential dwelling
R22	**Figure 50**	Uninvolved residential dwelling
R24	**Figure 51**	Uninvolved residential dwelling
R29	**Figure 52**	Uninvolved residential dwelling
R38	**Figure 53**	Uninvolved residential dwelling
R40	**Figure 54**	Uninvolved residential dwelling
R45	**Figure 55**	Uninvolved residential dwelling
R47	**Figure 56**	Uninvolved residential dwelling
R48	**Figure 57**	Uninvolved residential dwelling
R53	**Figure 58**	Uninvolved residential dwelling
R55	**Figure 59**	Uninvolved residential dwelling
R56	**Figure 60**	Uninvolved residential dwelling
R62	**Figure 61**	Uninvolved residential dwelling
R65	**Figure 62**	Uninvolved residential dwelling

The horizontal and vertical field of view within the majority of the photomontages exceeds the parameters of normal human vision. However, in reality the eyes, head and body can all move and, under normal conditions, the human brain would 'see' a broad area of landscape within a panorama view. Each of the Rye Park photomontage panoramas indicates the extent of a single photograph within the full extent of the panorama.

Whilst a photomontage can provide an image that illustrates a photo realistic representation of a wind turbine in relation to its proposed location and scale relative to the surrounding landscape, this LVIA acknowledges that large scale objects in the landscape can appear smaller in photomontage than in real life and is partly due to the fact that a flat image does not allow the viewer to perceive any information relating to depth or distance.

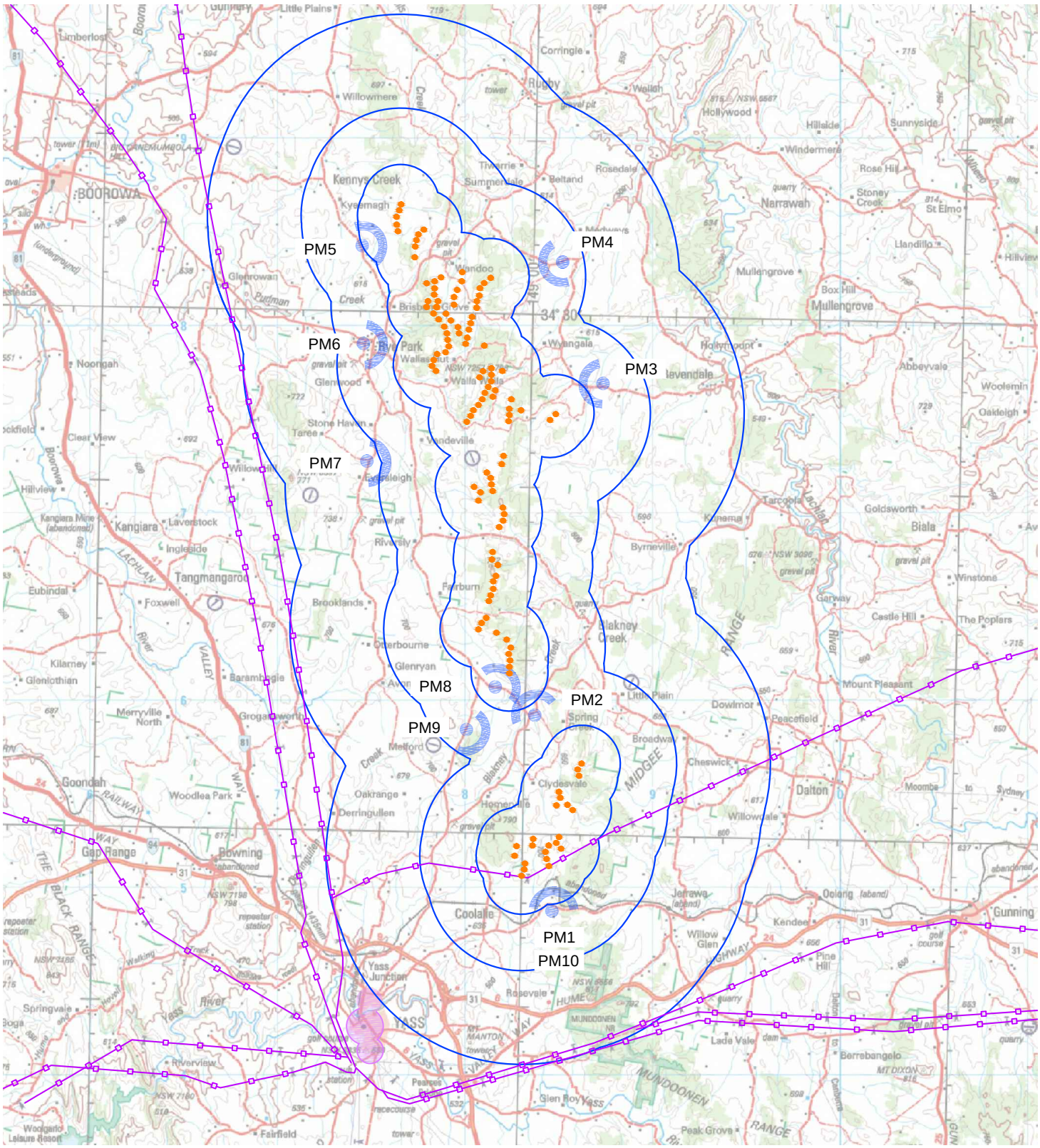
The British Landscape Institute states that '*it is also important to recognise that two-dimensional photographic images and photomontages alone cannot capture or reflect the complexity underlying the visual experience and should therefore be considered an approximate of the three-dimensional visual experiences that an observer would receive in the field'.*

10.3 Photomontage verification

Photomontages prepared for wind farm developments are sometimes claimed not to represent the correct relative scale of the wind turbines within the baseline panorama or single photographic images. Whilst modern windfarm industry software, such as WindFarmer, is able to produce correctly scaled turbines within photomontages, GBD undertook to independently verify the scale of the Rye Park wind turbines within the photomontages.

The verification process involved the direct photographic comparison of constructed and operational wind turbines (at the Capital and Gunning wind farm developments) with those presented in the photomontages. In order to undertake a direct comparison to the existing 124 m high Capital wind farm turbines, the wind turbines within the Rye Park verification photomontage were modelled at a tip height of 124 m. The wind turbines in the Rye Park residential dwelling photomontages have been modelled at a height of 157 m.

The results of the verification are illustrated in **Figures 63** and **64**, which demonstrate that the wind turbines in the Rye Park public and residential dwelling photomontages are correctly proportional relative to distance when compared to photographs of existing and operation wind turbines.



Legend

- Proposed Rye Park wind turbine (indicative layout)
- Distance from proposed Rye Park wind turbine
- Public photomontage location
- Existing powerline

0 km 5 km

Figure 31
Public photomontages locations

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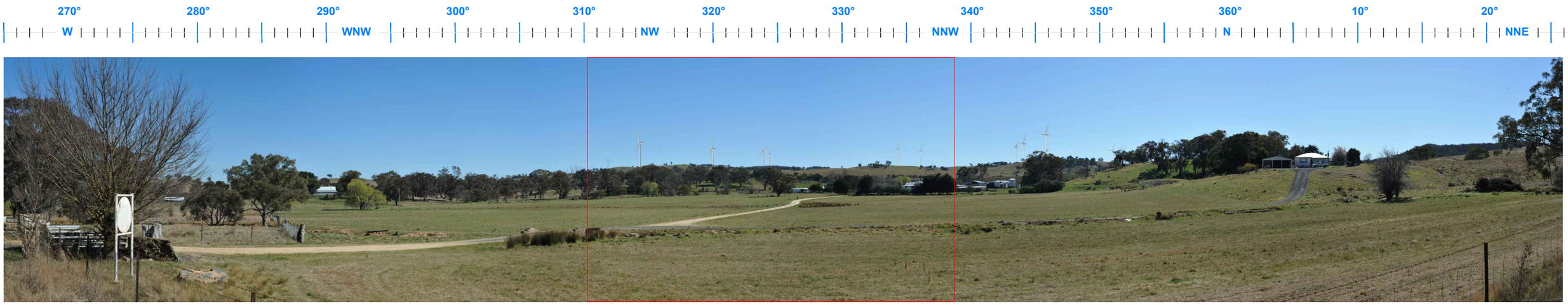
Public view location PM1 Coolalie Road - Existing view west to north north east. Photo coordinate Easting:684406 Northing:6149159 (MGAz55)



Public view location PM1 Coolalie Road- Proposed view through 120°. Approximate distance to closest visible wind turbine 2,050 m

Notes

Composite panorama photograph taken with a Nikon D700 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D700 digital SLR camera with a 50mm lens results in a single photograph with a view angle equivalent to a 35mm digital SLR camera photograph taken with a 50mm lens.

Refer Figure 31 for photomontage locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D700 digital SLR camera with a 50mm lens

Figure 32
Public view location PM 1
Coolalie Road

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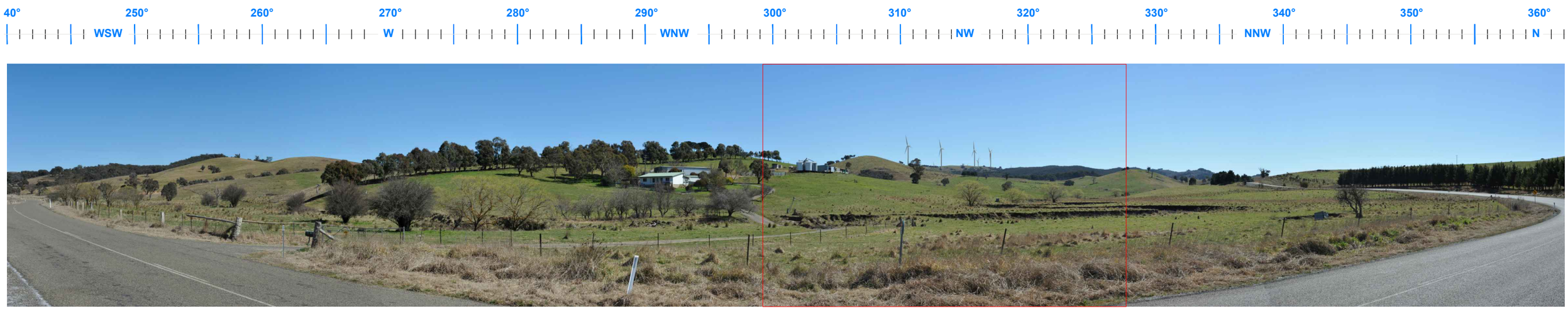
RYE PARK WIND FARM

Public view location PM2 Rye Park Dalton Road - Existing view west south west to north. Photo coordinate Easting:683794 Northing:6159433 (MGAz55)



Public view location PM2 Rye Park Dalton Road- Proposed view through 120°. Approximate distance to closest visible wind turbine 2,500 m

Notes

Composite panorama photograph taken with a Nikon D700 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D700 digital SLR camera with a 50mm lens results in a single photograph with a view angle equivalent to a 35mm digital SLR camera photograph taken with a 50mm lens.

Refer Figure 31 for photomontage locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D700 digital SLR camera with a 50mm lens

Figure 33
Public view location PM 2
Rye Park Dalton Road

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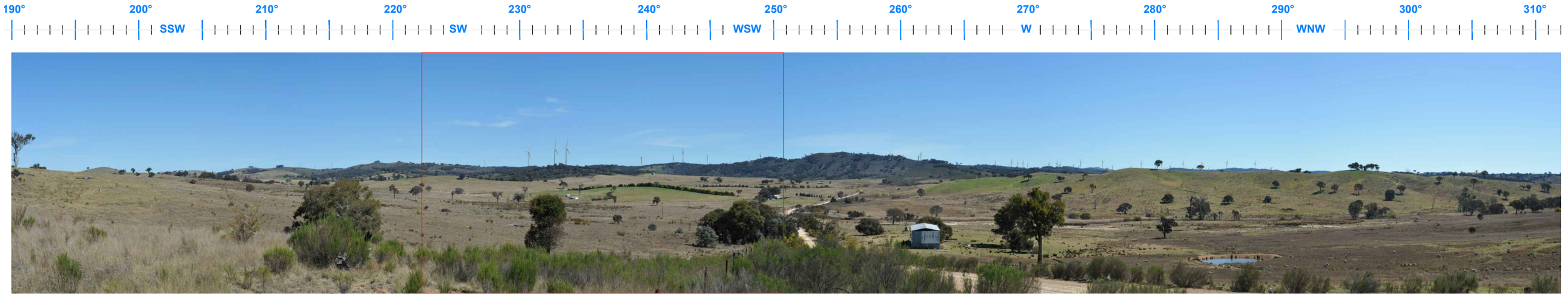
Public view location PM3 Maryvale Road - Existing view north to east south east. Photo coordinate Easting:687538 Northing:6176699 (MGAz55)



Public view location PM3 Maryvale Road- Proposed view through 120°. Approximate distance to closest visible wind turbine 2,990 m

Notes

Composite panorama photograph taken with a Nikon D700 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D700 digital SLR camera with a 50mm lens results in a single photograph with a view angle equivalent to a 35mm digital SLR camera photograph taken with a 50mm lens.

Refer Figure 31 for photomontage locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D700 digital SLR camera with a 50mm lens

Figure 34
Public view location PM 3
Maryvale Road

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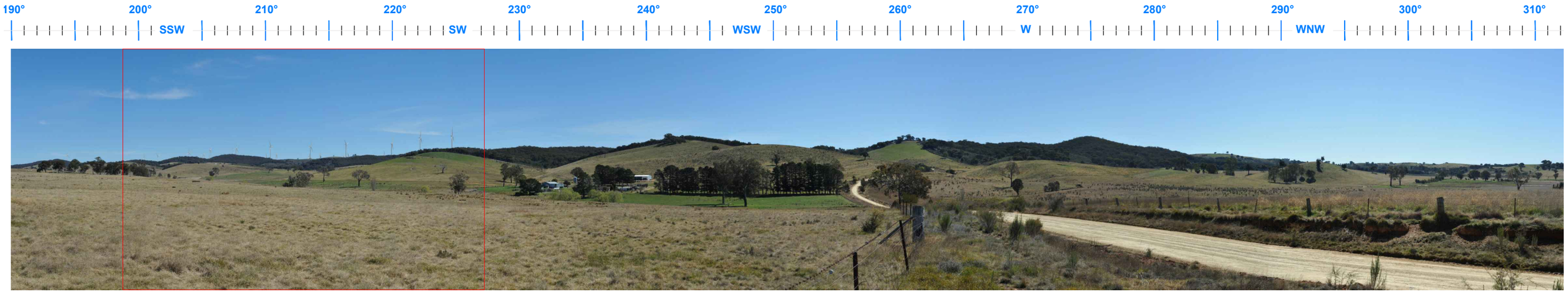
Public view location PM4 Maryvale Road - Existing view south south west to north west. Photo coordinate Easting:684522 Northing:6183167 (MGAz55)



Public view location PM4 Maryvale Road Road- Proposed view through 120°. Approximate distance to closest visible wind turbine 3,900 m

Notes

Composite panorama photograph taken with a Nikon D700 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D700 digital SLR camera with a 50mm lens results in a single photograph with a view angle equivalent to a 35mm digital SLR camera photograph taken with a 50mm lens.

Refer Figure 31 for photomontage locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D700 digital SLR camera with a 50mm lens

Figure 35
Public view location PM 4
Maryvale Road

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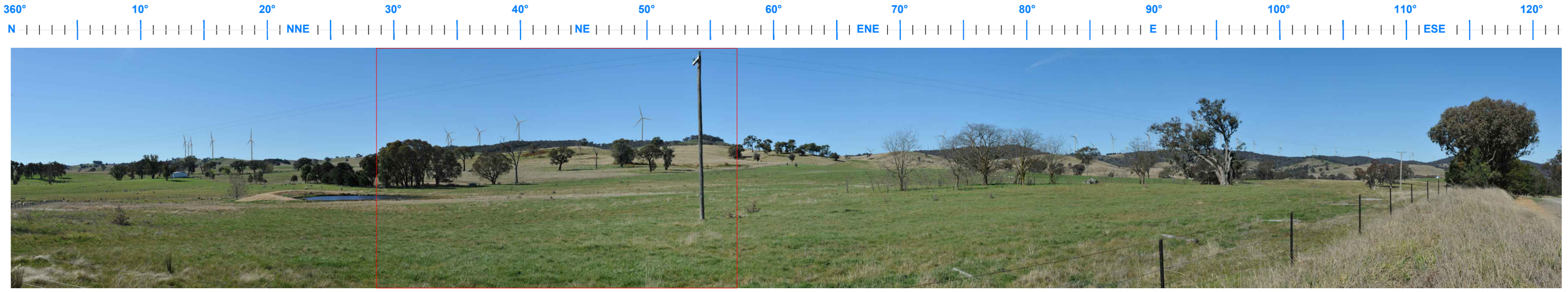
Public view location PM5 Little Plains Road - Existing view north to east south east. Photo coordinate Easting:675208 Northing:6182706 (MGAz55)



Public view location PM5 Little Plains Road- Proposed view through 120°. Approximate distance to closest visible wind turbine 2,000 m

Notes

Composite panorama photograph taken with a Nikon D700 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D700 digital SLR camera with a 50mm lens results in a single photograph with a view angle equivalent to a 35mm digital SLR camera photograph taken with a 50mm lens.

Refer Figure 31 for photomontage locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D700 digital SLR camera with a 50mm lens

Figure 36
Public view location PM 5
Little Plains Road

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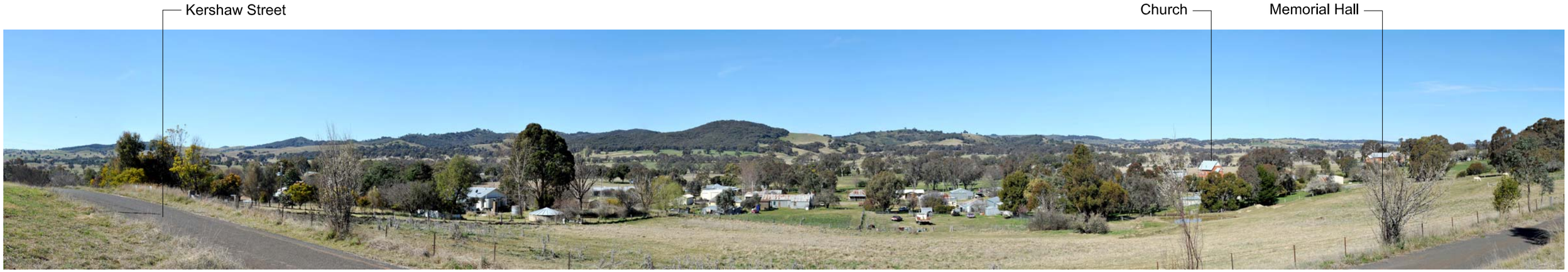
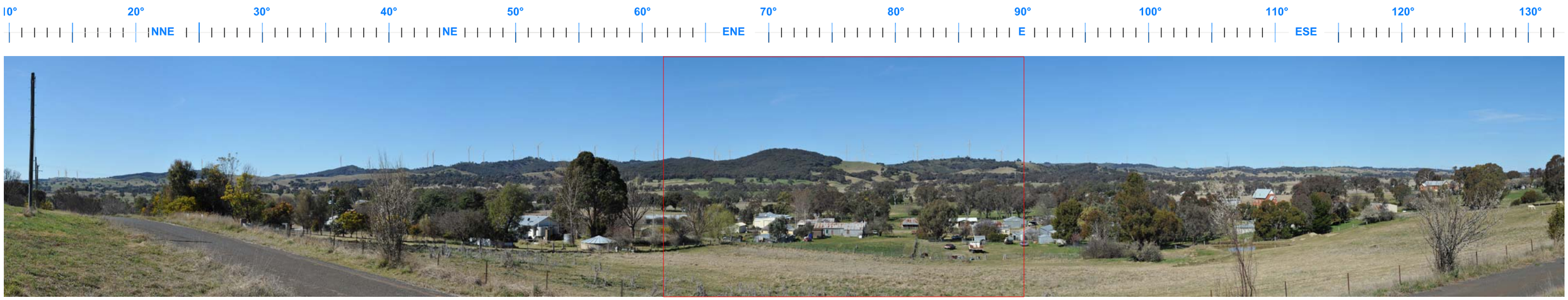


Public view location PM6 Kershaw Street, Rye Park - Existing view north to south east. Photo coordinate Easting:674899 Northing:6178817 (MGAz55)



Public view location PM6 Kershaw Street, Rye Park- Proposed view through 120°. Approximate distance to closest visible wind turbine 3,900 m

Notes

Composite panorama photograph taken with a Nikon D700 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D700 digital SLR camera with a 50mm lens results in a single photograph with a view angle equivalent to a 35mm digital SLR camera photograph taken with a 50mm lens.

Refer Figure 31 for photomontage locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D700 digital SLR camera with a 50mm lens

Figure 37
Public view location PM 6
Kershaw Street, Rye Park

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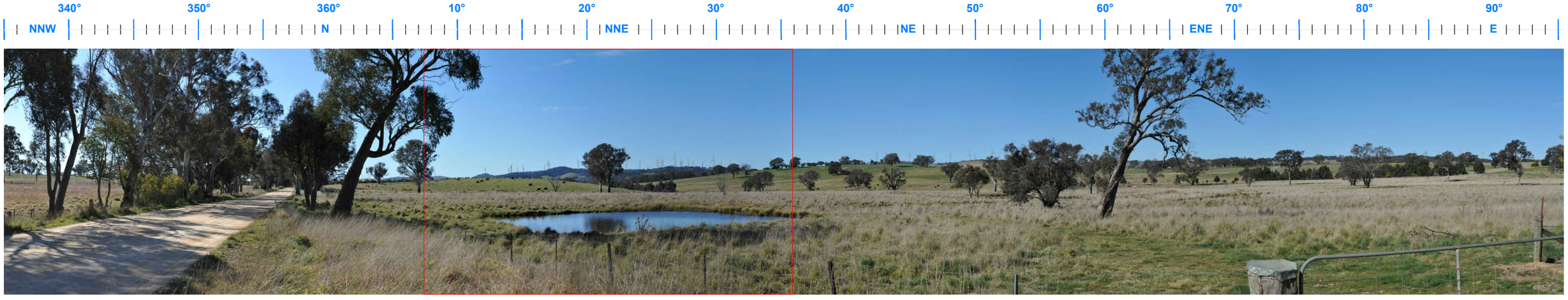
RYE PARK WIND FARM

Public view location PM7 Wargeila Road - Existing view north north west to east. Photo coordinate Easting:675243 Northing:6174080 (MGAz55)



Public view location PM7 Wargeila Road- Proposed view through 120°. Approximate distance to closest visible wind turbine 6,000 m

Notes

Composite panorama photograph taken with a Nikon D700 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D700 digital SLR camera with a 50mm lens results in a single photograph with a view angle equivalent to a 35mm digital SLR camera photograph taken with a 50mm lens.

Refer Figure 31 for photomontage locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D700 digital SLR camera with a 50mm lens

Figure 38
Public view location PM 7
Wargeila Road

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RYE PARK WIND FARM

Public view location PM8 Rye Park Dalton Road - Existing view north north west to east. Photo coordinate Easting:680991 Northing:6161071 (MGAz55)

Public view location PM8 Rye Park Dalton Road- Proposed view through 120°. Approximate distance to closest visible wind turbine 1,200 m

Notes

Composite panorama photograph taken with a Nikon D700 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D700 digital SLR camera with a 50mm lens results in a single photograph with a view angle equivalent to a 35mm digital SLR camera photograph taken with a 50mm lens.

Refer Figure 31 for photomontage locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D700 digital SLR camera with a 50mm lens

Figure 39
Public view location PM 8
Rye Park Dalton Road

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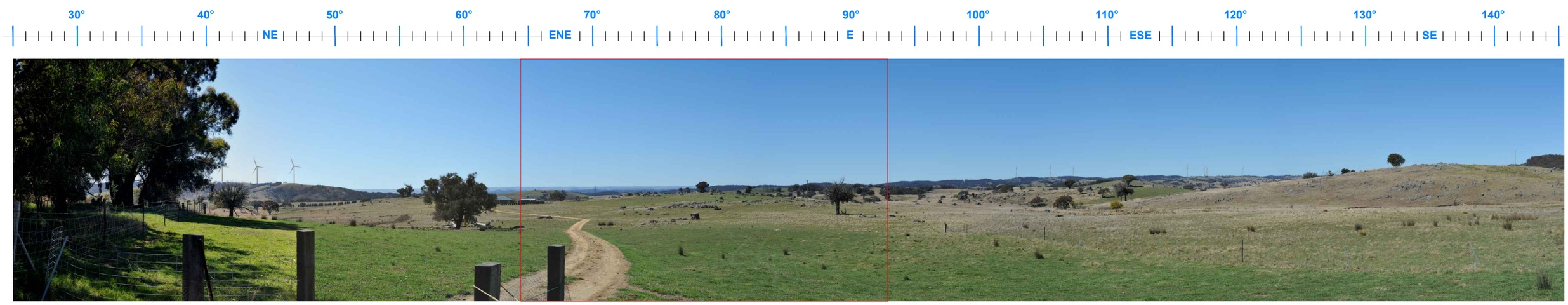
Public view location PM9 Blakney Creek South Road - Existing view north to east south east. Photo coordinate Easting:680365 Northing:6159222 (MGAz55)



Public view location PM9 Blakney Creek South Road- Proposed view through 120°. Approximate distance to closest visible wind turbine 4,000 m

Notes

Composite panorama photograph taken with a Nikon D700 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D700 digital SLR camera with a 50mm lens results in a single photograph with a view angle equivalent to a 35mm digital SLR camera photograph taken with a 50mm lens.

Refer Figure 31 for photomontage locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D700 digital SLR camera with a 50mm lens

Figure 40
Public view location PM 9
Blakney Creek South Road

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Uninvolved residential dwelling R1- Existing view south east to west south west. Photo coordinate Easting:677551 Northing:6187037 (MGAz55)

Uninvolved residential dwelling R1- Proposed view through 110°. Approximate distance to closest visible Rye Park wind turbine 1,100 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 41
Uninvolved residential dwelling photomontage R1

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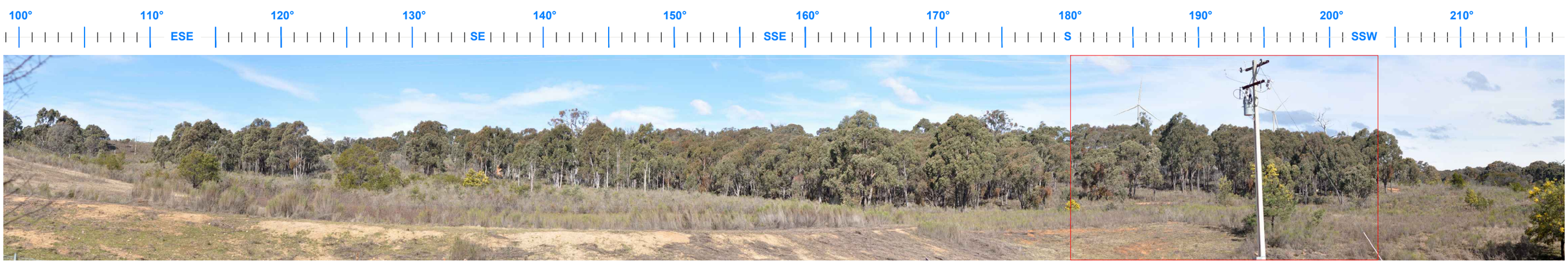
Uninvolved residential dwelling R6- Existing view east south east to south west. Photo coordinate Easting:681483 Northing:6184013 (MGAz55)



Uninvolved residential dwelling R6- Proposed view through 120°. Approximate distance to closest visible Rye Park wind turbine 1,400 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 42
Uninvolved residential dwelling photomontage R6

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Uninvolved residential dwelling R7- Existing view south to west south west. Photo coordinate Easting:6818676 Northing:6183988 (MGAz55)

Uninvolved residential dwelling R7- Proposed view through 120°. Approximate distance to closest visible Rye Park wind turbine 1,500 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 43
Uninvolved residential dwelling photomontage R7

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Uninvolved residential dwelling R8- Existing view south to west. Photo coordinate Easting:682329 Northing:6183809 (MGAz55)

Uninvolved residential dwelling R8- Proposed view through 70°. Approximate distance to closest visible wind turbine 1,600 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in portrait format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 44
Uninvolved residential dwelling photomontage R8

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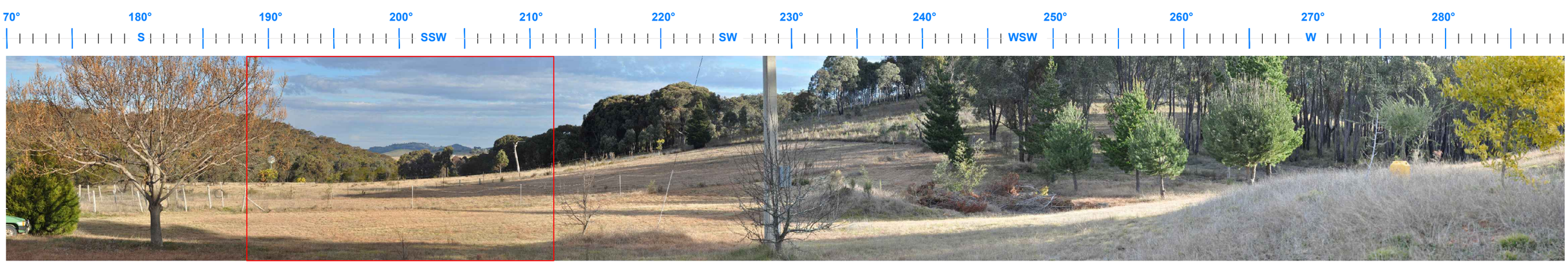
Uninvolved residential dwelling R9- Existing view south to west north west. Photo coordinate Easting:682545 Northing:6183840 (MGAz55)



Uninvovled residential dwelling R9- Existing view through 120°. Approximate distance to closest visible wind turbine 8,700 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 45
Uninvolved residential dwelling photomontage R9

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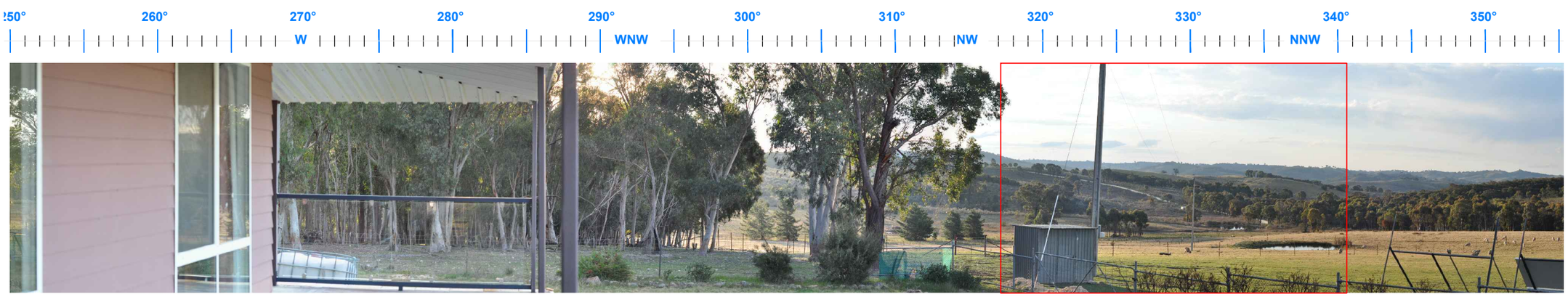
Uninvolved residential dwelling R10- Existing view west to east. Photo coordinate Easting:682839 Northing:6183785 (MGAz55)

No views toward proposed Rye Park Wind Farm turbines



Uninvolved residential dwelling R10 - Existing view through 120°. Proposed view west to north.

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 46
Uninvolved residential dwelling photomontage R10

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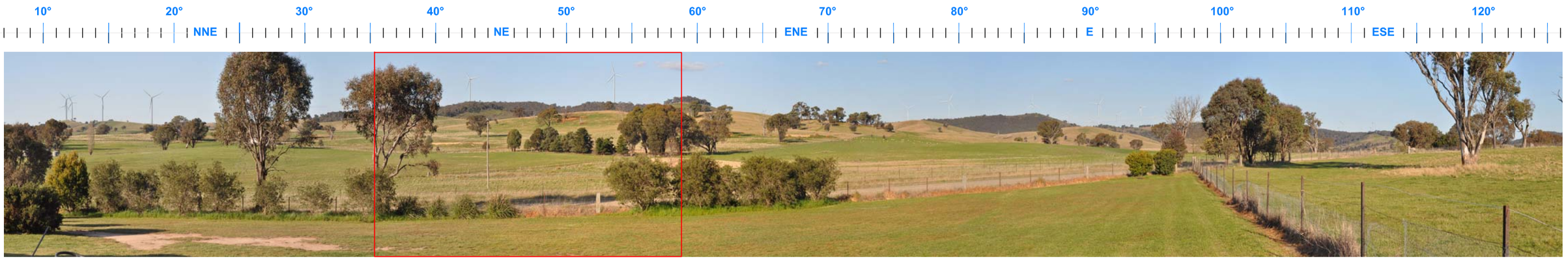
Uninvolved residential dwelling R15- Existing view north to south east. Photo coordinate Easting:675104 Northing:6182787 (MGAz55)



Uninvolved residential dwelling R15 - Existing view through 120°. Approximate distance to closest visible Rye Park wind turbine 2,416 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 47
Uninvolved residential dwelling photomontage R15

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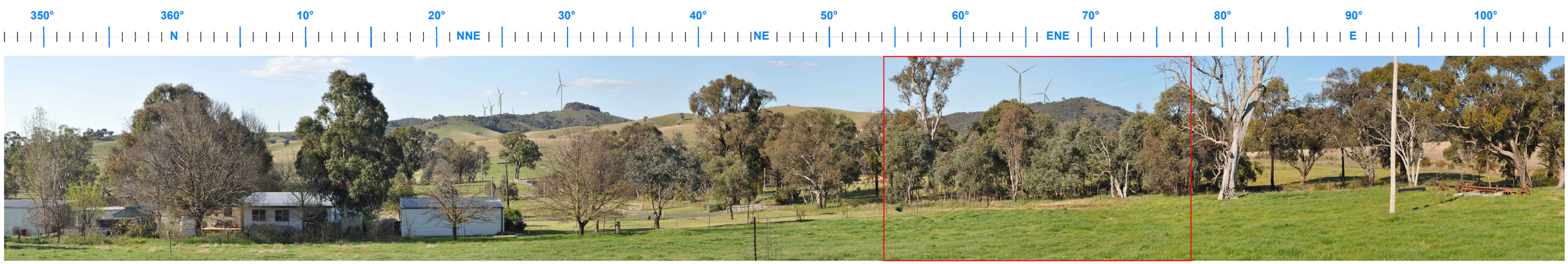
Uninvolved residential dwelling R17- Existing view north to east south east. Photo coordinate Easting:676148 Northing:6181529 (MGAz55)



Uninvolved residential dwelling R17 - Existing view through 120°. Approximate distance to closest visible Rye Park wind turbine 1,960 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 48
Uninvolved residential dwelling photomontage R17

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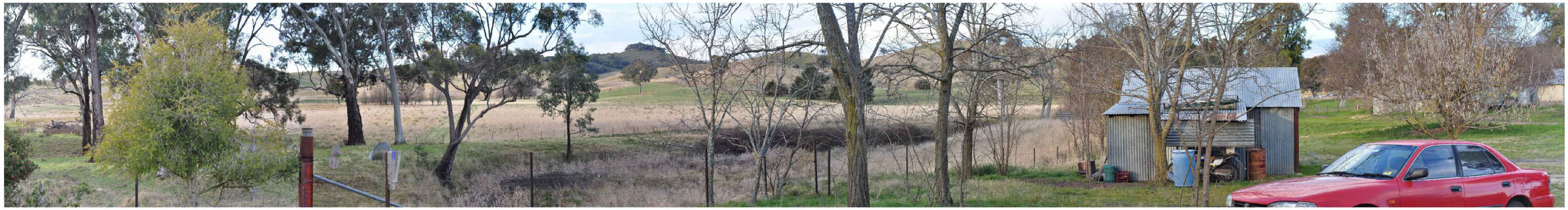
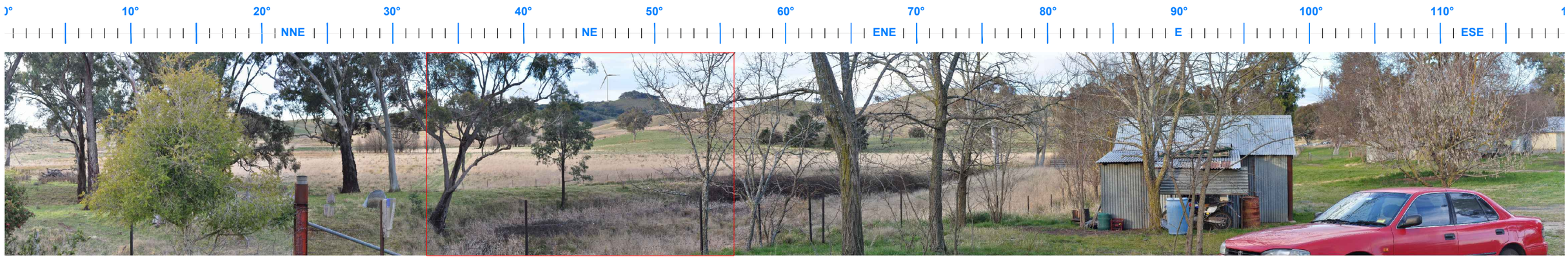


Uninvolved residential dwelling R20 - Existing view north to east south east. Photo coordinate Easting:676044 Northing:6181745 (MGAz55)



Uninvolved residential dwelling R20 - Existing view through 120°. Approximate distance to closest visible Rye Park wind turbine 1,870 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 49
Uninvolved residential dwelling photomontage R20

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Uninvolved residential dwelling R22- Existing view north west to north east. Photo coordinate Easting:676120 Northing:6181058 (MGAz55)

Uninvolved residential dwelling R22- Proposed view through 120°. Approximate distance to closest visible wind turbine 1,850 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 50
Uninvolved residential dwelling photomontage R22

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Uninvolved residential dwelling R24- Existing view north north east to south east. Photo coordinate Easting:674884 Northing:6183559 (MGAz55)

Uninvovled residential dwelling R24- Proposed view through 120°. Approximate distance to closest visible wind turbine 2,150 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 51
Uninvolved residential dwelling photomontage R24

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Uninvolved residential dwelling R29- Existing view north to south east. Photo coordinate Easting:676445 Northing:6177895 (MGAz55)

Uninvolved residential dwelling R29- Proposed view through 110°. Approximate distance to closest visible wind turbine 1,850 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 52
Uninvolved residential dwelling photomontage R29

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Uninvolved residential dwelling R38- Existing view north north west to east. Photo coordinate Easting:679632 Northing:6173617 (MGAz55)

Uninvolved residential dwelling R38- Proposed view through 120°. Approximate distance to closest visible wind turbine 1,400 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 53
Uninvolved residential dwelling photomontage R38

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Uninvovled residential dwelling R40- Existing view east north east to south south east. Photo coordinate Easting:678605 Northing:6171026 (MGAz55)

Uninvolved residential dwelling R40- Proposed view through 95°. Approximate distance to closest visible wind turbine 1,870 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 54
Uninvolved residential dwelling photomontage R40

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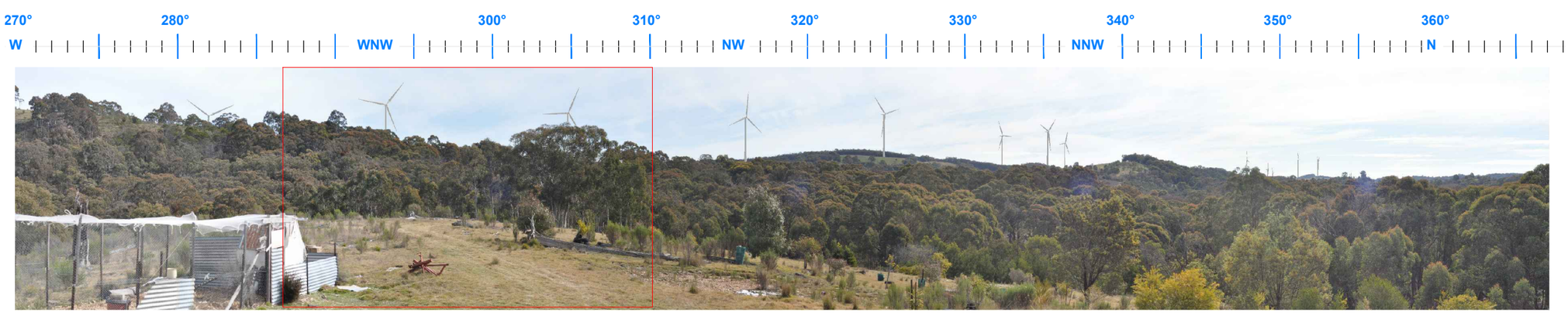
Uninvolved residential dwelling R45- Existing view west to north. Photo coordinate Easting:682827 Northing:6165276 (MGAz55)



Uninvolved residential dwelling R45- Proposed view through 95°. Approximate distance to closest visible wind turbine 1,486 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 55
Uninvolved residential dwelling photomontage R45

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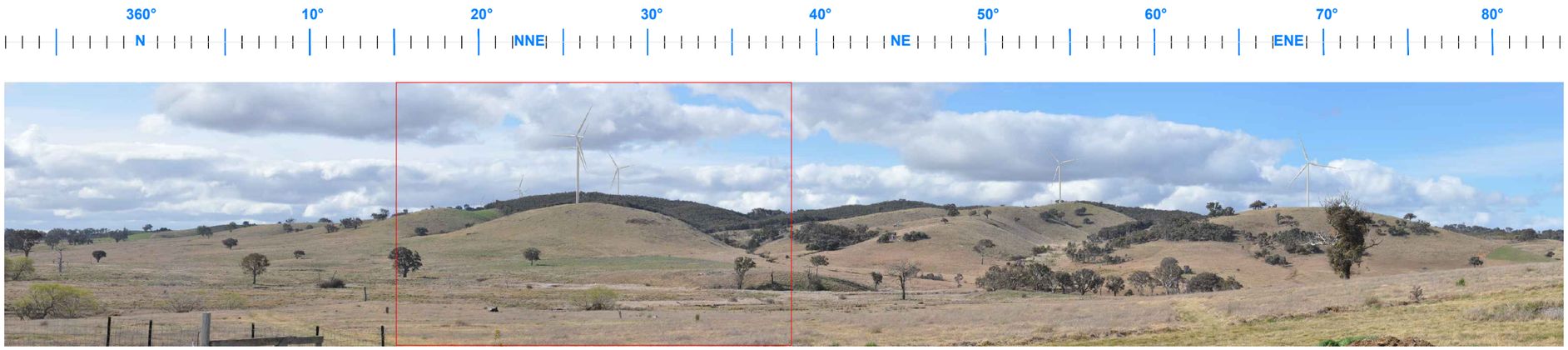
Uninvolved residential dwelling R47- Existing view north to east. Photo coordinate Easting:680217 Northing:6163011 (MGAz55)



Uninvolved residential dwelling R47- Proposed view through 100°. Approximate distance to closest visible Rye Park wind turbine 1,100 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 56
Uninvolved residential dwelling photomontage R47

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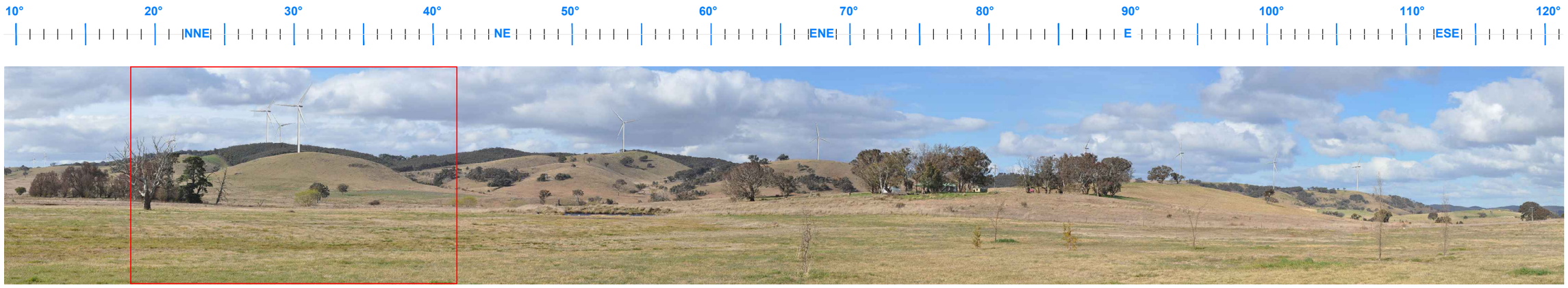
Uninvolved residential dwelling R48- Existing view north to south east. Photo coordinate Easting:679826 Northing:6162660 (MGAz55)



Uninvolved residential dwelling R48- Proposed view through 120°. Approximate distance to closest visible wind turbine 1,236 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 57
Uninvolved residential dwelling photomontage R48

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RYE PARK WIND FARM

Uninvolved residential dwelling R53- Existing view south east to west south west. Photo coordinate Easting:680904 Northing:6160886 (MGAz55)

Uinvolved residential dwelling R53- Proposed view through 110°. Approximate distance to closest visible Rye Park wind turbine 1,574 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 58
Uninvolved residential dwelling photomontage R53

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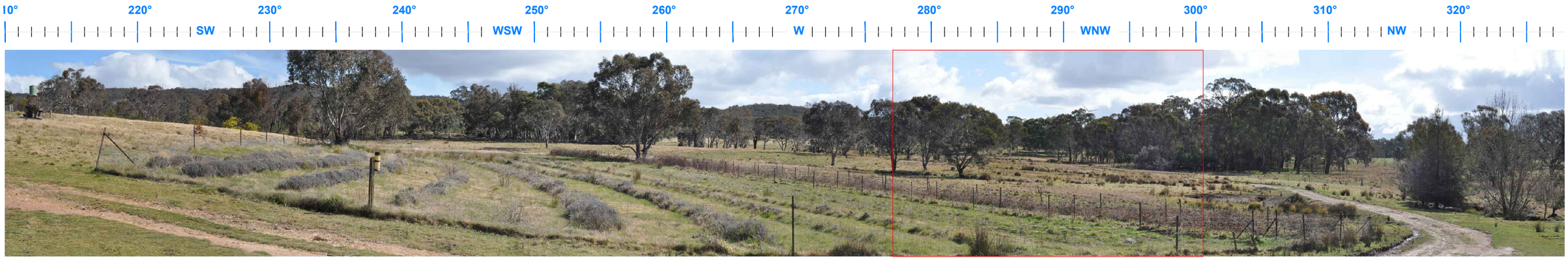
RYE PARK WIND FARM

Uninvolved residential dwelling R55- Existing view south west to north west. Photo coordinate Easting:689373 Northing:6154185 (MGAz55)



Uninvolved residential dwelling R55- Proposed view through 120°. Approximate distance to closest visible wind turbine 2,420 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 59
Uninvolved residential dwelling photomontage R55

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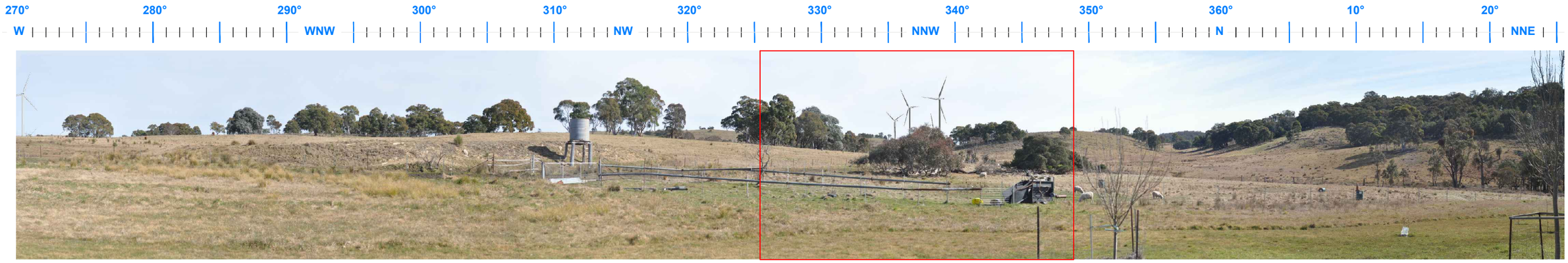
RYE PARK WIND FARM

Uninvolved residential dwelling R56- Existing view west to north north east. Photo coordinate Easting:686542 Northing:6153137 (MGAz55)



Uninvolved residential dwelling R56- Proposed view through 120°. Approximate distance to closest visible wind turbine 1,364 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 60
Uninvolved residential dwelling photomontage R56

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RYE PARK WIND FARM

Uninvolved residential dwelling R62- Existing view west to north east. Photo coordinate Easting:684017 Northing:6149081 (MGAz55)

Uninvolved residential dwelling R62- Proposed view through 95°. Approximate distance to closest visible wind turbine 1,978 m

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

Figure 61
Uninvolved residential dwelling photomontage R62

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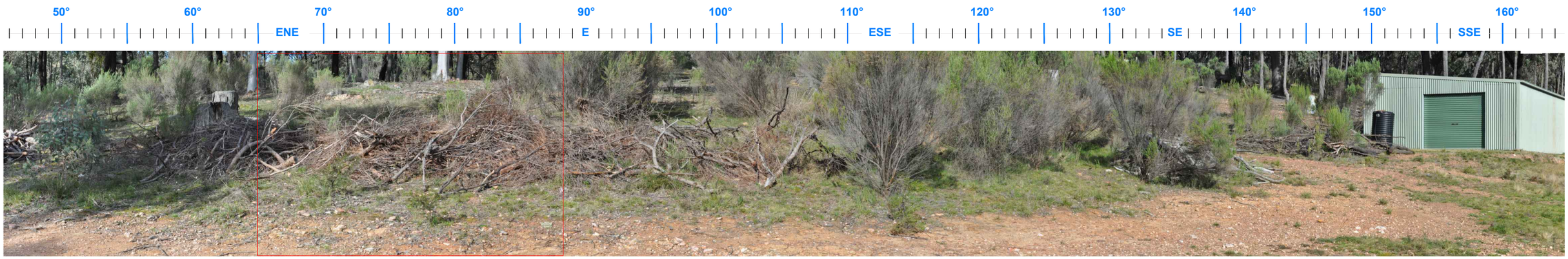
Views toward Rye Park wind turbines screened by
tree and shrub planting beyond residential dwelling



Uninvolved residential dwelling R65- Existing and proposed view through 120°. Photo coordinate Easting:676671 Northing:6179681

Notes

Composite panorama photograph taken with a Nikon D90 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D90 digital SLR camera has a crop factor of 1.6. A single photograph taken with a 50mm lens will result in a view angle equivalent to a single 35mm SLR camera photograph taken with a 75mm lens.

Refer Figure 28 for residential dwelling locations

Indicative extent of a single frame photograph (in landscape format) taken with the Nikon D90 digital SLR camera with a 50mm lens

RYE PARK WIND FARM

Figure 62
Uninvolved residential dwelling photomontage R65

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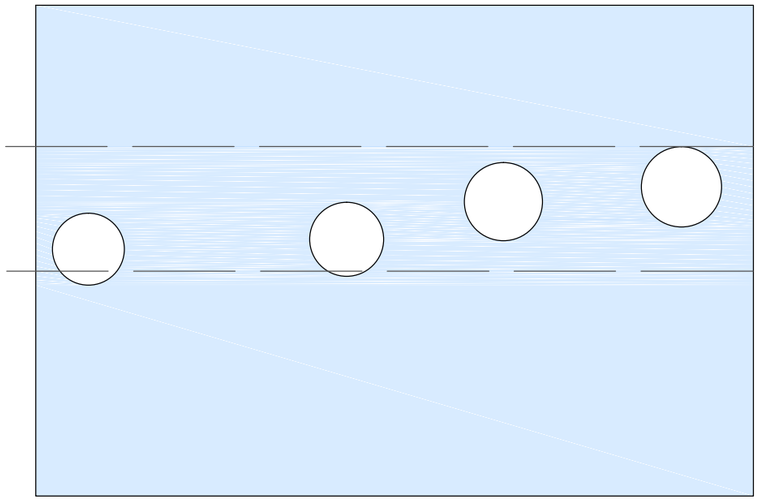
Proposed Rye Park wind farm photomontage.

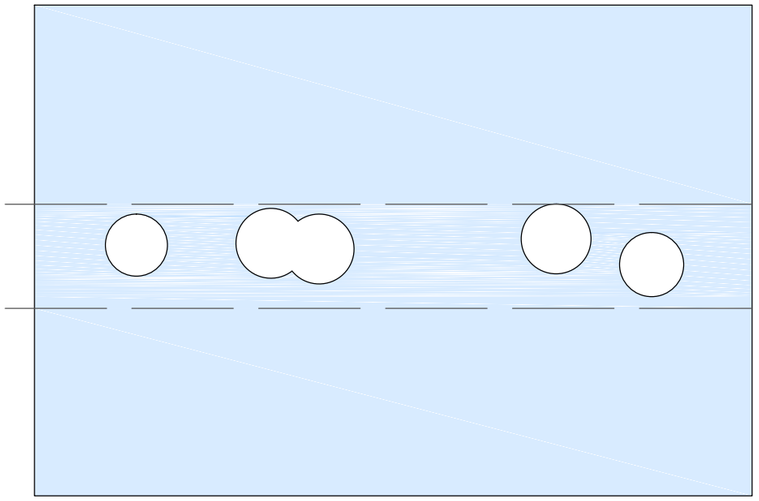
Public view location PM 4 Maryvale Road - Existing view south south west to north west.
Photo coordinate Easting:684522 Northing:6183167 (MGAz55) Approximate distance to closest visible wind turbine 3,900 m
Composite panorama photograph taken with a Nikon D700 digital SLR with a 50mm lens (equates to a 35mm SLR camera with a 50mm lens).



Rye Park wind turbine photomontage- comparative rotor swept area
Wind turbine 152 m tip height (101 m tower with 56 m rotor length)

Existing view toward the operational Gunning wind farm from Gunning Road.

Existing view north east to east. Photo coordinate Easting:711091 Northing 6157317 (MGAz55). Approximate distance to closest visible wind turbine 4,200 m
Composite panorama photograph taken with a Nikon D700 digital SLR with a 50m lens (equates to a 35mm SLR camera with a 50m lens).



Gunning wind turbine photograph- comparative rotor swept area
Wind turbine 120 m tip height (80 m tower with 40 m rotor length)

Figure 63
Comparison of operational and photomontage wind turbines

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Existing Cullerin wind turbines

Photo 1 - View toward operational Cullerin wind farm turbines

View distance to closest wind turbine is approximately 2.9 km. Height of wind turbine is approximately 125 m to tip of blade.

Single frame photo taken with a Pentax K10D digital SLR camera with a 50mm lens. The camera crop factor of 1.6 equates to a 35mm full frame SLR camera with a 75mm lens.

Proposed Rye Park wind turbines (photomontage)

Photo 2 - View toward proposed Rye Park wind turbines at reduced height of 124 m to tip of blade.

View distance to closest wind turbine is approximately 1.8 km. Height of wind turbine is approximately 124 m to tip of blade.

Single frame photo taken with a Nikon D90 digital SLR camera with 50mm lens. The camera crop factor of 1.6 equates to 35mm full frame SLR camera with a 75mm lens.

Existing Capital wind turbines

Photo 3 - View toward operational Capital wind farm turbines

View distance to closest wind turbine is approximately 1.5 km. Height of wind turbine is approximately 124 m to tip of blade.

Single frame photo taken with a Pentax K10D digital SLR camera with a 50mm lens. The camera crop factor of 1.6 equates to 35mm full frame SLR camera with a 75mm lens.

Existing Capital wind turbines

Photo 4 - View toward operational Capital wind turbines.

View distance to closest wind turbine is approximately 1.0 km. Height of wind turbine is approximately 124 m to tip of blade.

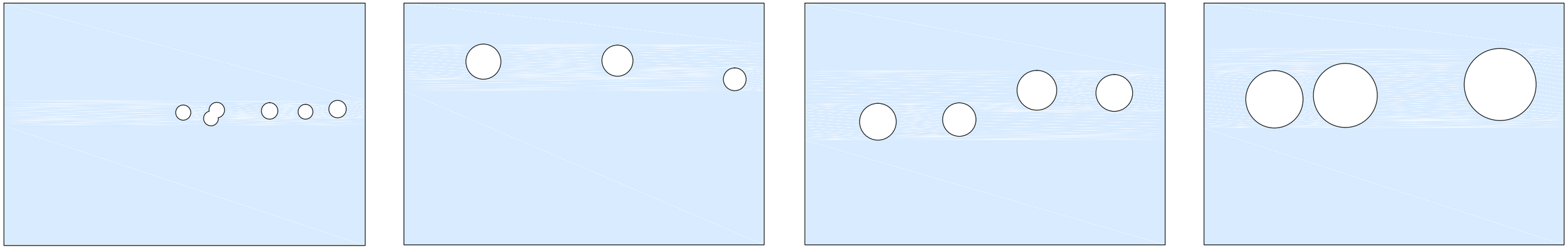
Single frame photo taken with a Pentax K10D digital SLR camera with 50mm lens. Camera crop factor of 1.6 equates to 35mm full frame SLR camera with a 75mm lens.

Rotor swept path area at 2.9 km

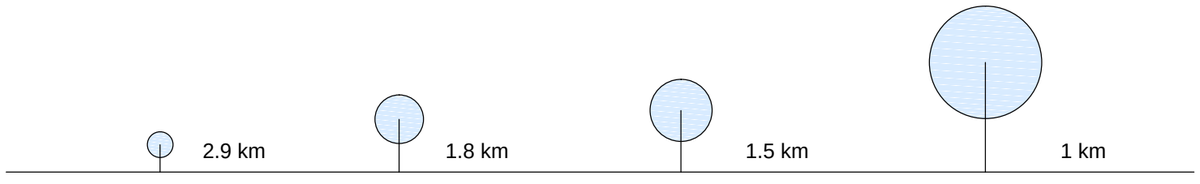
Rotor swept path area at 1.8 km

Rotor swept path area at 1.5 km

Rotor swept path area at 1 km



Relative comparison of distance effect on perceived wind turbine rotor swept path area



Relative comparison of distance effect on perceived wind turbine height

Figure 64
Comparison of operational and photomontage wind turbines

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Night time lighting

Section 11

11.1 Introduction

Although not currently proposed, the Rye Park wind farm may require obstacle lighting in the future. The future requirement for lighting would be subject to the advice and endorsement of the Civil Aviation Safety Authority (CASA). CASA is currently undertaking a safety study into the risk to aviation posed by wind farms to develop a new set of guidelines to replace the Advisory Circular with regard to lighting for wind turbines that was withdrawn by CASA in mid 2008.

Should future CASA regulations require a lighting assessment; the proponent will undertake an Aeronautical Impact Assessment, to first determine the risks posed to aviation activities by the wind farm. If required, an Obstacle Lighting Assessment would be undertaken by an Aeronautical Impact Assessment expert to stipulate the turbine lighting layout which would mitigate any risks to aviation. The outcomes of the Aeronautical Impact Assessment and the Obstacle Lighting Assessment would then be submitted to CASA for their comment.

Potential visual impacts associated with obstacle marking and lighting at night time have not been extensively researched or tested in New South Wales, although some site investigations have been carried out at existing wind farms in Victoria. Investigations have generally concluded that although night time lighting mounted on wind turbines could be visible for a number of kilometres from the wind farm project area, the actual intensity of the lighting appears no greater than other sources of night time lighting, including vehicle head and tail lights.

Previous investigations have also suggested that replacing the more conventional incandescent lights with light emitting diodes (LED) could help to minimise the potential visual impact of the wind turbine lights (Epuron 2008).

In order to illustrate the visual effect of turbine mounted lighting a series of night time photographs were taken of the Cullerin wind farm in the New South Wales Southern Tablelands. These were taken at distances of 500 m, 3.5 km and 17 km from the turbines and are illustrated in **Figures 65, 66** and **67**. Each night time view is presented below a corresponding day time photograph taken from the same photo location. It should be noted that following community consultation, and the preparation

of an aviation risk assessment, Origin Energy have removed night time obstacle lighting from the Cullerin wind turbines.

11.2 Existing light sources

A small number of existing night time light sources occur within the Rye Park wind farm viewshed, and include residential and general lighting within surrounding villages.

Localised lighting is associated with a small number of dispersed homesteads located within the project boundary, but lighting is unlikely to be visually prominent and does not emit any significant illumination beyond immediate areas surrounding residential and agricultural buildings.

Lights from vehicles travelling along the local roads provide dynamic and temporary sources of light.

11.3 Potential light sources

The main potential light sources associated with the Rye Park wind farm would include:

- low intensity night lights for substations, control and auxiliary buildings; and
- night time obstacle lights mounted on some wind turbines (if required in the future).

In accordance with the withdrawn CASA Advisory Circular two red medium intensity obstacle lights were required on specified turbines at a distance not exceeding 900 m and all lights were to flash synchronously. To minimise visual impact some shielding of the obstacle lights below the horizontal plane was permitted. Lighting for aviation safety could also be required prior to and during the construction period, including lighting for large equipment such as cranes.

In addition to the standard level of lighting required for normal security and safety, lighting could also be required for scheduled or emergency maintenance around the control building, substation and wind turbine areas.

As the visibility of the substation and control room would be largely contained by the surrounding landform, it is unlikely that light spill from these sources would be visible from the majority of surrounding view locations including surrounding residences.

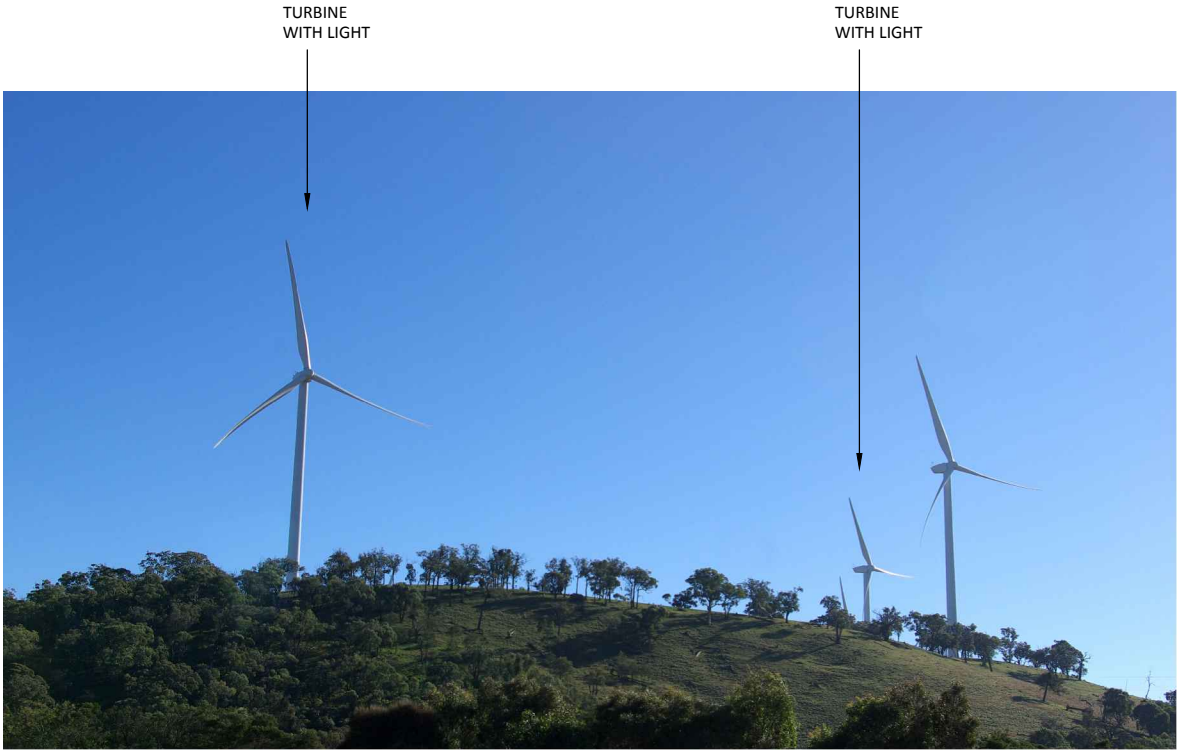
11.4 Potential view locations and impact

The categories of potential view locations that could be impacted by night time lighting generally include residents and motorists.

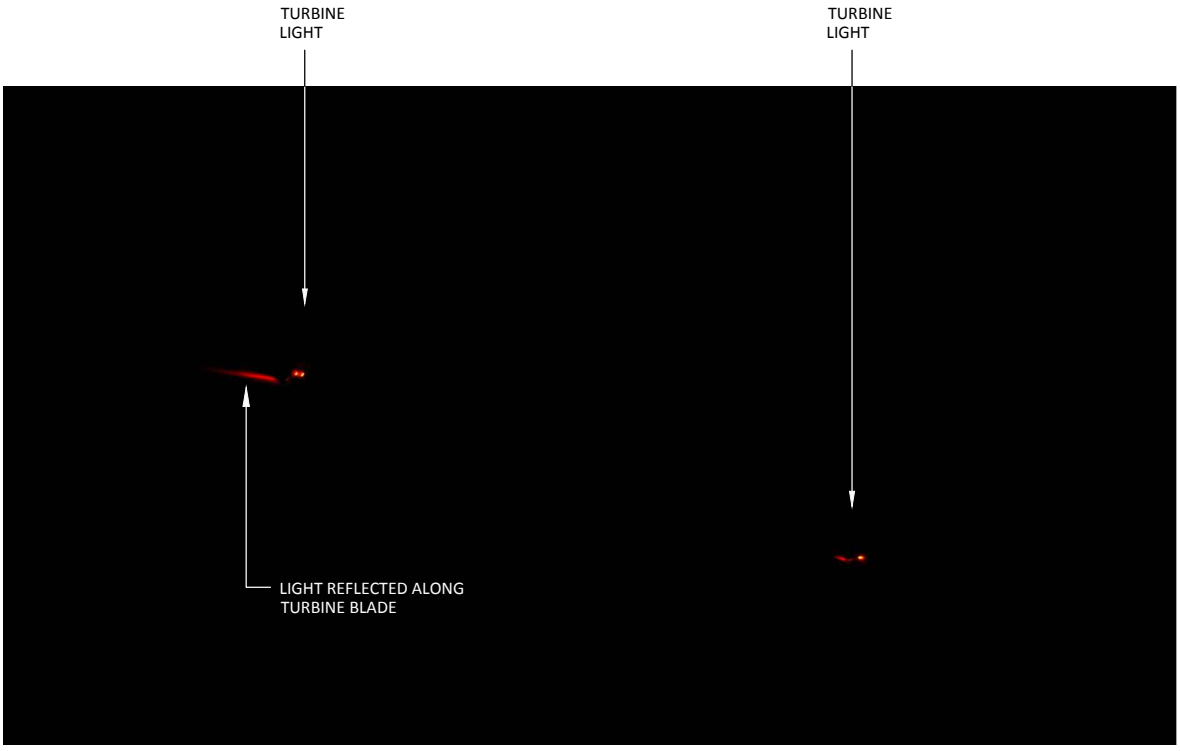
Night time lighting associated with the wind farm is unlikely to have a significant visual impact on the majority of public view locations. Whilst obstacle lighting would be visible to motorists travelling along the local roads, the duration of visibility would tend to be very short and partially screened by undulating landform along some sections of local road corridors and influenced by the direction of travel.

Night time obstacle lighting associated with the wind farm would be visible from a number of the residential view locations surrounding the Rye Park wind farm; however, topography and screening by vegetation and screen planting around residential dwellings would screen or partially obscure views toward night time obstacle lighting.

Irrespective of the total number of visible lights, obstacle lighting is more likely to be noticeable from exterior areas surrounding residences rather than from within residences, where internal lighting tends to reflect and mirror views in windows, or where exterior views would be obscured when curtains and blinds are closed.



Day time view from Hume highway toward Cullerin wind farm at around 500m



Night time view from Hume highway toward Cullerin wind farm at around 500m

Figure 65
Night lighting Cullerin wind farm at 500m

Cullerin wind farm night time lighting. View approximately 500 m west from Hume Highway

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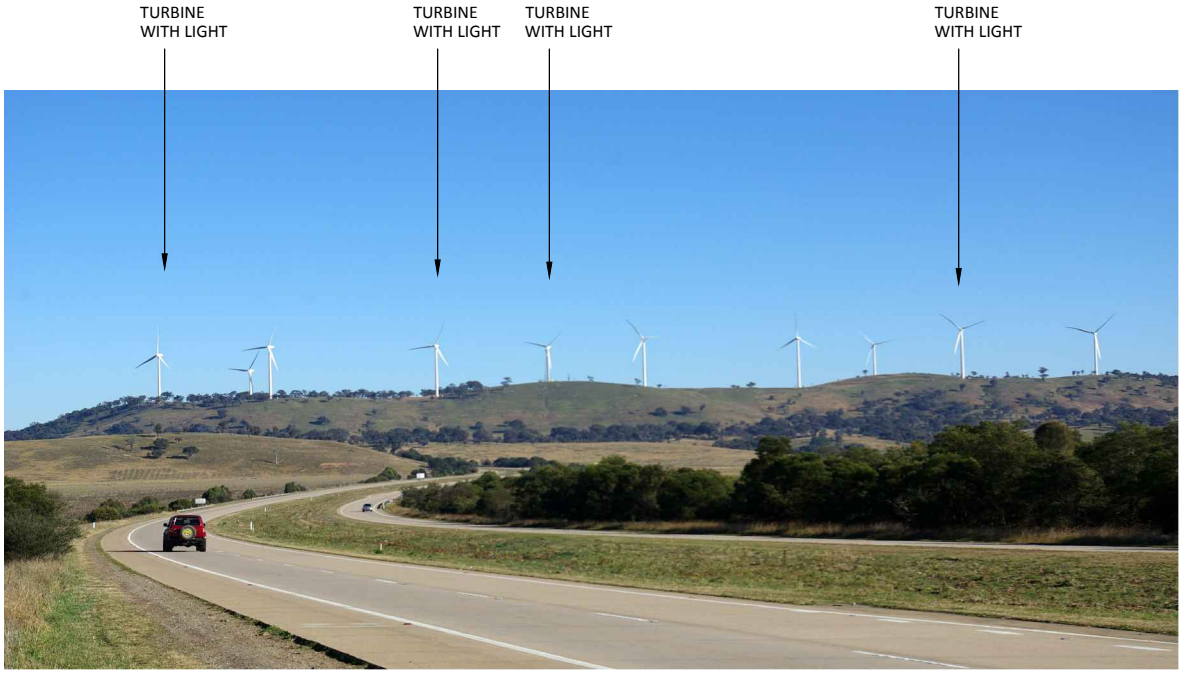
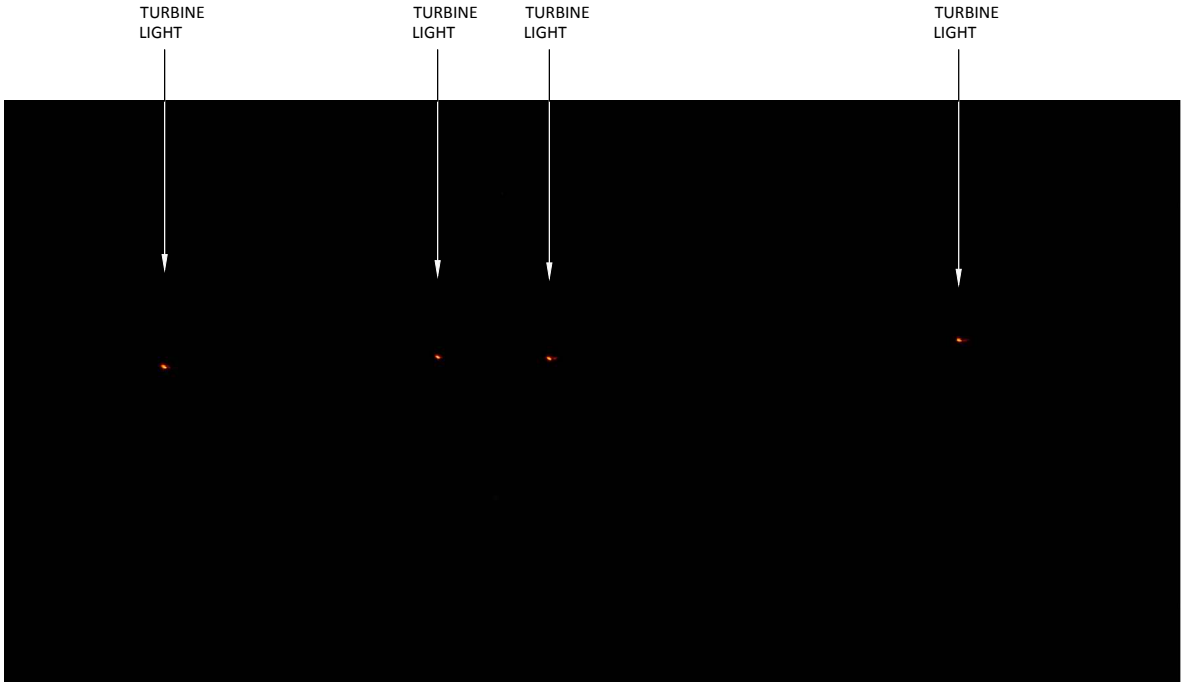


Day time view from Hume highway toward Cullerin wind farm at around 3.5km



Night time view from Hume highway toward Cullerin wind farm at around 3.5km

Cullerin wind farm night time lighting . View approximately 3.5 km west from Hume highway.

Figure 66
Night lighting Cullerin wind farm at 3.5 km

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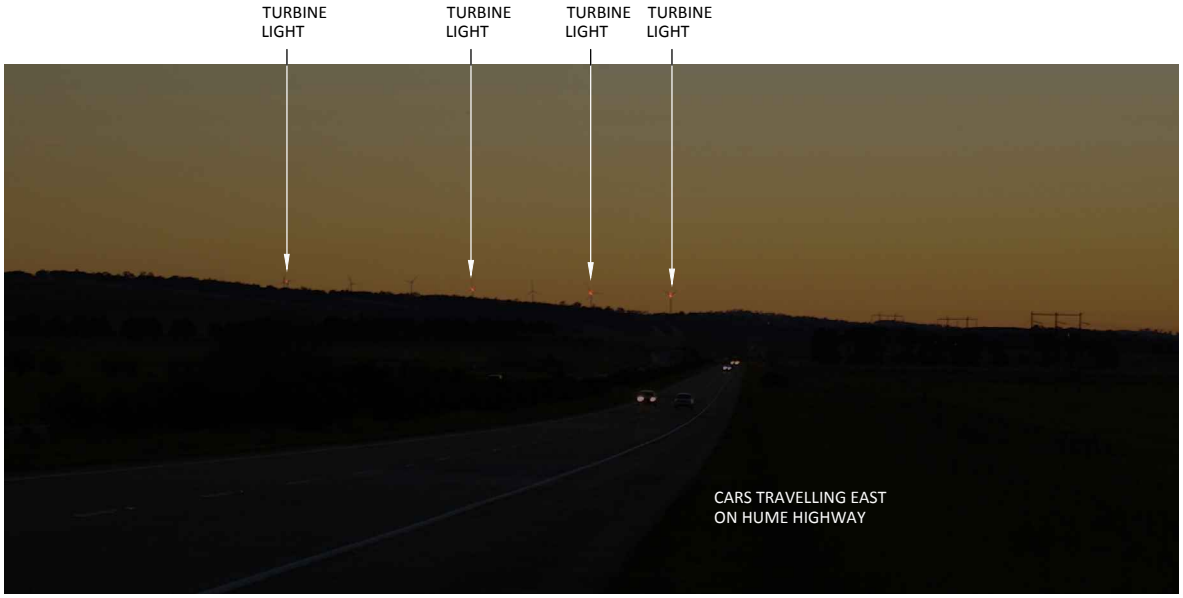
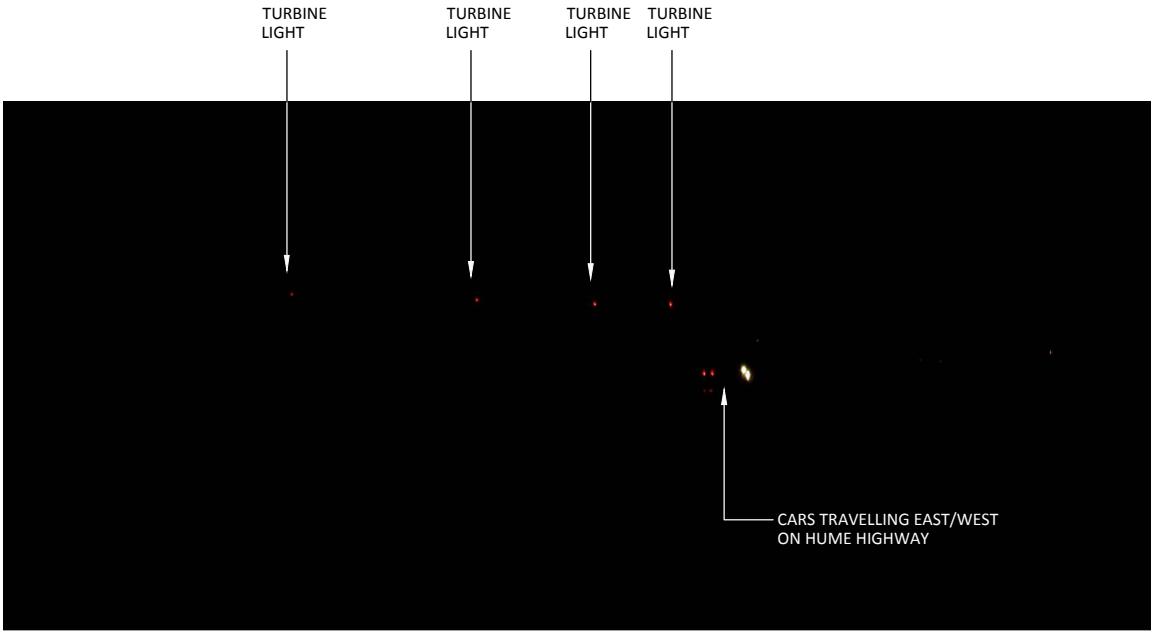


View west at dusk from Hume highway toward Cullerin wind farm at around 17km



View west after dark from Hume highway toward Cullerin wind farm at around 17km

Cullerin wind farm night time lighting . view west from Hume highway at around 17km distance.

Figure 67
Night lighting Cullerin wind farm at 17 km

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Electrical works

Section 12

12.1 Introduction

The Rye Park wind farm would include a range of electrical infrastructure to collect and distribute electricity generated by the wind turbines. Electrical works would include elements such as:

- 2 collection substations and 1 connection substation;
- a double circuit 330 kV powerline;
- generator transformers; and
- underground and overhead electrical and control cables.

The general arrangement for the proposed electrical works is illustrated in **Figures 68a** and **68b**.

A typical design for a wind farm substation is illustrated in **Plate 7** and demonstrates the relatively small scale development required for this component of the electrical infrastructure. A typical illustration of a folded plate double circuit supporting structure and angle poles is presented in **Plate 8**. The majority of electrical connections between the wind turbines would be via underground cabling, including areas along ridgelines within the project boundary. Small sections of 33kV overhead reticulation could be required within the site boundary; however, the scale of these structures would be similar to existing domestic distribution utility infrastructure found throughout the landscape.

Plate 7 – Typical wind farm collector substation

Plate 8 – Typical illustration of a 330 kV supporting structure and angle poles

12.2 Substations

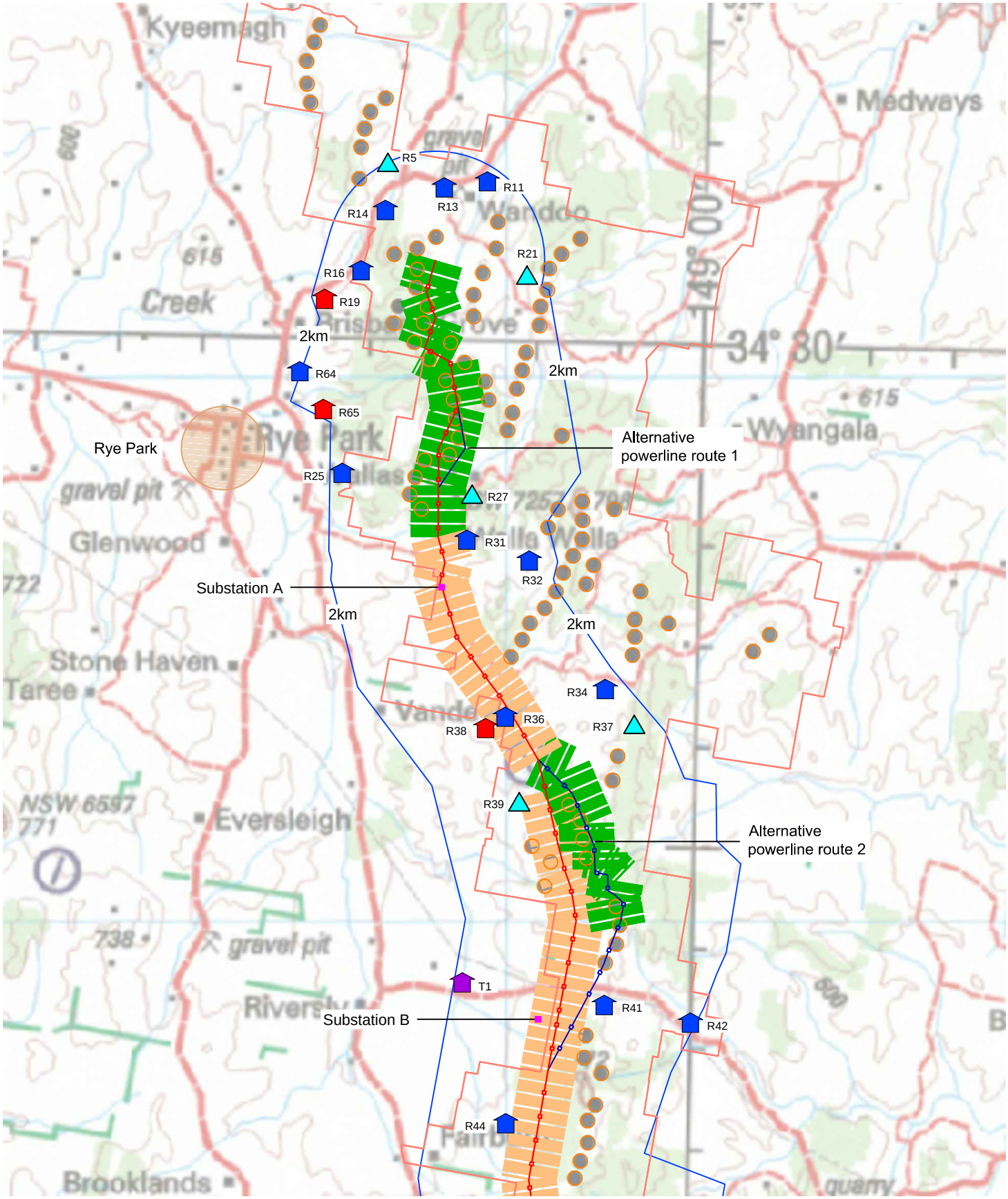
The substation locations are illustrated in **Figures 68a** and **68b**. Final locations would be selected subject to detail engineering design. The layout of the proposed substation will be developed at the detailed design stage. However, the main visual components of a typical wind farm switchyard substation would likely comprise:

- incoming and outgoing overhead powerlines;
- a single storey control building;
- an access road (or road utilising wind turbine maintenance access track);
- various switch bays and transformers;
- a communications pole;
- lightning masts;
- water tank;
- lighting for security and maintenance; and
- security fencing including a palisade fence and internal chainmesh fence.

The substation locations would not be significantly visible from areas to the west or east of the project area, and would be largely screened by landform and scattered tree within the north and central sections of the project. Views from individual residential dwellings toward the substations would also be partially screened by localised landform and would not be expected to result in any significant visual impact from surrounding view locations.

12.3 Powerline structure

Electricity generated by the Rye Park wind farm would be connected to the grid via an overhead double circuit 330 kV powerline extending north to south for around 40 km through the central portion of the site. The preferred 330 kV powerline route illustrated in **Figure 68a** and **68b** includes 5 alternative powerline routes which may be utilised subject to detailed site assessment work. The proposed powerline would connect to the existing 330 kV TransGrid powerline extending through the southern boundary of the Rye Park wind farm project area.



Legend

- Rye Park wind farm site boundary
- Preferred 330 kV powerline route
- Alternative 330 kV powerline route
- Existing powerline
- Proposed Rye Park wind turbine (indicative layout)
- Involved residential dwelling within 2 km of proposed powerline and wind turbine
- Involved residential dwelling within 2 km of proposed powerline but not wind turbine
- Uninvolved residential dwelling within 2 km of proposed powerline and wind turbine
- Uninvolved residential dwelling within 2 km of proposed powerline
- Proposed substation (indicative location)

Visual Absorption Capability (VAC)

- High
- Medium
- Low

0 km 1 km

Figure 68a
Proposed 330 kV powerline route and VAC

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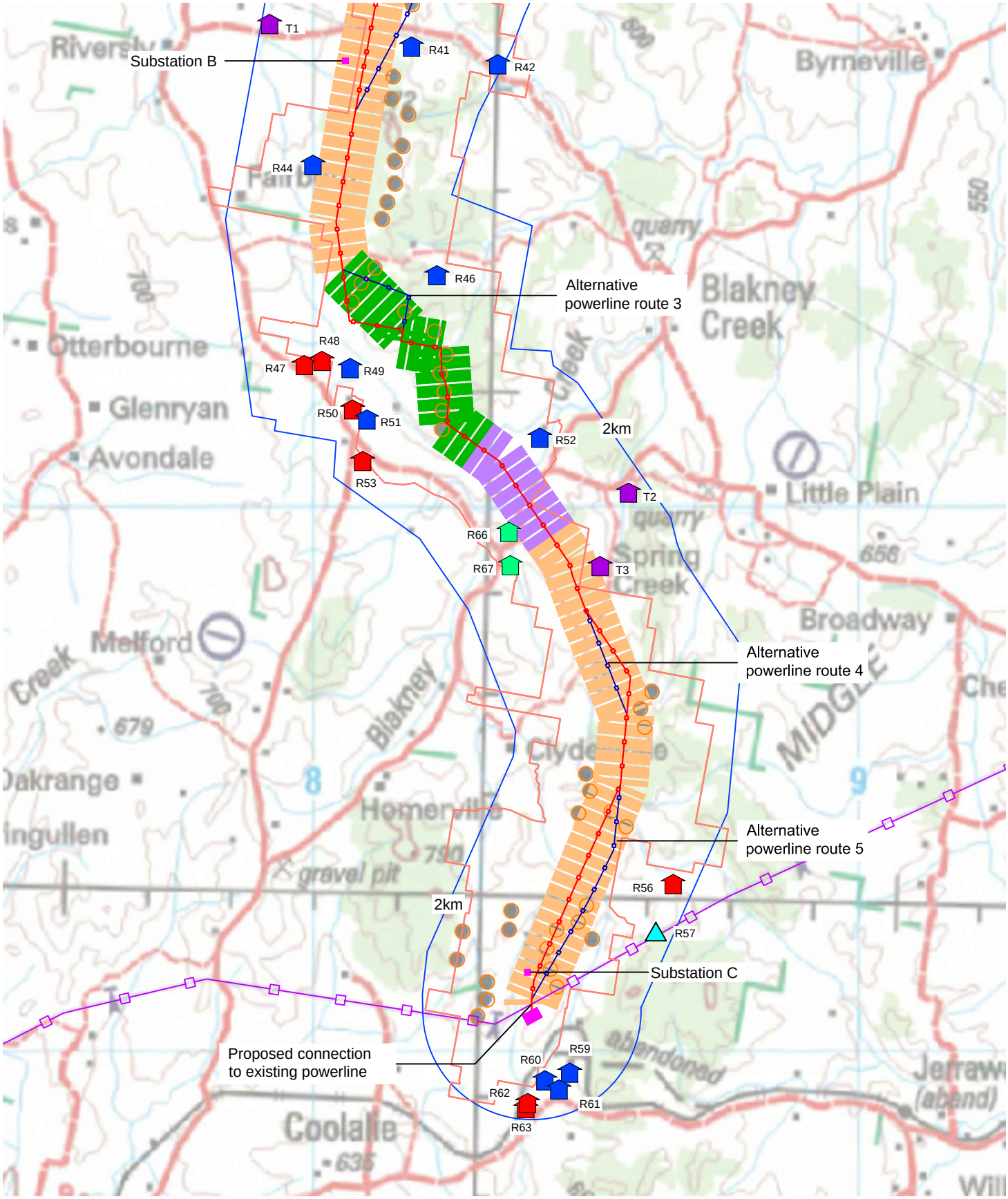

Legend

- Rye Park wind farm site boundary
- Preferred 330 kV powerline route
- Alternative 330 kV powerline route
- Existing powerline
- Proposed Rye Park wind turbine (indicative layout)
- Involved residential dwelling within 2 km of proposed powerline and wind turbine
- Involved residential dwelling within 2 km of proposed powerline but not wind turbine
- Uninvolved residential dwelling within 2 km of proposed powerline and wind turbine
- Uninvolved residential dwelling within 2 km of proposed powerline
- Proposed substation (indicative location)

Visual Absorption Capability (VAC)

- High
- Medium
- Low

0 km 1 km

Figure 68b
Proposed 330 kV powerline route and VAC

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The key visual components of the 330 kV powerline would comprise:

- single tapered steel poles up to 50 m high;
- aluminium alloy 330 kV conductors; and
- an aerial earth wire and communications link.

12. 4 Visual absorption capability

Visual absorption capability (VAC) is a classification system used to describe the relative ability of the landscape to accept modifications and alterations without the loss of landscape character or deterioration of visual amenity. The application of a VAC classification system is not particularly useful for large scale structures such as wind turbines and has not been applied to the assessment of the landscapes ability to accept the wind turbines; however, it can be applied to smaller ancillary structures, such as powerline infrastructure, where scale and form is more readily absorbed by elements (topography and vegetation) within the surrounding landscape. VAC relates to physical characteristics of the landscape that are often inherent and often quite static in the long term.

Undulating areas with a combination of open views interrupted by groups of trees and small forested areas would have a higher capability to visually absorb the proposed substations and powerline without significantly changing its amenity.

On the other hand, areas of cleared vegetation on level ground with limited screening, or areas spanning across prominent ridgelines without significant vegetation, would have a lower capability to visually absorb the proposed substations and powerline without changing the visual character and potentially reducing visual amenity.

Given the extent and combination of existing natural and cultural character within the wind farm site, the capability of the landscape to absorb the key components of the electrical infrastructure would be primarily dependent upon vegetation cover and landform.

For the purpose of this LVIA, the VAC ratings have been determined as:

Low – electrical infrastructure components would be highly visible either due to lack of screening by existing vegetation or surrounding landform (e.g. open flat farmland cleared of vegetation, or steep hillside crossing ridgeline).

Medium – electrical infrastructure components would be visible but existing vegetation and surrounding landform would provide some screening or background to reduce visual contrast.

High – electrical infrastructure components would be extensively screened by surrounding vegetation and undulating landform.

The landscape VAC along and surrounding the proposed and alternative 330 kV powerline route is illustrated in **Figures 68a** and **68b**.

12. 5 VAC summary

The landscape along the majority of the preferred and alternative powerline route, including the substation sites, is considered to have an overall moderate VAC, with some ability to accept modifications and alterations without the loss of landscape character or deterioration of existing levels of visual amenity. A higher VAC would occur in areas that present a backdrop of timbered or scattered tree cover. Areas of lower VAC would occur over cleared ridgelines as well as sections spanning road corridors and access tracks. Whilst the portions of the 3 alternative 330 kV powerline routes would be located closer to two of the involved residential dwellings, views toward the powerline would occur below the hill and ridgeline to the east of the dwellings, increasing the overall VAC and reducing visual significance.

The overall moderate level of VAC would largely result from the location of the proposed powerline routes relative to densely timbered hill sides, more gently undulating landforms and scattered tree cover. The moderate VAC would also tend to reduce the potential for cumulative impacts to occur where views toward the existing powerline included views toward proposed electrical infrastructure elements.

12.6 Assessment of visual significance (electrical infrastructure)

Utilising a methodology very similar to the assessment of the wind turbine visual impact, the potential visibility and resultant visual significance of the substations and powerline infrastructure would primarily result from the combination of two factors:

- the extent to which the substation and powerline would be visible from surrounding areas; and
- the degree of visual contrast between the substation and powerline and the surrounding landscape that would be visible from surrounding view locations.

The overall visual impact is generally determined by a combination of factors including:

- the category and type of situation from which people may view the components of the substation and powerline (e.g. resident or motorist);
- the potential number of people with a view toward components of the substation and powerline from any one view location;
- the distance between a person and components of the substation and powerline; and
- the duration of time that a person may view components of the substation and powerline.

The potential view catchment is the extent to which the proposed powerline would be visible from surrounding areas. Identification of the view catchment considers the character of the landscape, landform and existing structural elements with regard to their potential for localised visual screening effects.

For the purpose of this LVIA, the electrical infrastructure view catchment has been determined within an approximate 2 km offset from the proposed substation location or each side of the powerline, beyond which the views would have a greater tendency to be screened by undulating landform or the presence of vegetation for portions of the powerline route. It is also considered that whilst the powerline would be noticeable from areas beyond a 2km distance, the substation and powerlines are unlikely to appear as a dominant visual element within the landscape beyond this distance.

The 2 km view catchment is a generalised assessment, where views toward the proposed powerline could, in some situations, be blocked by buildings, vegetation or local landform features at specific

points within the 2 km offset, and similarly glimpses of the proposed powerline would be available from isolated positions outside the view catchment area. **Table 21** presents the view location matrix for electrical infrastructure. Involved and uninvolved residential dwelling locations within 2 km of the electrical infrastructure are illustrated in **Figures 68a** and **68b**.

The distance criteria for the proposed powerline visual assessment have been adopted as follows:

Category	**Distance**
Long distance view	>1 km
Medium distance view	500 m – 1 km
Short distance view	200 m – 500 m
Very short distance view	< 200 m

The potential visual significance of the proposed powerline is expressed as a rating of High, Medium, Low or Nil. For the purposes of this LVIA visibility ratings have been defined as:

High – The construction of the powerline may result in a very prominent physical change to the landscape, and includes the potential for proximate views toward extensive portions of the powerline from sensitive receptor locations.

Medium – The construction of the powerline may result in a noticeable physical change to the landscape although the powerline would not appear to be substantially different in scale and character to the existing landscape from surrounding receptor locations.

Low – The construction of the powerline is unlikely to result in a prominent change to the landscape and views from surrounding receptor locations toward the powerline may be difficult to distinguish from elements within the surrounding landscape.

Nil – The construction of the powerline would not create a noticeable change to the existing landscape and is unlikely to result in views toward the powerline from surrounding receptor locations.

12.7 Visual significance matrix (electrical infrastructure)

Table 21 – Visual significance matrix (Refer **Figure 68a** and **68b** for residential view locations)

View location (Refer to Figure 68 a/b)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest powerline	Duration of effect	VAC within proximity to powerline	Degree of visibility	Visual significance
R5	Non residential structure	N/A	N/A	N/A	N/A	N/A	N/A
R11	Involved landowner Residential dwelling High sensitivity	Very low	1,800 m	High	High	Long distance views south to south west from the residential dwelling location toward the proposed powerline is blocked by tree shelter belt planting.	Nil
R13	Involved landowner Residential dwelling High sensitivity	Very low	1,450 m	High	High	Long distance views south to south west from the residential dwelling location toward the proposed powerline is blocked by tree planting.	Nil
R14	Involved landowner Residential dwelling High sensitivity	Very low	1,370 m	High	High	Long distance views south east from the residential dwelling location toward the proposed powerline are blocked by a combination of landform and tree planting.	Nil
R16	Involved	Very low	1,270 m	High	High	Long distance views east to south east from the residential	Nil

Table 21 – Visual significance matrix (Refer **Figure 68a** and **68b** for residential view locations)

View location (Refer to Figure 68 a/b)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest powerline	Duration of effect	VAC within proximity to powerline	Degree of visibility	Visual significance
	landowner Residential dwelling High sensitivity					dwelling location toward the proposed powerline are blocked by a combination of landform and tree planting.	
R19	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	1,875 m	High	High	Long distance views east to south east from the residential dwelling location toward the proposed powerline are blocked by a combination of landform and tree planting.	Nil
R21	Non residential structure	N/A	N/A	N/A	N/A	N/A	N/A
R64	Involved landowner Residential dwelling High sensitivity	Very low	2,324 m	High	High	Long distance views east from the residential dwelling location toward the proposed powerline will be blocked by topography and tree cover.	Nil
R27	Non residential structure	N/A	N/A	N/A	N/A	N/A	N/A
R65	**Uninvolved landowner**	Very low	2,229 m	High	High	Long distance views east from the residential dwelling location	Nil

Table 21 – Visual significance matrix (Refer **Figure 68a** and **68b** for residential view locations)

View location (Refer to Figure 68 a/b)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest powerline	Duration of effect	VAC within proximity to powerline	Degree of visibility	Visual significance
	Residential dwelling High sensitivity					toward the proposed powerline, alternative route 1, and the substation A location, will be blocked by topography and tree cover.	
R25	Involved landowner Residential dwelling High sensitivity	Very low	1,761 m	High	High	Long distance views east from the residential dwelling location toward the proposed powerline, alternative route 1, and the substation A location, will be blocked by topography and tree cover.	Nil
R31	Involved landowner Residential dwelling High sensitivity	Very low	500 m	High	Medium	Medium distance views south east from the residential dwelling location toward the proposed powerline, and the substation A location, will be blocked by topography and tree cover.	Nil
R32	Involved landowner Residential dwelling High sensitivity	Very low	1,580 m	High	Medium	Long distance views south east from the residential dwelling location toward the proposed powerline, and the substation A location, will be blocked by topography and tree cover.	Nil
R34	Involved landowner	Very low	1,712 m	High	Medium	Long distance views north west to south west will be obstructed by rising and undulating landform to the west of the dwelling. There	Nil

Table 21 – Visual significance matrix (Refer **Figure 68a** and **68b** for residential view locations)

View location (Refer to Figure 68 a/b)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest powerline	Duration of effect	VAC within proximity to powerline	Degree of visibility	Visual significance
	Residential dwelling High sensitivity					will be no views toward any of the proposed substation locations.	
R36	Involved landowner Residential dwelling High sensitivity	Very low	260 m	High	Medium	Short distance views north east to south east will extend toward short sections of the powerline; however, views will be partially obstructed by rising and undulating landform to the east of the dwelling. There will be no views toward any of the proposed substation locations.	Low
R37	Non residential structure	N/A	N/A	N/A	N/A	N/A	N/A
R38	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	650 m	High	Medium	Medium distance views north east to south east will extend toward short sections of the powerline; however, views will be partially obstructed by rising and undulating landform to the east of the dwelling together with tree cover surrounding the residential dwelling. There will be no views toward any of the proposed substation locations.	Low
R39	Non residential structure	N/A	N/A	N/A	N/A	N/A	N/A
T1	**Uninvolved**	Very low	1,600 m	High	Medium	Long distance views north east to south east will extend toward	Low

Table 21 – Visual significance matrix (Refer **Figure 68a** and **68b** for residential view locations)

View location (Refer to Figure 68 a/b)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest powerline	Duration of effect	VAC within proximity to powerline	Degree of visibility	Visual significance
	landowner Residential dwelling High sensitivity		(to alternative powerline route 1)			sections of the powerline; however, views will be partially obstructed by rising and undulating landform to the east of the dwelling together with tree cover surrounding the residential dwelling. Views toward the proposed substation B location will be blocked by topography and tree cover to the east of the residential dwelling.	
R41	Involved landowner Residential dwelling High sensitivity	Very low	790 m	High	Medium	Medium distance views north west to south west from the residential dwelling toward the powerline and substation B location will be partially screened by landform and scattered tree cover.	Low
R42	Involved landowner Residential dwelling High sensitivity	Very low	2,388 m	High	Medium	Long distance views north west to south west from the residential dwelling toward the powerline and substation B location will be largely screened by landform and scattered tree cover.	Nil
R44	Involved landowner Residential dwelling High sensitivity	Very low	380 m	High	Medium to High	Short distance views north east to south east toward the proposed powerline will be filtered to some extent by scattered tree cover beyond the residential dwelling. Views toward the proposed substation B location will be screened by ridgeline landform and dense tree cover.	Low

Table 21 – Visual significance matrix (Refer **Figure 68a** and **68b** for residential view locations)

View location (Refer to Figure 68 a/b)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest powerline	Duration of effect	VAC within proximity to powerline	Degree of visibility	Visual significance
R46	Involved landowner Residential dwelling High sensitivity	Very low	1,145 m	High	High	Long distance views south to west toward the proposed powerline and alternative route 3 will be screened by topography and tree cover.	Nil
R47	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	1,165 m	High	High	Long distance views within proximity to the residential dwelling will extend east to north east toward the proposed powerline. Views of the powerline will be partially screened by a low undulating landform below the main wind farm ridgeline, and by scattered to denser areas of tree cover on hillside slopes beyond the ridgeline. Strategic planting to the north and north east of the dwelling would potentially screen portions of the powerline from views surrounding the dwelling. There will be no views toward the proposed substation locations.	Low
R48	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	919 m	High	High	Medium distance views within proximity to the residential dwelling will extend east to north east toward the proposed powerline. Views of the powerline will be partially screened by a low undulating landform below the main wind farm ridgeline, and by scattered to denser areas of tree cover on hillside slopes beyond the ridgeline. Strategic planting to the north and north east of the dwelling would potentially screen portions of the powerline from	Low

Table 21 – Visual significance matrix (Refer **Figure 68a** and **68b** for residential view locations)

View location (Refer to Figure 68 a/b)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest powerline	Duration of effect	VAC within proximity to powerline	Degree of visibility	Visual significance
						views surrounding the dwelling. There will be no views toward the proposed substation locations.	
R49	Involved landowner Residential dwelling High sensitivity	Very low	1,075 m	High	High	Long distance views within proximity to the residential dwelling will extend east to north east toward the proposed powerline. Views of the powerline will be partially screened by a low undulating landform below the main wind farm ridgeline, and by scattered to denser areas of tree cover on hillside slopes beyond the ridgeline. Strategic planting to the north and north east of the dwelling would potentially screen portions of the powerline from views surrounding the dwelling. There will be no views toward the proposed substation locations.	Low
R50	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	1,565 m	High	High	Long distance views within proximity to the residential dwelling will extend east to north east toward the proposed powerline. Views of the powerline will be partially screened by a low undulating landform below the main wind farm ridgeline, and by scattered to denser areas of tree cover on hillside slopes beyond the ridgeline. Strategic planting to the north and north east of the dwelling would potentially screen portions of the powerline from views surrounding the dwelling. There will be no views toward the proposed substation locations.	Low
R51	Involved landowner	Very low	1,474 m	High	High	Long distance views within proximity to the residential dwelling will	Low

Table 21 – Visual significance matrix (Refer **Figure 68a** and **68b** for residential view locations)

View location (Refer to Figure 68 a/b)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest powerline	Duration of effect	VAC within proximity to powerline	Degree of visibility	Visual significance
	Residential dwelling High sensitivity					extend east to north east toward the proposed powerline. Views of the powerline will be partially screened by a low undulating landform below the main wind farm ridgeline, and by scattered to denser areas of tree cover on hillside slopes beyond the ridgeline. Strategic planting to the north and north east of the dwelling would potentially screen portions of the powerline from views surrounding the dwelling. There will be no views toward the proposed substation locations.	
R52	Involved landowner Residential dwelling High sensitivity	Very low	854 m	High	Low to medium	Medium distance views south west to west from the residential dwelling toward the proposed powerline will be screened by existing tree planting to the west of the dwelling. There will be no views toward the proposed substation locations from the dwelling.	Nil
R53	Involved landowner Residential dwelling High sensitivity	Very low	1,708 m	High	Medium	Long distance views north to north east toward the proposed alternative powerline route will be partially screened by tree cover within the property as well as trees along the Rye Park Dalton Road corridor.	Low
R66	Involved landowner Residential	Very low	606 m	High	Low	Medium distance views north to east from the involved residential dwelling will extend toward the powerline as it descends toward, and spans, the Rye Park Dalton Road corridor. There will be no	Medium

Table 21 – Visual significance matrix (Refer **Figure 68a** and **68b** for residential view locations)

View location (Refer to Figure 68 a/b)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest powerline	Duration of effect	VAC within proximity to powerline	Degree of visibility	Visual significance
	dwelling High sensitivity					views toward the proposed substation locations.	
R67	Involved landowner Residential dwelling High sensitivity	Very low	956 m	High	Low to medium	Medium distance views north east to east from the residential dwelling toward the preferred powerline are largely screened by a low ridgeline descending in a north westerly direction to the east of the residential dwelling. There will be no views toward the proposed substation locations.	Low
T2	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	1,620 m	High	Low/High	Potential long distance views west to south west from the residential dwelling toward the proposed powerline route will be screened by tree cover surrounding and beyond the residential dwelling.	Nil
T3	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	538 m	High	Medium to high	Short to medium distance views west to south west toward the proposed preferred powerline will be significantly screened by a low ridgeline and hills to the west of the residential dwelling. There will be no views toward the proposed substation locations.	Low (potentially Nil)
R57	Non residential structure	N/A	N/A	N/A	N/A	N/A	N/A

Table 21 – Visual significance matrix (Refer **Figure 68a** and **68b** for residential view locations)

View location (Refer to Figure 68 a/b)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest powerline	Duration of effect	VAC within proximity to powerline	Degree of visibility	Visual significance
R56	**Uninvolved landowner** Residential dwelling High sensitivity	Very low	1,260 m (to alternative powerline route 5)	High	Medium	Long distance views north to south west toward the proposed preferred powerline route and the closer alternative powerline route 5 will be screened by a combination of undulating landform and tree cover to the west of the residential dwelling.	Nil
R59	Involved landowner Residential dwelling High sensitivity	Very low	1,500 m	High	Medium	Long distance views north toward the proposed powerline and substation C location are largely screened by a low undulating landform, including a low ridgeline above the Main Northern Railway line cutting.	Low
R60	Involved landowner Residential dwelling High sensitivity	Very low	1,460 m	High	Medium	Long distance views north toward the proposed powerline and substation C location are largely screened by a low undulating landform, including a low ridgeline above the Main Northern Railway line cutting.	Low
R61	Involved landowner Residential dwelling High sensitivity	Very low	1,865 m	High	Medium	Long distance views north toward the proposed powerline and substation C location are largely screened by a low undulating landform, including a low ridgeline above the Main Northern Railway line cutting, as well as tree cover to the north of the dwelling.	Low

Table 21 – Visual significance matrix (Refer **Figure 68a** and **68b** for residential view locations)

View location (Refer to Figure 68 a/b)	Category of view location and sensitivity	Relative number of people	Approximate distance to closest powerline	Duration of effect	VAC within proximity to powerline	Degree of visibility	Visual significance
R62	**Uninvolved landowner** Residential dwelling High	Very low	1,863 m	High	Medium	Long distance views north toward the proposed powerline and substation C location are screened by a low undulating landform, including a low ridgeline above the Main Northern Railway line cutting, as well as tree cover to the north of the dwelling.	Nil
R63	**Uninvolved landowner** Residential dwelling High	Very low	1,996 m	High	Medium	Long distance views north toward the proposed powerline and substation C location are screened by a low undulating landform, including a low ridgeline above the Main Northern Railway line cutting, as well as tree cover to the north of the dwelling.	Nil

12.8 Summary of visual significance (electrical infrastructure)

A total of 41 potential dwellings have been identified within a 2 km offset from the preferred and alternative 330 kV powerline routes. Six of the potential dwellings have been determined to be non residential structures. Eighteen of the residential dwellings are involved and nine and uninvolved residential dwellings. As assessment of visual significance for the proposed powerline and substations determined that:

- 18 of the 35 residential dwellings would have a Nil visual significance;
- 16 of the 35 residential dwellings would have a Low visual significance;
- 1 of the 35 residential dwellings would have a Medium visual significance.

The proposed powerline would span a small number of local unsealed and sealed roads including Lagoon Creek Road, Flakney Creek/Pudman Lane and the Rye Park Dalton Road. These roads carry a low volume of traffic, and transitory views from vehicles travelling along these roads would be unlikely to result in a significant level of impact.

Overall, this LVIA has determined that the electrical infrastructure associated with the Rye Park wind farm project would be unlikely to have a significant visual impact on surrounding private residential dwelling view locations, including both involved and uninvolved dwellings.

Whilst the alternative route alignments are closer to a number of involved and uninvolved residential dwellings than the preferred route, the alternative routes would be located away from ridgeline areas and therefore have the potential to be less visible from the surrounding landscape.

The three substation locations would be located away from uninvolved residential dwellings and largely visually contained within private land by an undulating landform and tree cover.

The undulating nature of local landform, and distribution of tree cover along the preferred and alternative powerline routes, would also tend to limit the potential for direct visibility toward existing high voltage powerline infrastructure within the surrounding landscape.

Figure 69 illustrates a photomontage from the Rye Park-Dalton Road looking toward the proposed wind turbines and preferred 330 kV powerline route.

Public view location PM8 Rye Park Dalton Road - Existing view north north west to east. Photo coordinate Easting:680991 Northing:6161071 (MGAz55)

Public view location PM8 Rye Park Dalton Road- Proposed view toward proposed wind turbines and 330 kV transmission line.

Notes

Individual panorama photograph taken with a Nikon D700 digital SLR camera with 50 mm prime lens.

Individual panorama photograph coordinate map datum is MGAz55 to ± 5 m.

Extent of potential wind turbine visibility and directional bearing illustrated on each photomontage is indicative only.

The Nikon D700 digital SLR camera with a 50mm lens results in a single photograph with a view angle equivalent to a 35mm film photograph taken with a 50mm lens.

Refer Figure 31 for public view locations

Figure 68
PM 10 View toward proposed 330 kV transmission line from Rye Park Dalton Road

EPURON

Rye Park Wind Farm Pty Ltd

GREEN BEAN DESIGN
landscape architects

RYE PARK WIND FARM

Pre-construction and construction

Section 13

13.1 Potential visual impacts

There are potential visual impacts that could occur during both pre-construction and construction phases of the project. The wind farm construction phase is likely to occur over a period of around 24 months, although the extent and nature of pre-construction and construction activities would vary at different locations within the project area.

Plate 10 and **11 -** Illustrating typical general construction activities during turbine construction

Plate 12 - Illustrating general construction activities at the Capital wind farm site, including views toward cranes, partial construction of towers and laydown areas.

The key pre-construction and construction activities that would be visible from areas surrounding the proposed wind farm include:

- ongoing detailed site assessment including sub surface geotechnical investigations;
- various civil works to upgrade local roads and access point;
- construction compound buildings and facilities;
- construction facilities, including portable structures and laydown areas;
- various construction and directional signage;

- mobilisation of rock crushing equipment and concrete batching plant (if required);
- excavation and earthworks; and
- various construction activities including erection of wind turbines, monitoring masts and substation with associated electrical infrastructure works.

The majority of pre-construction and construction activities, some of which would result in physical changes to the landscape (which have been assessed in this LVIA report), are generally temporary in nature and for the most restricted to various discrete areas within or beyond the immediate wind farm project area. The majority of pre-construction and construction activities would be unlikely to result in an unacceptable level of visual impact for their duration and temporary nature.

Perception and public consultation

Section 14

14.1 Perception

People's perception of wind farms is an important issue to consider as the attitude or opinion of individual people adds significant weight to the level of potential visual impact.

The opinions and perception of individuals from the local community and broader area were sought and provided through a range of consultation activities. These included:

- public open day;
- meetings of the Community Consultation Committee
- dedicated project web site including feedback provisions; and
- individual stakeholder meetings.

The attitudes or opinions of individuals toward wind farms can be shaped or formed through a multitude of complex social and cultural values. Whilst some people may accept and support wind farms in response to global or local environmental issues, others may find the concept of wind farms completely unacceptable. Some may support the environmental ideals of wind farm development as part of a broader renewable energy strategy but do not consider them appropriate for their regional or local area. It is unlikely that wind farm projects will ever conform or be acceptable to all points of view; however, research within Australia as well as overseas consistently suggests that the majority of people who have been canvassed do support the development of wind farms.

Wind farms are generally easy to recognise in the landscape and to take advantage of available wind resources are more often located in elevated and exposed locations. The geometrical form of a wind turbine is a relatively simple one and can be visible for some distance beyond a wind farm, and the level of visibility may be accentuated by the repetitive or repeating pattern of multiple wind turbines within a local area. Wind farms do have a significant potential to alter the physical appearance of the landscape, as well as change existing landscape values.

14.2 Public consultation

A public open day was held at the Rye Park Memorial Hall on the 26th July 2012. The open day provided an opportunity for members of the local community to view preliminary photomontages as well as other maps and plans illustrating layouts and potential locations for project infrastructure. The open day also provided an opportunity for the local community to provide feedback (via a landscape values questionnaire) on their experience and personal values associated with the surrounding landscape.

A single questionnaire was completed with a range of relevant and pertinent observations and detailed a number of points, which it would be reasonable to assume, could be reflected across a broader section of the local community. The key observations noted:

- landscape attributes of open space, peace and quiet, rolling hills, flora and fauna and a sparse population;
- landscape orientated recreational activities (gardening, fishing, shooting and walking);
- importance of views from local roads including Little Plains Road;
- lookouts or viewpoints are not necessary as views across the landscape can be gained from many locations in the locality including homes and farms;
- changes in the landscape have occurred as a result of subdivision with some land becoming degraded and weed infested on absentee landholders blocks, or additional vegetation has been added to the landscape such as shelter belts.

Whilst the respondent believes that the wind farm will have a negative impact on the landscape they also note that '*as an industrial complex I believe the wind farm will have a more minimal impact on the landscape and be better to look at than other alternatives'.*

14.3 Quantitative research

Whilst published Australian research into the potential landscape and visual impacts of wind farms is limited, there are general corresponding results between the limited number that have been carried out when compared with those carried out overseas.

A recent survey was conducted by ARM Interactive on behalf of the NSW Department of Environment, Climate Change and Water (September 2010). The survey polled 2,022 residents across the 6 Renewable Energy Precincts established by the NSW Government; including the NSW/ACT Border Region Renewable Energy Precinct. Key findings of the survey indicated that:

- *97% of people across the Precincts had heard about wind farms or turbines, and 81% had seen a wind farm or turbine (in person or the media);*
- *85% of people supported the construction of wind farms in New South Wales, and 80% within their local region; and*
- *79% supported wind farms being built within 10km of residences and 60% of people surveyed supported the construction of wind turbines within 1 to 2km from their residences.*

These results are reflected in other surveys including the community perception survey commissioned by Epuron for the *Gullen Range Wind Farm Environmental Assessment (August 2008).* The results of the survey, which targeted a number of local populations within the Southern Tablelands, suggested that around 89% of respondents were in favour of wind farms being developed in the Southern Tablelands, with around 71% of respondents accepting the development of a wind farm within one kilometre from their residential dwelling.

These general levels of support for wind farm developments have also been recorded for a number of wind farm developments around Australia as well as overseas.

Auspoll research carried out in February 2002 on behalf of a wind farm developer for a wind farm project in Victoria included just over 200 respondents. The results indicated that:

- *Over 92% of respondents agreed that wind farms can make a difference in reducing greenhouse emissions and mitigating the effects of global warming;*
- *Over 88% disagreed with the statement that wind farms are ugly;*
- *Over 93% of respondents identified 'interesting' as a good way to describe wind farms, over 73% nominating 'graceful' and over 55% selecting 'attractive';*

- *Over 79% of respondents thought that the wind farm would have a good impact on tourism, with 15% of respondents believing that the wind farm would make no difference; and*
- *Over 40% of respondents believed that the impact of the wind farm on the visual amenity of the area would be good, with 40% believing that it would make no difference.*

A September 2002 MORI poll of 307 tourists conducted in Argyll (United Kingdom) indicated that:

- *43% maintained that the presence of wind farms had a positive impression of Argyll as a place to visit;*
- *43% maintained that the presence of wind farms had an equally positive or negative effect;*
- *Less than 8% maintained it had a negative effect; and*
- *91% of tourists maintained that the presence of wind farms in Argyll made no difference to the likelihood of them visiting the area.*

There is no published Australian research on community attitudes to the impact of wind farms on landscape and visual issues before and after construction. However, overseas research in the United Kingdom conducted by MORI in 2003 indicated that:

- *Prior to construction 27% of people polled thought problems may arise from wind farm impact on the landscape; and*
- *Following construction the number of people who thought the landscape has been spoiled was 12%.*

The majority of research carried out to date has focussed on public attitudes to wind farms and does not provide any indication for acceptable or agreed thresholds in relation to numbers and heights of turbines, and the potential impact of distance between turbines and view locations.

14.4 The broader public good

Whilst visual perceptions and attitudes of local communities toward wind farm developments are an important issue, and need to be assessed locally in terms of potential landscape and visual impacts,

there is also an issue of the greater potential public benefit provided by renewable energy production. Wind farms are expected to make a contribution toward meeting the Government's commitment that 20% of Australia's electricity supply comes from renewable energy sources by 2020.

In the 2006 Land and Environment Court decision to grant, on an amended basis, consent for the construction of a wind farm at Taralga, Chief Judge Justice Preston said in his prologue to the judgement:

"The insertion of wind turbines into a non-industrial landscape is perceived by many as a radical change which confronts their present reality. However, those perceptions come in different hues. To residents, such as members of the Taralga Landscape Guardians Inc. (the Guardians), the change is stark and negative. It would represent a blight and the confrontation is with their enjoyment of their rural setting.

To others; however, the change is positive. It would represent an opportunity to shift from societal dependence on high emission fossil fuels to renewable energy sources. For them, the confrontation is beneficial – being one much needed step in the policy settings confronting carbon emission and global warming.

Resolving this conundrum – the conflict between the geographically narrower concerns of the guardians and the broader public good of increasing the supply of renewable energy – has not been easy. However, I have concluded that, on balance, the broader public good must prevail".

Whilst the exact circumstances between the Taralga wind farm and the Rye Park wind farm may differ, the comments provided by the Chief Judge make it clear that, in the circumstances of that case, there was a need for the broader public good to be put before the potential negative impacts on some members of the local community. Similar reasoning can be applied to the project.

Mitigation measures

Section 15

15.1 Mitigation measures

The British Landscape Institute states *'the purpose of mitigation is to avoid, reduce, or where possible remedy or offset any significant negative (adverse) effects on the environment arising from the proposed development' (2002).* In general mitigation measures would reduce the potential visual impact of the project in one of two ways:

- firstly, by reducing the visual prominence of the wind turbines and associated structures by minimising the visual contrast between the wind turbines and the landscape in which they are viewed; and
- secondly, by screening views toward the wind turbines from specific view locations.

In relation to the first form of mitigation, the design of the turbine structures has been highly refined over a number of years to maximise their efficiency. The height of the supporting towers and dimensions of the rotors are defined by engineering efficiency and design criteria. Consequently, modification of the turbine design to mitigate potential visual impacts is not considered a realistic option.

Colour is one aspect of the wind turbine design that does provide an opportunity to reduce visual contrast between the turbine structures and the background against which they are viewed. The white colour that is used on a majority of turbine structures provides the maximum level of visual contrast with the background. This maximum level of visual contrast could be reduced through the use of an appropriate off white or grey colour for the turbines where the visual contrast would be reduced when portions of the turbine were viewed against the sky as well as for those portions viewed against a background of landscape. The final colour selection would, however, be subject to the availability of turbine models on the market at the time of ordering and to aviation safety requirements.

The potential visual impact of the project from specific view locations could be mitigated by planting vegetation close to the view locations. For instance, tree or large shrub planting close to a residence

can screen potential views to individual or clusters of turbines. Similarly roadside tree planting can screen potential views of turbines from portions of road corridors.

The location and design of screen planting used as a mitigation measure is very site specific and requires detailed analysis of potential views and consultation with surrounding landowners. Planting vegetation would not provide effective mitigation in all circumstances and can reduce the extent of existing views available from residences or other view locations.

There is greater potential to mitigate the visual prominence for some of the ancillary structures and built elements associated with the wind farm through the appropriate selection of materials and colours, together with consideration of their reflective properties.

The potential visual impacts of vehicular tracks providing access for construction and maintenance can be mitigated by:

- minimising the extent of cut and fill in the track construction;
- re-vegetating disturbed soil areas immediately after completion of construction works; and
- using local materials as much as possible in track construction to minimise colour contrast.

15.2 Summary of mitigation measures

A summary of the mitigation measures available for the wind farm and powerline infrastructure is presented in **Tables 22** and **23**.

Table 22 - Mitigation measures summary

Safeguard	Implementation			
	Design	Site Preparation	Construction	Operation
Consider options for use of colour to reduce visual contrast between project structures and visible background.	✓			
Avoid use of advertising, signs or logos mounted on turbine			✓	✓

Table 22 - Mitigation measures summary

Safeguard	Implementation			
	Design	Site Preparation	Construction	Operation
structures, except those required for safety purposes.				
If necessary, design and construct site control building and facilities building sympathetically with nature of locality.	✓		✓	
If necessary, locate substations away from direct views from roads and residential dwellings.	✓		✓	
Enforce safeguards to control and minimise fugitive dust emissions.		✓	✓	✓
Restrict the height of permanent stockpiles to minimise visibility from outside the site.		✓	✓	
Minimise construction activities that may require night time lighting, and if necessary use low lux (intensity) lighting designed to be mounted with the light projecting inwards to the site to minimise glare at night.		✓	✓	✓
Minimise cut and fill for site tracks and revegetate disturbed soils as soon as possible after construction.		✓	✓	
Maximise revegetation of disturbed areas to ensure effective cover is achieved.			✓	
Consider options for planting screening vegetation in vicinity of nearby residences and along roadsides to screen potential views of turbines. Such works to be considered in consultation with local residents and authorities.	✓	✓	✓	
Undertake revegetation and off-set planting at areas around the site	✓	✓	✓	

Table 22 - Mitigation measures summary

Safeguard	Implementation			
	Design	Site Preparation	Construction	Operation
where required in consultation and agreement with landholders.				

Table 23 – Powerline and substation, mitigation measures summary

Safeguard	Implementation			
	Design	Site Preparation	Construction	Operation
A careful and considered access route selection process to avoid sensitive view locations and loss of existing vegetation where possible.	✓		✓	
Wherever possible, select angle positions in strategic locations to minimise potential visual impact (e.g. avoiding, where possible, skyline views) and to provide a maximum setback from residential dwellings and road corridors.	✓		✓	
Selection of suitable component materials with low reflective properties.	✓		✓	
Selection of suitable storage areas for materials or plant with minimum visibility from residences and roads with screening where necessary.			✓	
Design for strategic tree or shrub planting between view locations and the powerline if required.	✓		✓	

Conclusion Section 16

16.1 Summary

This LVIA has determined that the Rye Park wind farm would have an overall medium visual significance on the majority of uninvolved and involved residential dwellings within the projects 10 km viewshed. The Rye Park wind farm would have a slightly lower visual significance on views from surrounding road corridors and public spaces.

This LVIA has determined that the project would have a high visual significance for two residential dwellings within 2 km of the Rye Park wind turbines, one involved and one uninvolved. GBD understand that the uninvolved residential dwelling is involved with the neighbouring Rugby wind farm project.

This LVIA has also determined that the project will have a medium to high significance for seventeen residential dwellings within 2 km of the proposed turbines. Nine of these dwellings are uninvolved and eight involved.

This LVIA determined the overall landscape character sensitivity to be medium/medium to high. Some recognisable characteristics of the LCA's will be altered by the proposed project, and result in the introduction of visually prominent elements that will alter the perceived characteristics of the landscape. The potential extent and degree of alteration would be partially mitigated by existing and modified landscape elements within the landscape. The main characteristics of the landscape, including the pattern and combinations of landform and landcover will still be visually evident from within and beyond the project site boundary.

The LCA's identified and described in this LVIA are generally well represented throughout the surrounding Local Government Areas and more generally within other areas across the NSW/ACT Border Region Renewable Energy Precinct. This LVIA has determined that the landscape surrounding the project will have some ability to accommodate the physical changes associated with the wind farm and its associated structures.

Many of the residential dwellings surrounding the wind farm have been positioned within the landscape to mitigate exposure to inclement weather, or have adopted measures to reduce these

impacts by planting and maintaining windbreaks around residential dwellings. The extent of windbreak planting reduces the potential visibility of the wind farm from a number of residential view locations in the surrounding landscape.

The project would be visible from a number of local roads such as Wargeila Road, Rye Park-Dalton Road, Little Plains Road, Maryvale Road, Boorowa Road and the Rye Park-Rugby Road. This LVIA has determined that views toward the Rye Park wind turbines would generally result in a low impact for the majority of motorists travelling through the area due to the short duration and transitory nature of effects.

This LVIA has determined that the construction of the project would result in some 'direct', 'indirect' or 'sequential' cumulative impacts when considered in addition to existing or proposed wind farm developments, including the proposed Bango and Rugby wind farm projects. The potential for 'direct' and 'indirect' cumulative visual impacts is likely to be more limited for residential dwellings within the 2 km viewshed where hill and ridgeline landforms, together with tree cover, directly influence the extent and degree of visibility between proposed and operational wind farm developments.

The proposed substation locations and preferred and alternative powerline routes are unlikely to result in a significant visual impact for the majority of surrounding residential or public view locations. A combination of distance, undulating landform and tree cover between substation and powerline components to surrounding view locations would tend to result in a moderate to high visual absorption capability and reduction in overall visibility.

Both pre-construction and construction activities are unlikely to result in an unacceptable level of visual impact due to the temporary nature of these activities together with proposed restoration and rehabilitation strategies. The preferred location for some of the construction activities, including the on-site concrete batch plant and rock crushing equipment, would be located away from publicly accessible areas, with the closest residential view locations generally comprising involved landowners.

Although not currently proposed, night time obstacle lighting would have the potential to be visible from a number of surrounding view locations, as well as areas beyond the project 10 km viewshed. The level of visual impact would diminish when viewed from more distant view locations, with a

greater probability of night time lighting being screened by landform and/or tree cover. It should also be noted that the night time lighting installed on the Cullerin wind farm (as illustrated in this LVIA) has been decommissioned by Origin Energy following a risk based aviation assessment. A number of recent wind farm developments in New South Wales have also been approved without a requirement for night time lighting, including the Gullen Range and Glen Innes wind farms. A number of other operational wind farm developments, including some in Victoria, have also had night lighting decommissioned.

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

The Proponent has engaged in ongoing consultation with local residents and made a number of adjustments to the location of individual turbines to minimise visual impacts where possible.

Subject to any conditions of approval, the proponent would commit to negotiating and implementing landscape treatments to screen and mitigate the potential visual impact of the wind farm for individual neighbouring dwellings within an appropriate distance from the wind farm project area, subject to consultation and agreement with individual property owners.

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Visual Representation of Wind Farms, Good Practice Guidance, Scottish Natural Heritage March 2006.

Visual Assessment of Windfarms: Best Practice. Scottish Natural Heritage Commissioned Report F01AA303A, University of Newcastle 2002.

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Wind Farms and Landscape Values National Assessment Framework, June 2007, Australian Wind Energy Association and Australian Council of National Trusts.

Limitations

GBD has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Epuron Australia Pty Ltd and only those third parties who have been authorised in writing by GBD to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the GBD Proposal dated 5th April 2012.

The methodology adopted and sources of information used are outlined in this report. GBD has made no independent verification of this information beyond the agreed scope of works and GBD assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to GBD was false.

This report was prepared between May 2012 and April 2013 and is based on the conditions encountered and information reviewed at the time of preparation. GBD disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

Appendix A – Civil Aviation Safety Authority Advisory Circular AC139-18(0) July 2007 (Withdrawn)

Australian Government
Civil Aviation Safety Authority

Advisory Circular

AC 139-18(0) SEPTEMBER 2004

OBSTACLE MARKING AND LIGHTING OF WIND FARMS

CONTENTS

1. REFERENCES

- CASR Part 139, Subpart 139.E, and in particular
  - ◊ 139.365 Structures 110 metres or more above ground level.
  - ◊ 139.370 Hazardous objects etc.
- MOS-Part 139 Chapter 7 – Obstacle Restrictions and Limitations.
- MOS-Part 139 Section 8.10 – Obstacle Marking.
- MOS-Part 139 Section 9.4 – Obstacle Lighting.

2. PURPOSE

This Advisory Circular (AC) provides general information and advice on the obstacle marking and lighting of Wind Farms (including single wind turbines), where CASA has determined that the wind farm is, or will be, a hazardous object to aviation.

3. STATUS OF THIS AC

This is the first AC to be issued on this subject.

Advisory Circulars are intended to provide recommendations and guidance to illustrate a means but not necessarily the only means of complying with the Regulations, or to explain certain regulatory requirements by providing interpretative and explanatory material.

Where an AC is referred to in a 'Note' below the regulation, the AC remains as guidance material.

ACs should always be read in conjunction with the referenced regulations

4. GENERAL

4.1 This AC applies specifically to horizontal-axis wind turbines, which are the only type installed, or known to be proposed for installation, in Australia, at the date of issue of this document.

4.2 This AC applies to:

(a) a single wind turbine; or

(b) a group of wind turbines, referred to as a wind farm, which may be spread over a relatively large area.

4.3 The height of a wind turbine is defined to be the maximum height reached by the tip of the turbine blades.

4.4 Australian standards and recommended practices for the marking and lighting of obstacles and objects assessed as being hazardous to aviation, are consistent with international standards and recommended practices as published by the International Civil Aviation Organisation (ICAO) in Annex 14 Volume 1 (Aerodrome Design and Operations). The general requirements are:

(a) marking is used to make objects conspicuous to pilots, by day.

(b) lighting is used to make objects conspicuous to pilots, by night;

(c) lights are located as close as practicable to the top of the objects, and at other locations so as to indicate the general definition and extent of the objects.

4.5 Wind turbines pose a particular practical problem in that their highest point is not a fixed structure, and therefore lights can not be appropriately located. The highest fixed part of the turbine where lights can conveniently be located is the top of the generator housing, sometimes known as the nacelle, and this is typically of the order of 2/3 the maximum height of the turbine.

4.6 ICAO has not yet published standards and recommended practices specifically suited to wind turbines. The advice in this document has been derived by allowing some variations to standards and recommended practices to accommodate the specific practical difficulties associated with wind turbines and wind farms, and taking into consideration the practices of some overseas countries.

5. WIND TURBINES IN THE VICINITY OF AN AERODROME

5.1 CASA strongly discourages the siting of wind turbines in the vicinity of an aerodrome.

5.2 A wind turbine located sufficiently close to an aerodrome so that it penetrates an obstacle limitation surface (OLS) of the aerodrome, is defined by MOS-Part 139 Section 7.1, to be an obstacle.

5.3 If the aerodrome is to be used at night, an obstacle that penetrates an OLS should be lighted, in accordance with MOS-Part 139 Section 9.4. The top lights are required to be arranged so as to at least indicate the points or edges of the object highest above the obstacle limitation surface. For a wind turbine, these lights may be located on a separate supporting structure adjacent to the wind turbine, to overcome the difficulty associated with the highest point of the obstacle being the (moving) blades of the turbine.

Note: Obstacle limitation surfaces are a complex of imaginary surfaces associated with an aerodrome. They vary depending on number and orientation of runways, and the instrument-approach type of the runway(s). Some surfaces can extend to 15 km from an aerodrome. Aerodrome operators can provide details for their particular aerodrome.

6. WIND TURBINES WITH A HEIGHT OF 110 m OR MORE

6.1 CASR 139.365 requires a person proposing to construct a building or structure, the top of which will be 110 m or more above ground level, to inform CASA of that intention and the proposed height and location of the proposed building or structure.

6.2 CASA will conduct an aeronautical study to determine if the wind turbine will be a hazardous object to aviation, in accordance with CASR 139.370.

6.3 If, as a result of the aeronautical study CASA finds that a proposed wind turbine will penetrate an OLS of an aerodrome, the proposal will be dealt with in accordance with 5 above.

6.4 The aeronautical study may find that even though the proposed wind turbine will not penetrate any OLS of an aerodrome, it will be a hazardous object to aviation.

6.5 The hazard that an object poses to aviation can be reduced by indicating its presence by appropriate marking and/or lighting.

Note: The marking and/or lighting does not necessarily reduce operating limitations which may be imposed by an obstacle or hazardous object.

6.6 The advice, in 7 and 8 below, on marking and lighting of wind turbines, should be suitable for wind turbines that do not penetrate an OLS, in most cases. However, because of the variations in configurations and layout of turbines in wind farms, the aeronautical study may indicate that a variation to that advice would be appropriate for a particular wind farm. In such a case, CASA may offer suggestions for variations to the normal advice provided in 7 and 8 below.

7. MARKING OF WIND TURBINES

7.1 Experience with wind turbines installed to date, indicates that they are sufficiently conspicuous by day, due to their shape, size, and colour.

7.2 Wind turbines that are of basically a single colour, and visually conspicuous against the prevailing background, do not require to be painted in obstacle marking colours and/or patterns.

8. LIGHTING OF WIND TURBINES

8.1 In the case of a single wind turbine:

(a) two flashing red medium intensity obstacle lights should be mounted on top of the generator housing;

(b) the light fixtures should be mounted at a horizontal separation to ensure an unobstructed view of at least one of the lights by a pilot approaching from any direction;

(c) both lights should flash simultaneously; and

(d) the characteristics of the obstacle lights should be in accordance with MOS-Part 139 subsection 9.4.7.

8.2 In the case of a wind farm, sufficient individual wind turbines should be lighted to indicate the extent of the group of turbines:

(a) the interval between obstacle lights should not be less than the current extensive object standard of 900 metres, and at a distance that minimises the number of lighted wind turbine generators without diminishing appropriate aviation safety;

(b) in addition, the most prominent (highest for the terrain) turbine(s) should be lighted, if not included amongst the turbines lighted in accordance with (a) above; and

(c) the lighting of individual turbines should be in accordance with 8.1 above.

*Note**:*** *There is an overseas proposal that all lighting provided at a wind farm should flash simultaneously. This proposal is still to be validated and accepted. It is suggested that wind farm operators bear in mind that the simultaneous flashing of all lights at a wind farm could become accepted practice some time in the future.*

8.3 On completion of the project, CASA may choose to conduct a flight check to determine the adequacy of the obstacle lighting. This may result in a change (either more or fewer) to the number of obstacle lights required, to ensure the development remains conspicuous.

8.4 Where obstacle lighting is to be provided, it is recommended a monitoring, reporting and maintenance procedure be put in place to ensure outages are reported through the NOTAM system and repairs are implemented.

Bill McIntyre
Executive Manager
Aviation Safety Standards

Appendix B – Andrew Homewood, curriculum vitae

GREEN BEAN DESIGN

landscape architects

Areas of Expertise	Landscape and Visual Impact Assessment Landscape Design and Contract Documentation Independent Verification & Landscape Management
Education	University of Sheffield, Graduate Diploma Landscape Management, 1996 University of Sheffield, BSc (Dual Hons), Landscape Architecture & Archaeology, 1995 Writtle College, National Diploma Amenity Horticulture, 1989
Registration & Memberships	Registered Landscape Architect , Australian Institute Landscape Architects (AILA) Member Environmental Institute Australia and New Zealand (MEIANZ) Member of the Landscape Research Group (UK)

Selected Project Experience

Landscape and Visual Impact Assessment

Wind and Solar Farms

BP Moree Solar Power Station, Status: Approved

LVIA for the Solar Flagship Moree Solar Farm site in northern New South Wales.

Boco Rock Wind Farm EA, (Wind Prospect CWP Pty Ltd) Status: Approved

LVIA for the proposed construction of up to 125 wind turbine generators in the NSW Southern Tablelands Monaro sub region, including coordination for supply of photomontage, ZVI and flicker assessment.

Sapphire Wind Farm EA (Wind Prospect CWP Pty Ltd) Status: Approved

LVIA for the proposed construction of up to 174 wind turbine generators in the NSW New England region, including coordination for supply of photomontage, ZVI and flicker assessment.

Silverton Wind Farm EA Stages 1 & 2 (Epuron Pty Ltd) Status: Approved

LVIA for a 1000MW wind farm at Silverton in the Unincorporated Area of western NSW, for up to 600 wind turbines including a 25km length of 220kV transmission line between the wind farm and Broken Hill.

Conroy's Gap Wind Farm (Epuron Pty Ltd) Status: Approved

LVIA for a DA modification for additional wind turbines to an approved development located in the southern highlands NSW.

Bango Wind Farm (Wind Prospect CWP Pty Ltd)

LVIA for the proposed construction of up to 100 wind turbines located in the southern highlands NSW.

Liverpool Range Wind Farm Stage 1 (Epuron Pty Ltd)

LVIA for the proposed construction of up to 200 wind turbines located in the Warrumbungle and Upper Hunter Shire Councils approximately 370 km north of Sydney, and a 60 km length of 330 kV line connecting to the Ulan mine site.

Rye Park Wind Farm, (Epuron Pty Ltd)

LVIA for the proposed construction of up to 120 wind turbines adjoining multiple wind farm sites in the New South Wales southern highlands.

Deepwater Wind Farm (Epuron Pty Ltd)

LVIA for the proposed construction of up to 7 wind turbines at Deepwater in north NSW.

Port Kembla Wind Farm (Epuron Pty Ltd)

LVIA for the proposed construction of up to 7 wind turbines within the Port Kembla industrial facility at Wollongong.

Eden Wind Farm, (Epuron Pty Ltd)

LVIA for the proposed construction of up to 7 wind turbines within the SEFE woodchip facility on the south coast of New South Wales.

Paling Yards Wind Farm EA, (Union Fenosa Pty Ltd)

LVIA for the proposed construction of up to 59 wind turbines including night lighting, cumulative impact assessment, detailed field assessment for shadow flicker and preparation of photomontages.

Collector Wind Farm EA, (APP/RATCH)

LVIA for the proposed construction of up to 68 wind turbines adjoining the operation Cullerin wind farm project including a detailed cumulative impact assessment.

Willatook Wind Farm EES Referral, (Wind Prospect WA Pty Ltd)

Preliminary LVIA for the proposed construction of up to 190 wind turbines within Moyne Shire Council (Victoria) including a detailed cumulative impact assessment, photomontage location selection and community consultation.

Birrema Wind Farm EA (Epuron Pty Ltd)

LVIA for the proposed construction of up to 75 wind turbines adjoining the proposed Yass Valley wind farm project development including a detailed cumulative impact assessment, photomontage location selection and community consultation.

White Rock Wind Farm EA, (Epuron Pty Ltd)

LVIA for the proposed construction of up to 100 wind turbines adjoining the proposed Sapphire and approved Glen Innes wind farm projects including a detailed cumulative impact assessment, photomontage location selection and community consultation.

Crookwell 3 Wind Farm EA, (Union Fenosa Wind Australia)

LVIA for the proposed construction of up to 35 wind turbines adjoining the approved Crookwell 2 wind farm development including a detailed cumulative impact and night time lighting assessment.

Electrical Infrastructure

22kV transmission line (Country Energy)

LVIA for a short section of electrical distribution line through central New South Wales.

Wagga North 132kV substation (TransGrid)

LVIA for a proposed 132/66kV substation and installation of transmission line connections at Wagga Wagga New South Wales.

Lismore to Dumaresq 330kV transmission line (TransGrid)

LVIA for a proposed 330kV transmission line through northern New South Wales.

Manildra to Parkes 132kV transmission line (TransGrid)

LVIA for a proposed 132kV transmission line through central New South Wales.

Mount Macquarie Communication Tower (TransGrid)

LVIA and preparation of visual simulations for proposed 80m high microwave communication tower in rural New South Wales, adjacent to the Blayney Wind Farm.

Broken Hill to Red Cliffs 220kV transmission line duplication (Epuron Pty Ltd)

LVIA for approximately 300km of 220kV transmission line duplication for the Silverton Wind Farm Concept Approval application.

Molong to Manildra 132kV transmission line (TransGrid)

View catchment mapping and visual assessment for a 28 km section of 132kV transmission line through rural landscape in central western New South Wales.

GREEN BEAN DESIGN

landscape architects

Power Generation

Dalton Gas fired Power Plant (AGL Energy)

LVIA for gas turbine peaking power station, valve station and communication tower in rural NSW. Preparation of photomontage and 3D modelling.

Herons Creek Peaking Power Station (International Power)

LVIA for 120MW distillate-fired peaking power station in rural landscape setting. Visual assessment included preparation of visual simulations to model each of the three 40MW generating units in the existing landscape.

Parkes Peaking Power Station (International Power)

LVIA for 120MW distillate-fired peaking power station in central New South Wales, including provision of photomontages.

Buronga Peaking Power Station (International Power)

LVIA for 120MW distillate-fired peaking power station in far west New South Wales.

Leafs Gully Peaking Power Plant (AGL Energy Pty Ltd)

LVIA and landscape master plan for gas turbine peaking power station in south-west Sydney.

Bio Energy Project (SEFE)

LVIA for a 5MW bio fuel power plant located on the south of Two Fold Bay, Eden.

Professional History

Green Bean Design, Principal Landscape Architect 2006 -
URS Australia Pty Ltd, Practice Leader Landscape Architecture 2005 - 2006
URS Australia Pty Ltd, Associate Landscape Architect 2003-2005
URS Australia Pty Ltd, Senior Landscape Architect, 2002 - 2003
URS Australia Pty Ltd, Landscape Planner, 2001-2002
URS, Contract Landscape Architect, 2000-2001
Blacktown City Council, Contract Landscape Planner, 2000-2001
Knox & Partners Pty Ltd, Landscape Architect, 1996-2000
Brown & Associates, Landscape Architect, 1996
Philip Parker & Associates, Graduate Landscape Architect, 1994-1995
Rendel & Branch, Landscape Assistant, 1989-1991
National Trust, Horticulturalist, 1987-1988
English Nature, Species Protection Warden, 1985-1986
Essex Wildlife Trust, Botanist, 1984-1985
Royal Society for the Protection of Birds, Voluntary Warden, 1983-1984