UNION FENOSA
WIND AUSTRALIA

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PALING YARDS WIND FARM

CHAPTER 9

LANDSCAPE & VISUAL IMPACTS

9 Landscape and Visual Impacts

9.1 Introduction

Green Bean Design was engaged by UWFA to assess the potential landscape and visual impacts of the project. The full landscape and visual impact assessment (LVIA) can be found at **Appendix 6**. The LVIA was updated by Green Bean Design to respond to the adequacy review comments provided by DoPI on 9 May 2013.

The LVIA involved a comprehensive evaluation of the landscape character in which the project and ancillary structures would be located, and an assessment of the potential landscape and visual impacts that could result from the construction and operation of the wind farm, and explores mitigation measures to reduce any negative impacts.

The proponent is considering a number of alternative wind turbine models and therefore the LVIA has adopted a theoretical wind turbine 'tip' height of up to 175 metres and a rotor height of up to136 metres in order to assess the 'worst case scenario' with the longest blade currently available to this market. Therefore the LVIA should be considered conservative in nature. 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 LVIA considered the *Draft NSW Wind Farm Guidelines* (Draft Guidelines), which sets out a comprehensive framework for the assessment of landscape and visual impacts including residential dwellings within a 2km distance of any proposed wind turbines. It is important to note that there are no non-project involved, identified residential dwellings within 2km of the proposed wind turbines.

9.2 Methodology

The LVIA methodology included the following activities:

- Desktop study addressing visual character and identification of view locations within the surrounding area;
- Desktop study for the identification of any population centres within 10km of the site boundary;
- Fieldwork and photography;
- Preparation of ZVI diagrams;
- Assessment and determination of landscape sensitivity;
- Assessment and determination of visual impact;
- Preparation of photomontages and illustrative figures; and
- Preparation of a shadow flicker and blade glint assessment (refer to **Chapter 17**).

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.

The fieldwork involved:

- two days of general site inspections to determine the potential extent of visibility of the project and ancillary structures, and to identify landscape characteristics surrounding the wind farm site, and along the proposed transmission line corridors;
- one day detailed site inspection to determine associated residential dwelling window locations and orientations for a detailed shadow flicker assessment;

- one day of site photography for the photomontages locations;
- Confirmation of the various view location categories and locations from which the project structures could potentially be visible; and
- Preparation of a record for each view location inspected and assessed.

The criteria used to determine the significance of the visual impact of the project on surrounding view locations is detailed in Chapter 8.1 of the LVIA and includes:

- The category of the viewer (static or dynamic)
- The number of viewers
- The view distance
- Number of turbines visible
- Period of view

The LVIA identifies that the significance of visual impact resulting from the wind farm development would result primarily from a combination of:

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

The level of sensitivity of the receptors has been determined by assessing:

- The location and context of the viewpoint
- The occupation of activity of the receptor
- The overall number of people affected

The scale or magnitude of the visual effects has been determined by assessing:

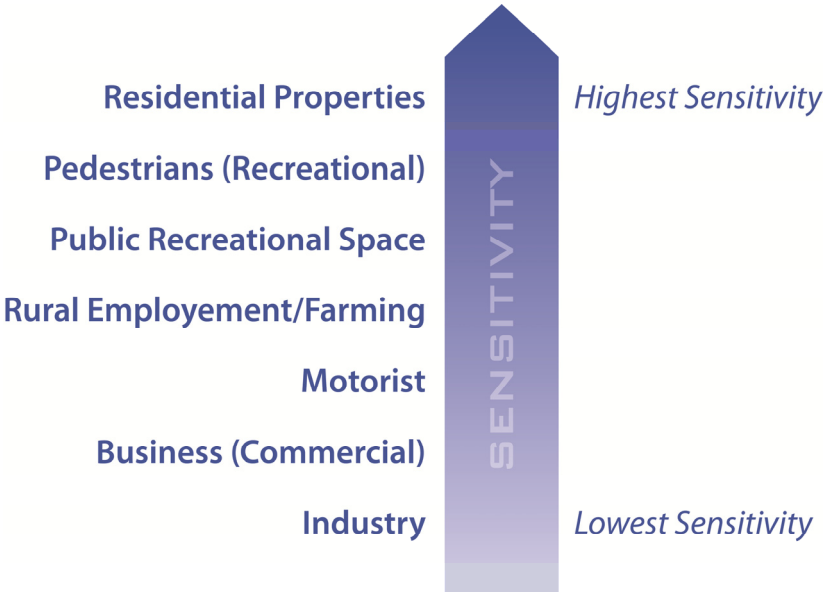
- The distance between the view location and the turbines
- The duration of the effect
- The extent of the area over which the wind farm could be theoretically visible (ZVI hub height)
- The degree of visibility subject to existing landscape elements (such as forested areas or tree cover)

In terms of the number of viewers that make a view location sensitive, the level of sensitivity is determine based on the following criteria:

- 'High number of viewers': >400 people per day
- 'Medium to High number of viewers': 100-399 people per day
- 'Medium number of viewers': 50-99 people per day
- 'Low number of viewers': 10-25 people per day
- 'Very low number of viewers': <10 people per day

In terms of the sensitivity of the view location, the level of sensitivity is represented in the figure below.

Figure 28 View Location Based on Sensitivity



Source: Information derived from Table 13 (Page 50) in the LVIA at Appendix 6

The table below outlines the 'sensitivity and magnitude assessment criteria' used to determine the visual impact at each view location.

Table 12 Sensitivity and Magnitude Assessment Criteria

Criteria	Definition
Distance	
Very Short	<1km
Short	1-3km
Medium	3-5km
Long	5-10km+
Duration of effect	
High	>2 hours
Medium	30-120 minutes
Low	10-30 minutes
Very Low	<10 minutes
Extent of visibility	
High	81-122 wind turbines visible
Medium	41-80 wind turbines visible
Low	21-40 wind turbines visible
Very Low	1-20 wind turbines visible

The table below outlines the criteria used to assess the 'high', 'medium', 'low' and 'very low' sensitivity of the visual receptor (the view locations), in order to determine the scale or magnitude of change in view due to the proposed development.

Table 13 Visual significance

			Scale or magnitude of change 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	*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*	High	Medium to High	Medium	Low to Medium
	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

It is important to note that a conservative approach was adopted during the field assessments where there was no opportunity to confirm the exact extent of view at the view location. At the majority of view locations, the assessment was undertaken from

the closest publically accessible location. Therefore, it is considered that some of the actual visibility impacts would be less than the impacts stated in the LVIA.

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

On behalf of UFWA, Garrad Hassan Pacific Pty Ltd (Garrad Hassan) prepared Zone of Visual Influence (ZVI) Diagrams to illustrate the potential visibility of the wind turbines within the project 10km viewshed. ZVI Diagrams included visibility from tip of blade and hub height.

In addition, Green Bean Design and Garrad Hassan prepared eight photomontages to illustrate the potential visibility of the wind farm from/within the vicinity of residential dwellings as well as publically accessible areas. The photomontages include views (between 800 metres and 4.6km) toward the proposed turbines and the proposed northern 500 kV transmission line.

The photomontage locations are summarised in the table below.

Table 14 Photomontage descriptions

Photomontage location	Location name and view matrix reference (R)	Status
PM1 Levels Road	N/A	Unsealed road corridor (minor local road)
PM2 Rock Orchard (south of residential dwelling)	R128	Non-project involved residential dwelling
PM3 Abercrombie Road	N/A	Abercrombie Road
PM4 Hilltop residence (south of dwelling from driveway)	R6A	Non-project involved residential dwelling
PM5 Jerrong Road	N/A	Jerrong Road
PM6 Mount Hutton private land	N/A	Hilltop on project involved property View north to south along Abercrombie Road
PM7 Abercrombie Rd	N/A	Abercrombie Road View toward 500kV transmission line
PM8 Hilltop residence (south of dwelling from driveway)	N/A	Non-project involved residential dwelling View toward 500kV transmission line

9.3 Wind Farms and Landscape Values National Assessment Framework (2007)

The LVIA has been prepared in accordance with the Australian Wind Energy Association and Australian Council of National Trust's publication *Wind Farms and Landscape Values National Assessment Framework* (2007) (NAF).

The LVIA methodology followed the majority of techniques and has tested and determined outcomes for the principal issues that have been raised in the NAF.

9.4 Draft NSW Wind Farm Guidelines (December 2011)

The Draft Guidelines set out key considerations for the upfront assessment of landscape and visual impact for residential dwellings within a 2 km radius of proposed wind turbines and specific assessment requirements that may be set out in the NSW DoPI DGRs on a project by project basis. Refer to Table 2 in **Appendix 6** for the Landscape and Visual Amenities checklist for addressing the Draft Guidelines.

The Draft Guidelines set out a comprehensive framework for the assessment of landscape and visual impacts including residential dwellings within a 2 km distance of any proposed wind turbines.

It is important to note that there are no non-project involved, identified residential dwellings within 2km of the proposed wind turbines; nonetheless, an assessment in relation to likely impacts on landscape values that may apply to the site, and photomontages showing specifically how the turbines will appear from residences and public viewing places have been prepared as part of this LVIA in accordance with the Draft Guidelines.

9.5 Local environmental factors

9.5.1 Climate

The climate of the New South Wales South Eastern Highlands Bioregion is characterised by a temperate climate of warm summers and no dry season, with elevated areas in the north and south of the bioregion experiencing milder summer conditions in montane climate zones.

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

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

Rainfall would tend to reduce the level of visibility from a number of view locations surrounding the project with the degree of visibility tending to decrease over distance. 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. 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.

9.5.2 Topography and drainage

The topography of the landscape within the New South Wales South Eastern Highlands Bioregion covers a broad area of the dissected ranges and plateaus of the

Great Dividing Range. The project would be located on portions of plateau remnants above steep sided valleys cut by drainage lines, including the Abercrombie River.

The elevation of the wind farm site falls gently from the north-east toward the south-west, and falling more steeply south toward the Abercrombie River valley. A number of ephemeral drainage lines occur across the site, draining to broader valleys north-west and south-east of the site, as well as south toward the Abercrombie River valley.

9.5.3 Vegetation

In general, the landscape within the 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.

9.6 Population Centres

The Australian Bureau of Statistics 2011 Census identifies two 'state suburbs' within the vicinity of the site, which are:

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

The site is located within and near the southern boundary of Porters Retreat. Wombeyan Caves is located immediately south and south-east of the site. These 'suburbs' are linked by Abercrombie Road, which bisects the site.

The LVIA identified a total of 78 residential dwellings within a 10 km viewshed which make up approximately 22% of the combined private dwellings within Porters Retreat and Wombeyan Caves. There are no townships or villages within the 10km viewshed. The closest township to the site is Taralga, which has a population of approximately 285, and is located approximately 25km to the south of the site.

9.7 Results

9.7.1 Landscape Character Areas and Sensitivity Assessment

This LVIA has identified five Landscape Character Areas (LCAs), which occur within the project 10 km viewshed. The five LCAs represent *"areas that are relatively consistent and recognisable in terms of their key visual elements and physical attributes"* which include *"topography/landform, vegetation/land cover, land use and built structures"*.

The five LCAs have been identified through a desk top assessment and described during the landscape assessment fieldwork carried out for the LVIA. The five LCAs are illustrated in Figure 16 of **Appendix 6**. The LCAs should not be considered as discrete areas, and characteristics within one LCA may occur within adjoining or surrounding LCAs. For the purpose of this LVIA the five LCA are:

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

An overview and description of each LCA is presented in Section 7.1 'Landscape and character areas' at **Appendix 6**.

The criteria used to determine the sensitivity of each of the LCAs to the project was based on the following landscape and visual characteristics:

- Landform and scale: patterns, complexity and consistency.
- Landcover: patterns, complexity and consistency.
- Settlement and human influence.
- Movement.
- Rarity.
- Intervisibility with adjacent landscapes.

The criteria is further detailed in Chapter 7.2 'Landscape sensitivity assessment' of the LVIA at **Appendix 6** and was used to evaluate the sensitivity of each of the LCAs using a gradated score between 1 and 5 to represent levels of sensitivity from low to high. The sensitivity grades include high, medium to high, medium, low to medium and low landscape sensitivity.

The assessment found that the LCAs have the following landscape sensitivity to accommodate change:

- LCA 1 (gently undulating pastoral farmland): Medium.
- LCA 2 (steep sided valleys): Medium to High.
- LCA 3 (drainage lines): Medium to High.
- LCA 4 (forested hills and ridgelines): Medium to High.
- LCA 5 (rural dwellings): Medium.

Therefore, the LVIA determined that the landscape surrounding the project has an overall 'medium to high sensitivity' to accommodate change, and that the LCAs within the 10 km viewshed represent a landscape characteristics that are reasonably typical that in the New South Wales Central Tablelands and the NSW/ACT Border Region Renewable Energy Precinct.

The report noted that large portions of the NSW/ACT Border Region Renewable Energy Precinct landscape have been heavily modified by agricultural improvement post-European settlement.

Green Bean Design notes that some recognisable characteristics of the landscape will be altered by the project and that visually prominent elements will alter some perceived landscape characteristics. However, the main characteristics of the landscape, patterns and combinations of landform and land cover will still be evident.

9.7.2 Visual Impact Assessment

During the desktop assessment the LVIA identified a total of 85 potential residential dwelling locations within the 10km viewshed. However, seven of those potential residential structures were determined to be non-residential structures or could not be located during the field assessment and therefore a total of 78 residential dwellings were included and assessed in the LVIA. Refer to **Figure 29 – Residential locations**.

The LVIA assessed the potential visual impact of the Paling Yards Wind Farm for 78 identified residential view locations within the 10 km viewshed, as well as impacts for motorists travelling along roads surrounding the wind farm. The visibility of the wind farm within the 10km radius is illustrated on the ZVI diagrams (refer to **Figures 30** and **31**), and also represented on eight photomontages (**Figures 32** – **39**).

The ZVI diagrams demonstrate the influence of topography on the visibility of the wind farm, and identify areas from where the wind farm would and would not be visible.

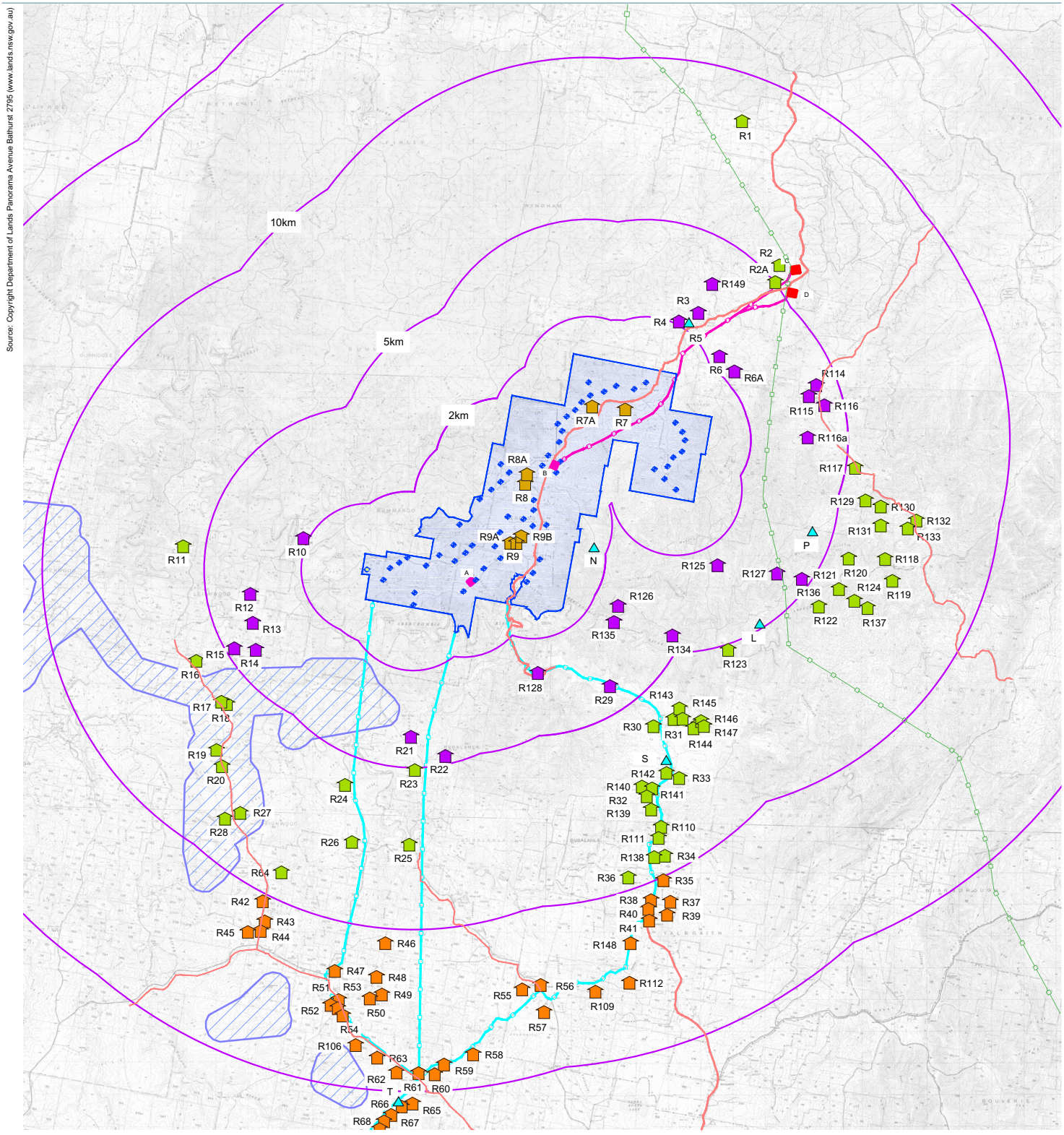
The ZVI diagrams illustrate that views toward the site from the Abercrombie River National Park (to the north and west of the wind farm site) are significantly influenced by topography. Views from the larger proportion of the National Park are physically screened by rising landform. Views may extend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

As outlined in the Methodology summary in **Chapter 9.2** of this report, the potential significance of visual impacts resulting from the wind farm includes a combination of the following factors:

- *"The extent to which the proposed wind farm structures would be visible from surrounding areas;*
- *The degree of visual contrast between the wind farm structures and the capability of the surrounding landscape to visually accommodate the wind farm;*
- *The category and type of situation from which people could view the wind farm (such as residents or motorists);*
- *The distance effect between the view location and the wind farm turbines;*
- *The potential number of people with a view toward the wind farm from any one location;*
- *The duration of time people could view the wind farm from any static or dynamic view location; and*
- *The visual sensitivity of view locations surrounding the wind farm".*

Refer to **Chapter 9.2** of this report (Methodology) for further details on the criteria for assessing and determining visual impact, and refer to **Figure 40** for an example of how distance affects the visual impacts between the view location and the turbines.

The table below summarises the assessment of visual impact on residential view locations within the Paling Yards Wind Farm 10km viewshed.



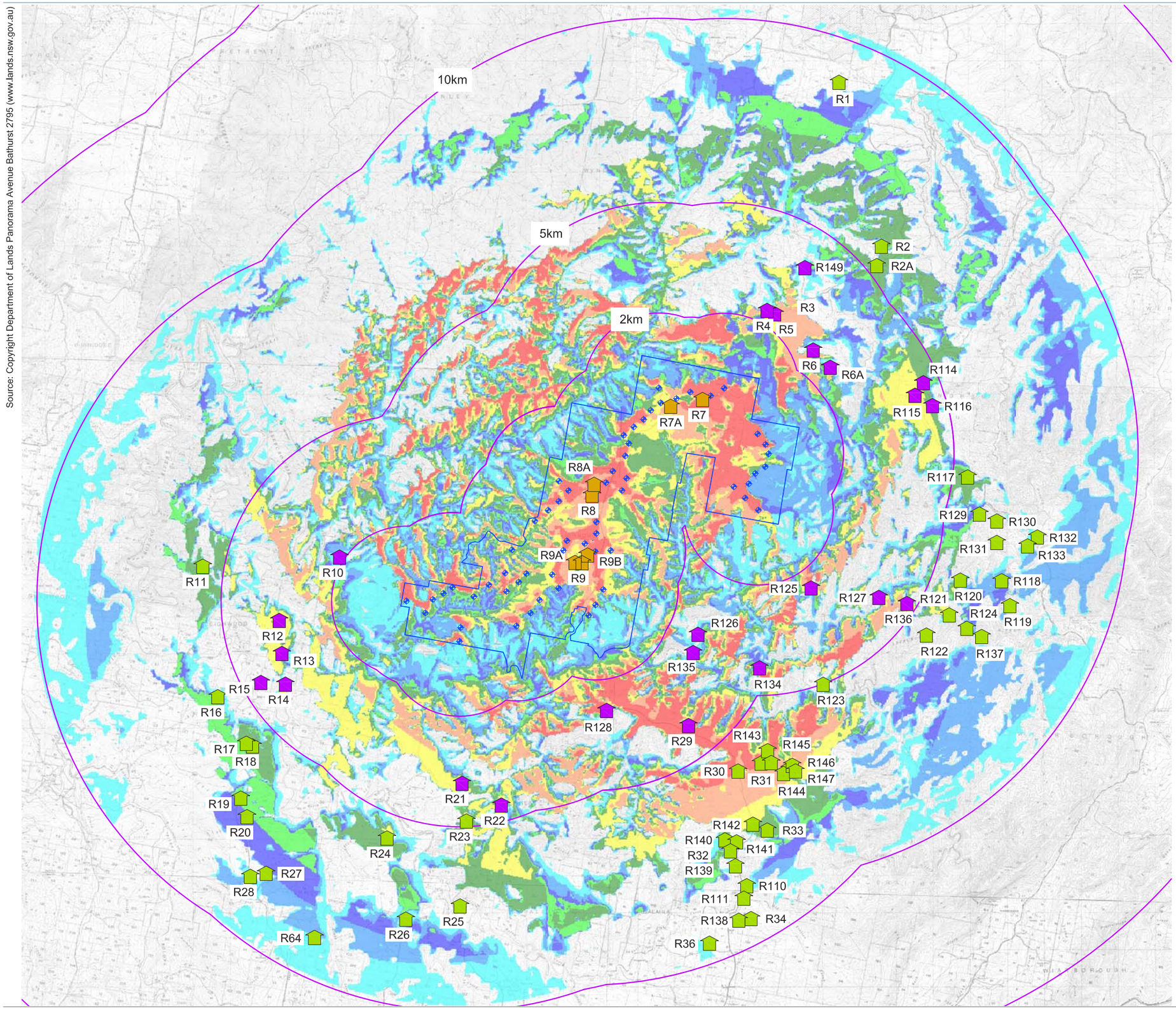
Legend

0km 2km

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

Figure 29 Residential Locations

Source: *Green Bean Design*



Legend

ZVI - Tips Visible

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

Associated residential dwelling

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

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

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

Proposed Paling Yards wind turbine indicative layout

Proposed Paling Yards Wind Farm site boundary

Distance from proposed wind turbine

0km 4km

Figure 30 ZVI Diagram 1 - Tip of Blade

Source: Green Bean Design

10km
5km
2km
R1
R2
R2A
R149
R3
R4
R5
R6
R6A
R114
R115
R116
R7A
R7
R8A
R8
R9A
R9B
R9
R10
R11
R12
R13
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R146
R147

Legend

ZVI - Hubs Visible

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

Associated residential dwelling

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

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

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

Proposed Paling Yards wind turbine indicative layout

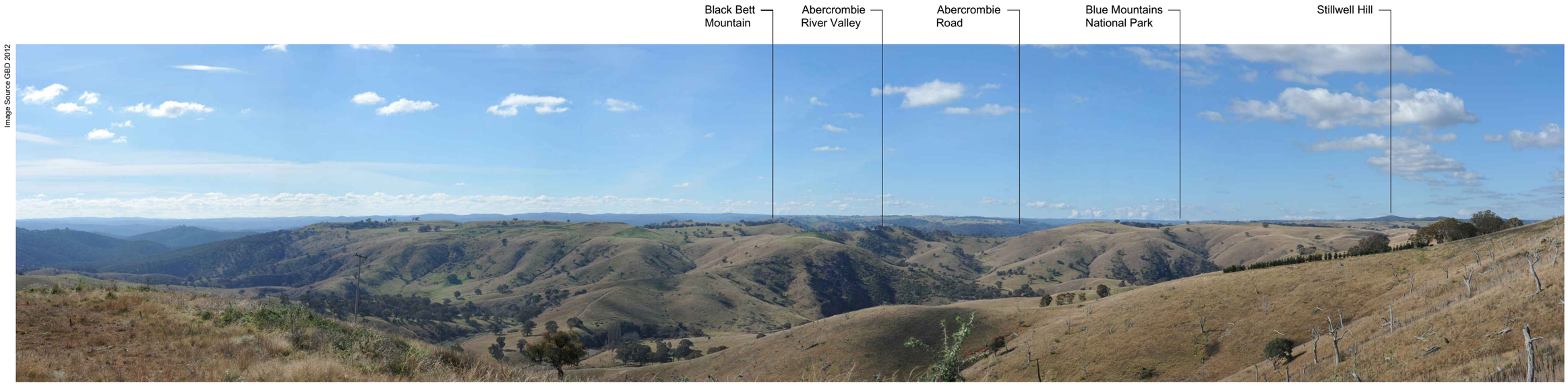
Proposed Paling Yards Wind Farm site boundary

Distance from proposed wind turbine

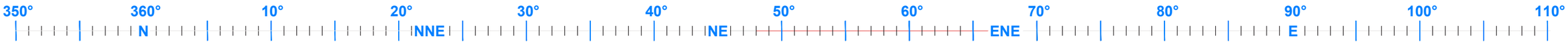
0km 4km

Figure 31 ZVI Diagram 2 - Hub Height

Source: *Green Bean Design*



Photomontage Location PM 1 Levels Road - Existing view, panorama north to east (Bearing 350° to 110°)



Photomontage Location PM 1 Proposed view, Levels Road, Extended panorama north to east (Bearing 350° to 110°)

Refer Figure 19 for Photomontage Location.

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

Photo coordinates: Easting 742978 Northing 6210924 (MGA 94z55H). Approximate distance to nearest visible turbine 6 km

Figure 32 Photomontage Location 1

Source: *Green Bean Design*

Image Source GBD 2012

Photomontage Location PM 2 Rock Orchard (residential dwelling) Existing view, extended panorama north west to east north east (Bearing 300° to 70°)

Image Source GBD 2012

Photomontage Location PM 2 Rock Orchard (residential dwelling) Proposed view, extended panorama north west to east north east (Bearing 300° to 70°)

Refer Figure 19 for Photomontage Location

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

Photo coordinates: Easting 753207 Northing 6211629 (MGA94z55H). Approximte distance to nearest visible turbine 2.6 km

Figure 33 Photomontage Location 2

Source: *Green Bean Design*

Abercrombie Road

Image Source GBD 2012

Photomontage Location PM 3 Abercrombie Road (south) Existing view, extended panorama south to west north west (Bearing 170° to 290°)

180° S 190° 200° SSW 210° 220° SW 230° 240° 250° WSW 260° 270° W 280° 290°

Image Source GBD 2012

Photomontage Location PM 3 Abercrombie Road (south) Proposed view, extended panorama south to west north west (Bearing 170° to 290°)

Refer Figure 19 for Photomontage Location

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

Photo coordinates: Easting 753068 Northing 6215581 (MGA94z55H). Approximate distance to nearest visible turbine 900 m

Figure 34 Photomontage Location 3

Source: *Green Bean Design*

Abercrombie Road

Image Source GBD 2012

Photomontage Location PM 4 Hilltop (non associated residential dwelling - driveway) Existing view, extended panorama south south east to west (Bearing 150° to 270°)

Image Source GBD 2012

Photomontage Location PM 4 Hilltop (non associated residential dwelling - driveway) Proposed view, extended panorama south south east to west (Bearing 150° to 270°)

Refer Figure 19 for Photomontage Location

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

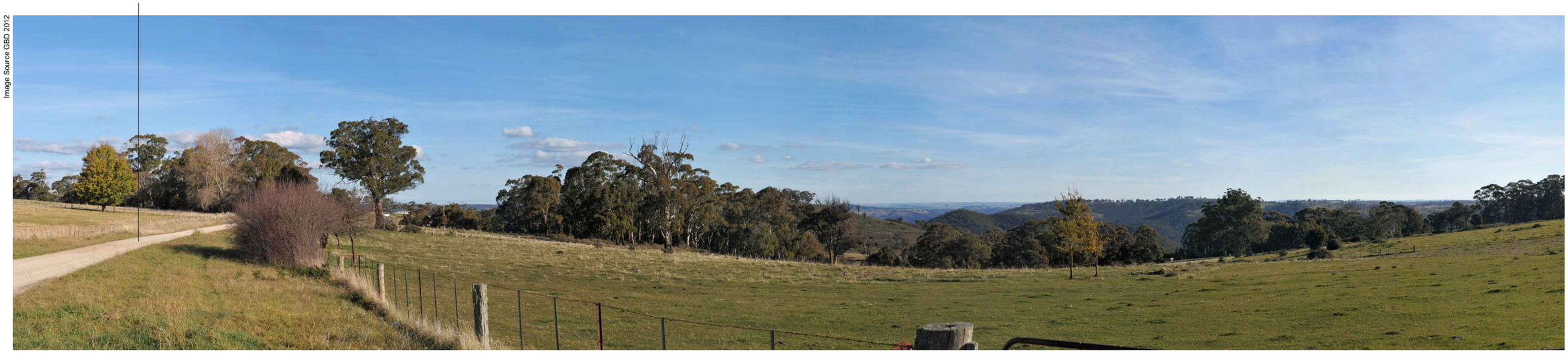
Photo coordinates: Easting 758731 Northing 6221170 (MGA94z55H) Approximate distance to nearest visible turbine 2.4km

Figure 35 Photomontage Location 4

Source: *Green Bean Design*

Jerrong Road

Image Source GBD 2012



Photomontage Location PM 5 Jerrong Road, Existing view, extended panorama south south east to west (Bearing 150° to 270°)

Image Source GBD 2012

Photomontage Location PM 5 Jerrong Road, Proposed view, extended panorama south south east to west (Bearing 150° to 270°)

Refer Figure 19 for Photomontage Location

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

Photo coordinates: Easting 761861 Northing 6219775 (MGA94z55H) Approximate distance to nearest visible turbine 4.6 km

Figure 36 Photomontage Location 5

Source: *Green Bean Design*

Photomontage Location PM 6 Hutton Hill Existing view, extended panorama south south west to north west (Bearing 195° to 320°)

Photomontage Location PM 6 Hutton Hill Proposed view, extended panorama south south west to north west (Bearing 195° to 320°)

Refer Figure 19 for Photomontage Location

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

Photo coordinates: Easting 755957 Northing 6220228 (MGA94z55H) Approximate distance to nearest visible turbine 800 m

Figure 37 Photomontage Location 6

Source: *Green Bean Design*

Photomontage Location PM 7 Abercrombie Road - Existing panorama view south east to south, south of Mingary Park (associated residential dwelling)

Photomontage Location PM 7 Abercombie Road - Proposed panorama view, south of Mingary Park (associated residential dwelling)

Figure 41
Photomontage PM 7

Typical view toward proposed 500 kV transmission line from Abercrombie Road

Refer Figure 19 for photomontage PM7 location. Wind turbines not shown.

Photomontage Location PM 8 Hilltop (non associated residential dwelling - driveway) Existing view, extended panorama south south east to west.

Photomontage Location PM 8 Hilltop (non associated residential dwelling - driveway) Proposed view, extended panorama south south east to west.

Figure 42
Photomontage Location PM 8

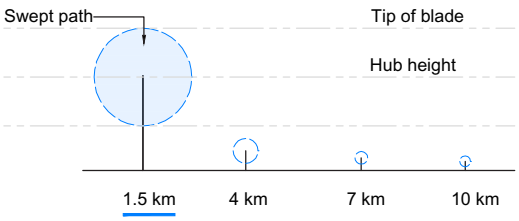
Typical view toward proposed wind turbines and assessed and proposed 500 kV transmission line from Hilltop non associated residential dwelling driveway.

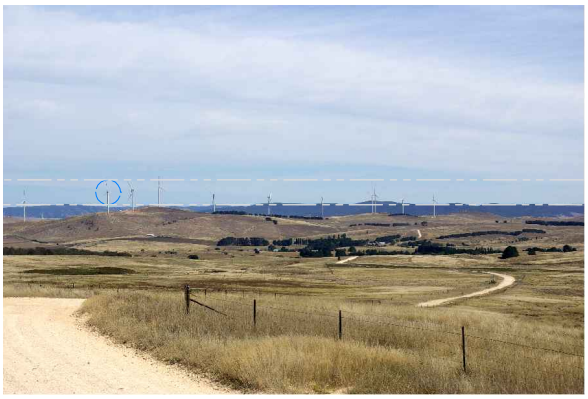
Refer Figure 19 for photomontage PM 8 location.

Figure 39 Photomontage Location 8

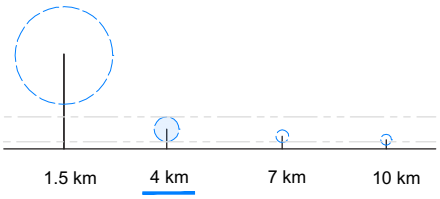
Source: *Green Bean Design*

Capital Wind Farm - View distance 1.5 km

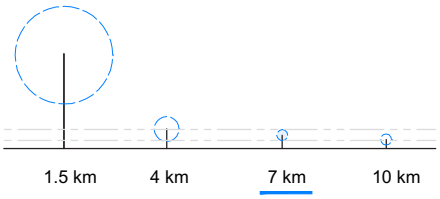




Capital Wind Farm - View distance 4 km



Capital Wind Farm - View distance 7 km



Capital Wind Farm - View distance 10 km

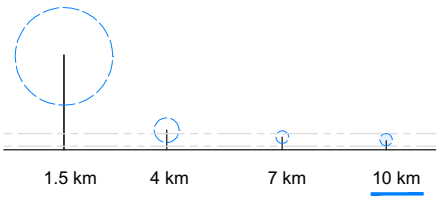


Figure 40 Visibility & Distance Example

Source: *Green Bean Design*

Table 15 Summary of visual impact ratings within the 10km viewshed

Visual impact rating within the 10km Paling Yards viewshed (Total from 78 residential dwellings)					
Nil	**Low**	**Low to Moderate**	**Moderate**	**Moderate to High**	**High**
37 (47%)	11 (14.5%)	19 (24%)	5 (6.5%)	6 (8%)	0 (0%)

An assessment of each potential residential view location indicated that:

- 37 of the 78 residential view locations would have a *Nil* visual impact;
- 11 of the 78 residential view locations would have a *Low* visual impact;
- 19 of the 78 residential view locations would have a *Low to Medium* visual impact;
- 5 of the 78 residential view locations would have a *Medium* visual impact; and
- 6 of the 78 residential view locations would have a *Medium to High* visual impact.

However, it is important to note that the six residential dwellings determined to have a *Medium to High* visual impact are project involved residences.

Therefore, the LVIA found that the majority of residential view locations within the Paling Yards Wind Farm 10km viewshed would experience a *Nil to Low* or *Low* visual impact.

The LVIA notes that existing residential dwellings in the vicinity of the site are located below surrounding ridgelines and/or include windbreak planting or tree planting around dwellings to provide shelter from prevailing winds, which assists in limiting the extent of available views across the surrounding landscape and to the proposed wind turbines.

Opportunities to view the Paling Yards wind turbines from publically accessible locations will be largely restricted to a small number of surrounding road corridors which are predominately limited to Abercrombie Road and the more distant Jerrong Road. The design layout will offer short distance and direct views from the road corridor toward wind turbines. The majority of turbines (41 out of the 55) would be located to the west of Abercrombie Road, which would reduce the potential for individual or groups of wind turbines interrupting or obstructing views from the road corridor over middle and long distant views. Furthermore, the duration of views towards the turbines along Abercrombie Road is reasonably short, with the average vehicular travel time being 6 to 10 minutes at 100km per hour; however, this duration would increase for those making return trips.

Any significant views toward the turbines from vehicle-based camp sites and water-based recreational activity areas within the surrounding national parks will be predominantly screened by a combination of topography and dense tree cover.

The potential transmission line corridors were assessed, and it was determined that the northern 500kV transmission line option would result in an overall *Low to Moderate* visual impact, while the southern 330kV transmission line options would result in an overall *Moderate* visual impact, with potential for high impact in certain locations. The southern transmission line options are no longer proposed and the northern

transmission line option has been identified as preferred. Accordingly approval is now being sought for the northern 500 kV transmission line corridor option only.

9.7.3 Proposed transmission line route visual impacts

The LVIA found that the proposed 500 kV transmission line to the north of the site (refer to **Chapter 5.8** for details) would not be significantly visible from any surrounding project involved or non-project involved residential dwellings within or beyond the site due to a combination of topography and scattered tree cover.

Some sections of the transmission line would be visible to motorists travelling along Abercrombie Road. However, there would be partial screening provided by roadside scattered tree cover.

The LVIA confirmed that the proposed transmission line route would result in a lesser degree of visual impact than the formerly considered and assessed 300 kV transmission line corridors to the south due to:

- *a shorter distance of constructed and visible transmission line;*
- *a significantly lower number of surrounding residential dwellings located within the vicinity of the transmission line; and*
- *a reduced requirement for vegetation clearing to establish a transmission line easement.*

The northern transmission line has been selected for this reason as the preferred and proposed option. The photomontages presented at **Figures 38 and 39** provide an indication of the visual impact that would occur.

9.7.4 National Parks and State Forests

There are a number of National Parks and State Forests in the vicinity of the project. The significant parks and forests include the Abercrombie National Park, the Blue Mountains National Park and the Gurnang State Forest. The national parks in the vicinity of the project are shown on **Figure 41**.

The Abercrombie National Park adjoins the western section of the site boundary. Covering an area of just over 19,000 hectares, the park includes walking tracks to take in low open forests, creeks and pools. Vehicle based camping facilities are provided at four locations within the park. The main section of the park is approximately 15,000 hectares and is located mainly on the north side of the Abercrombie River and to the north and west of the site. Approximately 4,000 hectares is located to the west of the main section of the park and greater than 10 km from the site. A smaller third section of around 200 hectares is located to the south of the main section.

The project is approximately 5 km from the southern portion of the Blue Mountains National Park, which is also part of the Greater Blue Mountain World Heritage Area. This park comprises approximately 267,000 hectares. The irregular boundary of the park is broken up by areas of urban development, road networks and broader landholdings.

The Gurnang State Forest is approximately 5km north-east of the project. There are no formal recreational or camping areas within the Gurnang State Forest.

Views toward the majority of the Paling Yard wind farm turbines from recreational areas (for example, camp sites, trails and amenities) within the surrounding National Parks, will be screened by a combination of topography (undulating and complex landforms following drainage lines) and dense tree cover crossing hillsides and ridgelines.

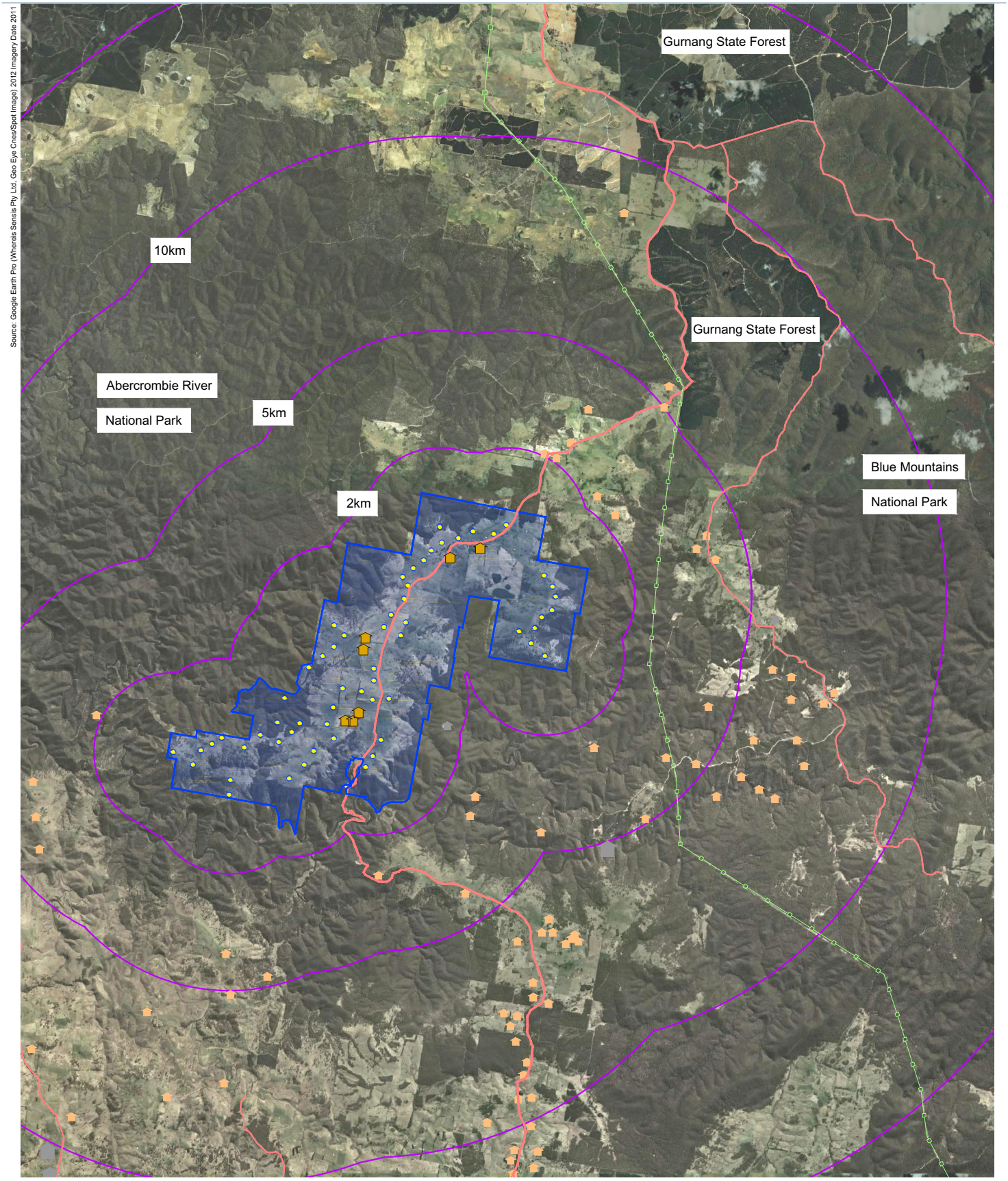


Figure 2 National Parks & State Forests

Figure 41 National Parks In The Vicinity Of The Project

Source: *Green Bean Design*

Through the influence of distance, land cover and topography, the project is unlikely to be visible from designated camping or recreational areas within any of the regional National Parks or State Forests. Therefore the project is not anticipated to have an unreasonable landscape or visual impact on the surrounding National Parks and State Forests

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

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

The locations of vehicle based camping sites are illustrated on Figure 2 of **Appendix 6**. Whilst there are no formal walking tracks within the park, bushwalking is permitted throughout the park. The most popular walking routes are along the Abercrombie River and its tributaries.

Any significant views toward the site from the vehicle based camp sites, as well as water based recreational activity areas will be predominantly screened by a combination of topography and dense tree cover.

Whilst subject to a very high annual visitation by tourists and sightseers, the project would not be visible from any of the key towns and associated attractions along the Great Western Highway.

9.7.5 Cumulative Impact Assessment

It is acknowledged that a cumulative landscape and visual impact may result from a wind farm being constructed in conjunction with other wind farm developments (existing and proposed) in the same area.

A cumulative visual impact assessment was undertaken by Green Bean Design which included the approved Taralga and proposed Golspie Wind Farms to the south and south-west of the project. None of the approved Taralga Wind Farm turbines are located within the Paling Yards Wind Farm 10 km viewshed. A small portion of the proposed Golspie Wind Farm project area is located within the Paling Yards 10 km viewshed; however the locations of wind turbines proposed as part of the Golspie project are not yet known.

The LVIA determined that there would be limited intervisibility between the project and other approved wind farm developments and that any potential cumulative impact is likely to be 'low'.

9.7.6 Night time lighting

Green Bean Design determined that obstacle lighting may be necessary, subject to a risk assessment to be prepared once the final turbine layout and height are known. The LVIA notes that obstacle lighting has been removed from the Cullerin Wind Farm adjoining the Hume Highway to the west of Yass in New South Wales as well as wind farms in Victoria.

Refer to **Chapter 13 – Aeronautical Impacts** for further details.

9.7.7 Pre-construction and construction

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.

Green Bean Design notes that the majority of pre-construction and construction activities are temporary in nature and are restricted to various discrete areas within or beyond the immediate wind farm project area. Therefore, it is unlikely to result in an unacceptable level of visual impact considering their duration and temporary nature.

9.7.8 Future residential dwellings

The LVIA notes that any future planning for residential dwellings would be able to respond to the layout design for the wind farm project and determine the optimal location for the dwellings on individual properties to minimise views towards wind turbines if desired. The design of future dwellings may also take advantage of topographic features in order to minimise views, or implement the mitigation measures listed in **Chapter 9.8** of this report.

Future dwellings that are constructed on land immediately adjacent to the site are likely to experience a visual impact and should implement in advance the mitigation measures listed in **Chapter 9.8** if desired.

9.8 Mitigation

The mitigation measures outlined in the LVIA are intended to reduce the potential visual impacts 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 towards the wind turbines from specific view locations.*

One of the options available for mitigation of visual impacts to residences is planting vegetation close to the view locations (between the viewing location and the source of intrusion). Similarly, roadside tree planting can screen potential views of turbines from particular sections of road provided the turbine is not located some distance from the road.

The location and design of screen planting used as a mitigation measure is very site specific and requires detailed analysis of potential views and arrangements to be made between an affected land holder and the proponent following the grant of project approval.

The LVIA provides a number of measures to mitigate potential visual impacts of the project. A summary of the mitigation measures available for the wind farm and transmission line infrastructure is presented in the tables below.

Table 16 Visual impact mitigation measures

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 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 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 in consultation and agreement with landholders.	✓	✓	✓	

Table 17 Substation and transmission line mitigation measures

Safeguard	Implementation			
	Design	Site Preparation	Construction	Operation
A careful and considered 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 transmission line.	✓		✓	

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

Feasibility, effectiveness and reliability testing of the proposed visual mitigation measures will be undertaken after the measures have been implemented for the project, in order to assess and identify any residual impacts.