

Photomontages

Section 11

11.1 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 twenty three photomontages have been prepared to illustrate views from neighbouring and uninvolved residential dwellings within 2km of the proposed Bango wind farm turbines, as well as public view locations from surrounding road corridors.

Photomontages PM 1 to PM 10 illustrate the proposed wind turbines from public view locations (such as road corridors). The public photomontage locations have been selected to represent a range of views including outlooks from Boorowa and Rye Park. Photomontages from public road corridors include the Lachlan Valley Way, Wargeila Road and local unsealed access roads within the project area.

Photomontages PM 11 to PM 23 illustrate views toward the proposed wind turbines from uninvolved residential dwellings and a derelict structure as well as neighbouring residential dwellings and weekender structures located within 2 km of a proposed wind turbine location. The photomontages locations are illustrated in **Figure 33** and presented in **Figures 34 to 79**.

11.2 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 public photomontages was undertaken by GBD using a tripod mounted Nikon D700 digital single-lens reflex (SLR) cameras. A 50 mm focal length prime lens was attached to the Nikon D700 camera.

The Nikon D700 has a full frame image sensor (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. Photography for the neighbouring and uninvolved residential dwelling locations was undertaken by the Proponent using a tripod mounted Canon EOS400D digital SLR camera with a 30mm 1:14DC HMS lens.

Following site photography each of the Bango 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 ReSoft 'WindFarm' software package;
- the layout of the wind farm and 3D representation of the wind turbine was configured in WindFarm;
- the location of each viewpoint (photo location) was configured in WindFarm – 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 WindFarm. 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 WindFarm and the visible turbines superimposed on the photographs;
- the photomontage were adjusted using GIMP 2.6 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.

Table 22 identifies the twenty three photomontage locations, property names (where relevant), corresponding reference number identified in the residential view matrix (**Table 18**) as well as the status of each photomontage location.

Table 22 – Photomontage details

Photomontage Location	Figure Reference	Status:
PM 1	Figures 34 & 35	Lachlan Valley Way – sealed road
PM 2	Figures 36 & 37	Wargeila Road – unsealed road
PM 3	Figures 38 & 39	Moorbys Lane – unsealed road
PM 4	Figures 40 & 41	Wargeila Road – unsealed road
PM 5	Figures 42 & 43	Cooks Road – Rye Park

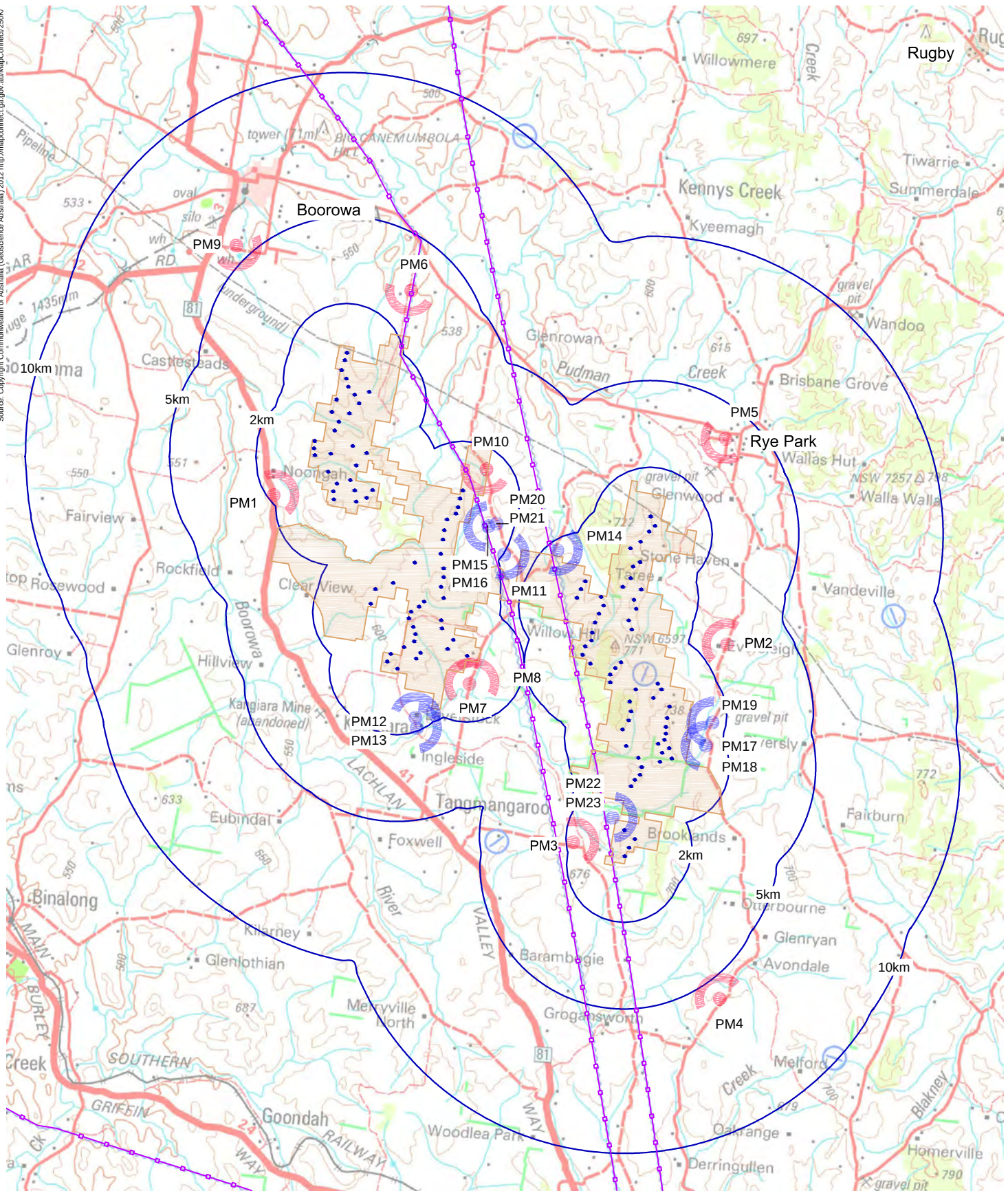
Table 22 – Photomontage details

Photomontage Location	Figure Reference	Status:
PM 6	Figures 44 & 45	Hopfield Lane – unsealed road
PM 7	Figures 46 & 47	Tangmangaroo Road – unsealed road
PM 8	Figures 48 & 49	Tangmangaroo Road - unsealed road
PM 9	Figure 50 & 51	Meads Lane – sealed road
PM10	Figure 52 & 53	Harry's Creek Road – unsealed road
PM11	Figures 54 & 55	Uninvolved residential dwelling 185 Klondyke
PM 12	Figures 56 & 57	Uninvolved residential dwelling 076 Laverstock
PM 13	Figures 58 & 59	Uninvolved residential dwelling 235 Laverstock
PM 14	Figures 60 & 61	Neighbour residential dwelling 158 Undurba Park
PM 15	Figures 62 & 63	Neighbour residential dwelling 101 Valrosa
PM 16	Figures 64 & 65	Neighbour residential dwelling 101 Valrosa
PM 17	Figures 66 & 67	Neighbour residential dwelling 115 Banksia Downs
PM 18	Figures 68 & 69	Neighbour residential dwelling 115 Banksia Downs
PM 19	Figures 70 & 71	Neighbour residential dwelling 136 Bobby's Hill
PM 20	Figures 72 & 73	Neighbour residential dwelling 155 Reeve Nikia/Rocky Springs
PM 21	Figures 74 & 75	Neighbour residential dwelling 155 Reeve Nikia/Rocky Springs
PM 22	Figures 76 & 77	Neighbour residential dwelling 172 Brookdale
PM 23	Figures 78 & 79	Neighbour residential dwelling 172 Brookdale

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 Bango 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'*.



Legend

- Proposed Bango wind turbine (Layout Option 1)
- Bango wind farm project area
- Existing powerline route
- Distance from proposed Bango wind turbine
- Public photomontage location
- Uninvolved and neighbour residential dwelling photomontage location (within 2 km of wind turbine)

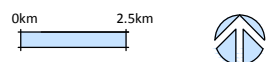


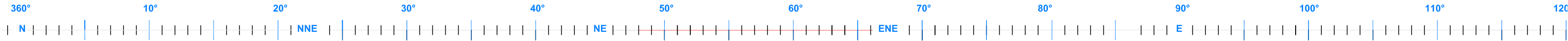
Figure 33
Photomontages
locations



Lachlan Valley Way



Photomontage Location PM 1 Lachlan Valley Way - Existing view, panorama north to east (Bearing 360° to 120°)



Photomontage Location PM 1 Proposed view, Lachlan Valley Way, Extended panorama north to east (Bearing 360° to 120°)

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Refer Figure 33 for Photomontage Location.

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

Photo coordinates: Easting 658868 Northing 6177164 (MGA 94z55H).
Approximate distance to nearest visible turbine 2 km

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Image Source GBD 2013



Photomontage Location PM 1 - Single frame photo detail, proposed view

Image Source GBD 2013



Photomontage Location PM 1, Lachlan Valley Way - Proposed view

Indicative extent of single frame photo
(refer detail below)

Figure 35
Photomontage PM 1 Sheet 2

Refer Figure 33 for Photomontage
Location

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

Photo coordinates:
Easting 658868
Northing 6177164 (MGA 94z55H)

Approximate distance to nearest visible
turbine 2 km

Image Source GBD 2013



Photomontage Location PM 2 Wargeila Road - Existing view, panorama south west to north west (Bearing 200° to 330°)



Image Source GBD 2013



Photomontage Location PM 2 Proposed view, Wargeila Road, Extended panorama south west to north west (Bearing 200° to 330°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

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

Photo coordinates: Easting 674761 Northing 6172273 (MGA 94z55H).
Approximate distance to nearest visible turbine 3.3 km

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Image Source GBD 2013



Photomontage Location PM 2, Wargeila Road - Proposed view

Indicative extent of single frame photo
(refer detail below)

Figure 37
Photomontage PM 2 Sheet 2

Refer Figure 33 for Photomontage Location

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

Photo coordinates:
Easting 674761
Northing 6172273 (MGA 94z55H)

Approximate distance to nearest visible turbine 3.3 km

Image Source GBD 2013



Photomontage Location PM 2 - Single frame photo detail, proposed view

Image Source GBD 2013



Photomontage Location PM 3 Moorbys Lane - Existing view, panorama north north west to east (Bearing 345° to 105°)



Image Source GBD 2013



Photomontage Location PM 3 Proposed view, Moorbys Lane, Extended panorama north north west to east (Bearing 345° to 105°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

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

Photo coordinates: Easting 669411 Northing 6165009 (MGA 94z55H).
Approximate distance to nearest visible turbine 1.8 km

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Image Source GBD 2013



Photomontage Location PM 3 - Single frame photo detail, proposed view

Image Source GBD 2013



Photomontage Location PM 3, Moorbys Lane - Proposed view

Indicative extent of single frame photo
(refer detail below)

Figure 39
Photomontage PM 3 Sheet 2

Refer Figure 33 for Photomontage
Location

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

Photo coordinates:
Easting 669411
Northing 6165009 (MGA 94z55H)

Approximate distance to nearest visible
turbine 1.8 km

Image Source GBD 2013



Photomontage Location PM 4 Wargeilla Road - Existing view, panorama west north west to north east (Bearing 295° to 50°)



Image Source GBD 2013



Photomontage Location PM 4 Proposed view, Wargeilla Road, Extended panorama west north west to north east (Bearing 295° to 50°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

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

Photo coordinates: Easting 674197 Northing 6159364 (MGA 94z55H).
Approximate distance to nearest visible turbine 6 km

Image Source GBD 2013



Photomontage Location PM 4, Wargeila Road - Proposed view

Indicative extent of single frame photo
(refer detail below)

Figure 41
Photomontage PM 4 Sheet 2

Refer Figure 33 for Photomontage
Location

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

Photo coordinates:
Easting 674197
Northing 6159364 (MGA 94z55H)

Approximate distance to nearest visible
turbine 6 km

Image Source GBD 2013



Photomontage Location PM 4 - Single frame photo detail, proposed view

Image Source GBD 2013



Photomontage Location PM 5 Cook Street Rye Park - Existing view, panorama south south west to north west (Bearing 195° to 310°)



Image Source GBD 2013



Photomontage Location PM 5 Proposed view, Cook Street Rye Park, Extended panorama south south west to north west (Bearing 195° to 310°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

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

Photo coordinates: Easting 674691 Northing 6178960 (MGA 94z55H).
Approximate distance to nearest visible turbine 3.7 km

Image Source GBD 2013



Indicative extent of single frame photo
(refer detail below)

Photomontage Location PM 5, Cook Street Rye Park - Proposed view

Figure 43
Photomontage PM 5 Sheet 2

Refer Figure 33 for Photomontage Location

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

Photo coordinates:
Easting 674691
Northing 6178960 (MGA 94z55H)

Approximate distance to nearest visible turbine 3.7 km

Image Source GBD 2013



Photomontage Location PM 5 - Single frame photo detail, proposed view

Image Source GBD 2013



Photomontage Location PM 6 Hopefield Lane - Existing view, panorama south east to west (Bearing 140° to 260°)



Image Source GBD 2013



Photomontage Location PM 6 Proposed view, Hopefield Lane, Extended panorama south east to west (Bearing 140° to 260°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

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

Photo coordinates: Easting 6663516 Northing 6183393 (MGA 94z55H).
Approximate distance to nearest visible turbine 3.1 km



Image Source GBD 2013



Photomontage Location PM 6, Hopefield Lane - Proposed view

Indicative extent of single frame photo
(refer detail below)

Figure 45
Photomontage PM 6 Sheet 2

Refer Figure 33 for Photomontage
Location

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

Photo coordinates:
Easting 663516
Northing 6183393 (MGA 94z55H)

Approximate distance to nearest visible
turbine 3.1 km

Image Source GBD 2013



Photomontage Location PM 6 - Single frame photo detail, proposed view

Image Source GBD 2013



Photomontage Location PM 7 Tangmangaroo Road - Existing view, panorama west to north east (Bearing 280° to 40°)

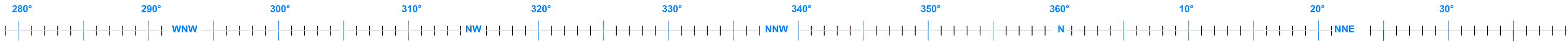


Image Source GBD 2013



Photomontage Location PM 7 Proposed view, Tangmangaroo Road, Extended panorama west to north east (Bearing 280° to 40°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

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

Photo coordinates: Easting 665502 Northing 6169307 (MGA 94z55H).
Approximate distance to nearest visible turbine 1.4 km



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Image Source GBD 2013



Photomontage Location PM 7, Tangmangaroo Road - Proposed view

Indicative extent of single frame photo
(refer detail below)

Figure 47
Photomontage PM 7 Sheet 2

Refer Figure 33 for Photomontage
Location

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

Photo coordinates:
Easting 665502
Northing 6169307 (MGA 94z55H)

Approximate distance to nearest visible
turbine 1.4 km

Image Source GBD 2013



Photomontage Location PM 7 - Single frame photo detail, proposed view

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Photomontage Location PM 8 Tangmangaroo Road - Existing view, panorama north north east to south east (Bearing 20° to 135°)



Image Source GBD 2013



Photomontage Location PM 8 Proposed view, Tangmangaroo Road, Extended panorama north north east to south east (Bearing 20° to 135°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

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

Photo coordinates: Easting 665502 Northing 6169307 (MGA 94z55H).
Approximate distance to nearest visible turbine 4 km



Image Source GBD 2013



Photomontage Location PM 8, Tangmangaroo Road - Proposed view

Indicative extent of single frame photo
(refer detail below)

Figure 49
Photomontage PM 8 Sheet 2

Refer Figure 33 for Photomontage
Location

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

Photo coordinates:
Easting 665502
Northing 6169307 (MGA 94z55H)

Approximate distance to nearest visible
turbine 4 km

Image Source GBD 2013



Photomontage Location PM 8 - Single frame photo detail, proposed view

Image Source GBD 2013



Photomontage Location PM 9 Meads Lane Boorowa- Existing view, panorama east north east to south south east (Bearing 60° to 170°)



Image Source GBD 2013



Photomontage Location PM 9 Proposed view, Meads Lane Boorowa, Extended panorama east north east to south south east (Bearing 60° to 170°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

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

Photo coordinates: Easting 657182 Northing 6185762 (MGA 94z55H).
Approximate distance to nearest visible turbine 5.2 km

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Image Source GBD 2013



Photomontage Location PM 9, Meads Lane - Proposed view

Indicative extent of single frame photo
(refer detail below)

Figure 51
Photomontage PM 9 Sheet 2

Refer Figure 33 for Photomontage
Location

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

Photo coordinates:
Easting 657182
Northing 6185762 (MGA 94z55H)

Approximate distance to nearest visible
turbine 5.3 km

Image Source GBD 2013



Photomontage Location PM 9 - Single frame photo detail, proposed view

Image Source GBD 2013



Photomontage Location PM 10 Harry's Creek Road - Existing view, panorama south to west north west (Bearing 180° to 300°)



Image Source GBD 2013



Photomontage Location PM 10 Proposed view, Harry's Creek Road, Extended panorama south to west north west (Bearing 180° to 300°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

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

Photo coordinates: Easting 666492 Northing 6177100 (MGA 94z55H).
Approximate distance to nearest visible turbine 1 km

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Image Source GBD 2013



Photomontage Location PM 10 - Single frame photo detail, proposed view

Image Source GBD 2013



Photomontage Location PM 10, Harry's Creek Road - Proposed view

Indicative extent of single frame photo
(refer detail below)

Figure 53
Photomontage PM 10 Sheet 2

Refer Figure 33 for Photomontage
Location

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

Photo coordinates:
Easting 666492
Northing 6177100 (MGA 94z55H)

Approximate distance to nearest visible
turbine 1 km

Image Source WPCWP 2013



Photomontage Location PM 11 Uninvolved residential dwelling 185 Klondyke - Existing view, panorama east to south south west (Bearing 80° to 215°)
Access to Klondyke property was not granted. Photo taken from edge of Tangmangaroo Road adjacent to property fenceline -derelict structure is located below road level off photo r.h.s



Image Source WPCWP 2013



Photomontage Location PM 11 Proposed view, Uninvolved residential dwelling 185 Klondyke, Extended panorama east to south south west (Bearing 80° to 215°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

Individual panorama photos taken with a Canon EOS400D digital SLR camera with 30 mm 1:14 DC HMS lens.

Photo coordinates: Easting 666492 Northing 6177100 (MGA 94z55H).
Approximate distance to nearest visible turbine 1.7 km

Image Source WPCWP 2013

Indicative extent of single frame photo
(refer detail below)



Photomontage Location PM 11, Uninvolved residential dwelling 185 Klondyke - Proposed view

Figure 55
Photomontage PM 11 Sheet 2

Refer Figure 33 for Photomontage
Location

Individual panorama photos taken with
a Canon EOS400D digital SLR camera
with 30 mm 1:14DC HMS lens.

Photo coordinates:
Easting 668766
Northing 6175478 (MGA 94z55H)

Approximate distance to nearest visible
turbine 1.7 km

Image Source WPCWP 2013



Photomontage Location PM 11 - Single frame photo detail, proposed view

Image Source WPCWP 2013



Photomontage Location PM 12 Uninvolved residential dwelling 076 Laverstock - Existing view, panorama north to south south east (Bearing 5° to 168°)



Image Source WPCWP 2013



Photomontage Location PM 12 Proposed view, Uninvolved residential dwelling 076 Laverstock, Extended panorama north to south south east (Bearing 5° to 168°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

Individual panorama photos taken with a Canon EOS400D digital SLR camera with 30 mm 1:14 DC HMS lens.

Photo coordinates: Easting 663894 Northing 6169298 (MGA 94z55H).
Approximate distance to nearest visible turbine 2.8 km

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Indicative extent of single frame photo
(refer detail below)

Image Source WPCWP 2013



Photomontage Location PM 12, Uninvolved residential dwelling 076 Laverstock - Proposed view

Figure 57
Photomontage PM 12 Sheet 2

Refer Figure 33 for Photomontage
Location

Individual panorama photos taken with
a Canon EOS400D digital SLR camera
with 30 mm 1:14DC HMS lens.

Photo coordinates:
Easting 663894
Northing 6169298 (MGA 94z55H)

Approximate distance to nearest visible
turbine 2.8 km

Image Source WPCWP 2013



Photomontage Location PM 12 - Single frame photo detail, proposed view

Image Source WPCWP 2013



Photomontage Location PM 13 Uninvolved residential dwelling 235 Laverstock Cottage - Existing view, panorama north west to south east (Bearing 304° to 114°)



Image Source WPCWP 2013



Photomontage Location PM 13 Proposed view, Uninvolved residential dwelling 235 Laverstock Cottage, Extended panorama north west to south east (Bearing 304° to 114°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

Individual panorama photos taken with a Canon EOS400D digital SLR camera with 30 mm 1:14 DC HMS lens.

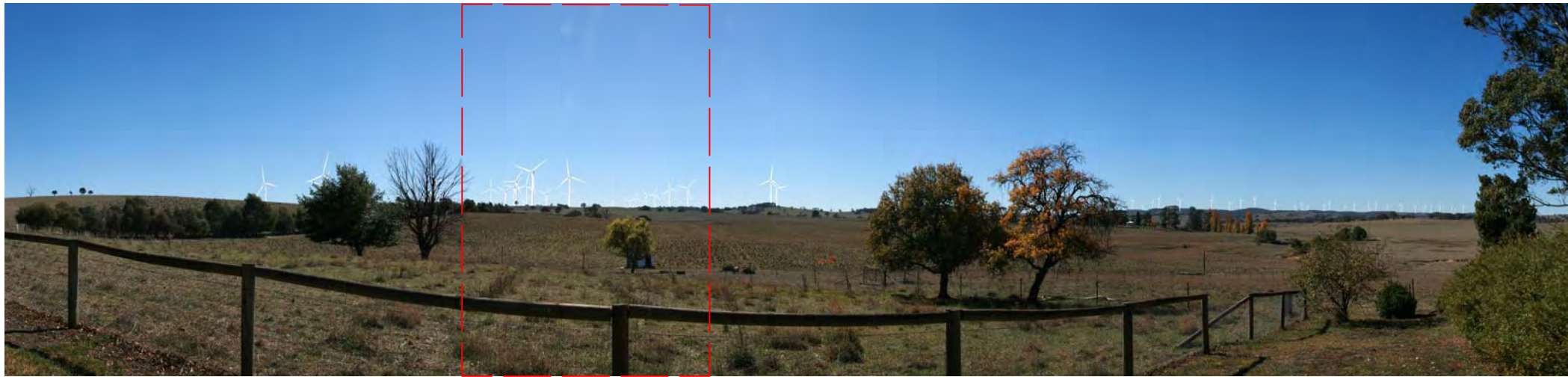
Photo coordinates: Easting 663849 Northing 6169495 (MGA 94z55H).
Approximate distance to nearest visible turbine 1.7 km

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Image Source WPCWP 2013

Indicative extent of single frame photo
(refer detail below)



Photomontage Location PM 13, Uninvolved residential dwelling 235 Laverstock Cottage - Proposed view

Figure 59
Photomontage PM 13 Sheet 2

Refer Figure 33 for Photomontage Location

Individual panorama photos taken with a Canon EOS400D digital SLR camera with 30 mm 1:14DC HMS lens.

Photo coordinates:
Easting 663849
Northing 6169495 (MGA 94z55H)

Approximate distance to nearest visible turbine 1.7 km

Image Source WPCWP 2013



Photomontage Location PM 13 - Single frame photo detail, proposed view

Image Source WPCWP 2013



Photomontage Location PM 14 Neighbour weekender 158 Undurba - Existing view, panorama west south west to north north west (Bearing 240° to 350°)



Image Source WPCWP 2013



Photomontage Location PM 14 Proposed view, Neighbour weekender 158 Undurba, Extended panorama west south west to north north west (Bearing 240° to 350°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

Individual panorama photos taken with a Canon EOS400D digital SLR camera with 30 mm 1:14 DC HMS lens.

Photo coordinates: Easting 666917 Northing 6175308 (MGA 94z55H).
Approximate distance to nearest visible turbine 2 km

Indicative extent of single frame photo
(refer detail below)



Photomontage Location PM 14, Neighbour weekender 158 Undurba - Proposed view

Figure 61
Photomontage PM 14 Sheet 2

Refer Figure 33 for Photomontage
Location

Individual panorama photos taken with
a Canon EOS400D digital SLR camera
with 30 mm 1:14DC HMS lens.

Photo coordinates:
Easting 666917
Northing 6175308 (MGA 94z55H)

Approximate distance to nearest visible
turbine 2 km



Photomontage Location PM 14 - Single frame photo detail, proposed view

Image Source WPCWP 2013



Photomontage Location PM 15 neighbour residential dwelling 101 Valrosa
Existing view, panorama south to west south west (Bearing 173° to 260°)



Image Source WPCWP 2013



Photomontage Location PM 15 Proposed view, neighbour residential dwelling 101 Valrosa,
Extended panorama south to west south west (Bearing 173° to 260°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

Individual panorama photos taken with a Canon EOS400D digital SLR camera with 30 mm 1:14 DC HMS lens.

Photo coordinates: Easting 666368 Northing 6176282 (MGA 94z55H).
Approximate distance to nearest visible turbine 1.13 km

Indicative extent of single frame photo
(refer detail below)



Photomontage Location PM 15, neighbour residential dwelling 101 Valrosa - Proposed view



Photomontage Location PM 15 - Single frame photo detail, proposed view

Figure 63
Photomontage PM 15 Sheet 2

Refer Figure 33 for Photomontage
Location

Individual panorama photos taken with
a Canon EOS400D digital SLR camera
with 30 mm 1:14DC HMS lens.

Photo coordinates:
Easting 666368
Northing 6176282 (MGA 94z55H)

Approximate distance to nearest visible
turbine 1.13 km

Image Source WPCWP 2013



Photomontage Location PM 16 neighbour residential dwelling 101 Valrosa
Existing view, panorama west south west to north north west (Bearing 250° to 340°)



Image Source WPCWP 2013



Photomontage Location PM 16 Proposed view, neighbour residential dwelling 101 Valrosa,
Extended panorama west south west to north north west (Bearing 250° to 340°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

Individual panorama photos taken with a Canon EOS400D digital SLR camera with 30 mm 1:14 DC HMS lens.

Photo coordinates: Easting 666368 Northing 6176282 (MGA 94z55H).
Approximate distance to nearest visible turbine 1.13 km

Indicative extent of single frame photo
(refer detail below)

Image Source WPCWP 2013



Photomontage Location PM 16, neighbour residential dwelling 101 Valrosa - Proposed view

Figure 65
Photomontage PM 16 Sheet 2

Refer Figure 33 for Photomontage
Location

Individual panorama photos taken with
a Canon EOS400D digital SLR camera
with 30 mm 1:14DC HMS lens.

Photo coordinates:
Easting 666368
Northing 6176282 (MGA 94z55H)

Approximate distance to nearest visible
turbine 1.13 km

Image Source WPCWP 2013



Photomontage Location PM 16 - Single frame photo detail, proposed view

Image Source WPCWP 2013



Photomontage Location PM 17 neighbour residential dwelling 115 Banksia Downs
Existing view, panorama south south west to west (Bearing 200° to 280°)



Image Source WPCWP 2013



Photomontage Location PM 17 Proposed view, neighbour residential dwelling 115 Banksia Downs,
Extended panorama south south west to west (Bearing 240° to 280°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

Individual panorama photos taken with a Canon EOS400D digital SLR camera with 30 mm 1:14 DC HMS lens.

Photo coordinates: Easting 673909 Northing 6168670 (MGA 94z55H).
Approximate distance to nearest visible turbine 1.32 km

Image Source WPCWP 2013

Indicative extent of single frame photo
(refer detail below)



Photomontage Location PM 17, neighbour residential dwelling 115 Banksia Downs - Proposed view

Figure 67
Photomontage PM 17 Sheet 2

Refer Figure 33 for Photomontage
Location

Individual panorama photos taken with
a Canon EOS400D digital SLR camera
with 30 mm 1:14DC HMS lens.

Photo coordinates:
Easting 673909
Northing 6168670 (MGA 94z55H)

Approximate distance to nearest visible
turbine 1.32 km

Image Source WPCWP 2013



Photomontage Location PM 17 - Single frame photo detail, proposed view

Image Source WPCWP 2013



Photomontage Location PM 18 neighbour residential dwelling 115 Banksia Downs
Existing view, panorama west to north (Bearing 275° to 360°)



Image Source WPCWP 2013



Photomontage Location PM 18 Proposed view, neighbour residential dwelling 115 Banksia Downs,
Extended panorama west to north (Bearing 275° to 360°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

Individual panorama photos taken with a Canon EOS400D digital SLR camera with 30 mm 1:14 DC HMS lens.

Photo coordinates: Easting 673909 Northing 6168670 (MGA 94z55H).
Approximate distance to nearest visible turbine 1.32 km

Indicative extent of single frame photo
(refer detail below)



Photomontage Location PM 18, neighbour residential dwelling 115 Banksia Downs - Proposed view

Figure 69
Photomontage PM 18 Sheet 2

Refer Figure 33 for Photomontage
Location

Individual panorama photos taken with
a Canon EOS400D digital SLR camera
with 30 mm 1:14DC HMS lens.

Photo coordinates:
Easting 673909
Northing 6168670 (MGA 94z55H)

Approximate distance to nearest visible
turbine 1.32 km



Photomontage Location PM 18 - Single frame photo detail, proposed view

Image Source WPCWP 2013



Photomontage Location PM 19 neighbour residential dwelling 136 Bobby's Hill
Existing view, panorama south west to west north west (Bearing 215° to 318°)



Image Source WPCWP 2013



Photomontage Location PM 19 Proposed view, neighbour residential dwelling 136 Bobby's Hill
Extended panorama south west to west north west (Bearing 215° to 318°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

Individual panorama photos taken with a Canon EOS400D digital SLR camera with 30 mm 1:14 DC HMS lens.

Photo coordinates: Easting 674135 Northing 6169484 (MGA 94z55H).
Approximate distance to nearest visible turbine 1.52 km

Indicative extent of single frame photo
(refer detail below)



Photomontage Location PM 19, neighbour residential dwelling 136 Bobby's Hill - Proposed view

Figure 71
Photomontage PM 19 Sheet 2

Refer Figure 33 for Photomontage
Location

Individual panorama photos taken with
a Canon EOS400D digital SLR camera
with 30 mm 1:14DC HMS lens.

Photo coordinates:
Easting 674135
Northing 6169484 (MGA 94z55H)

Approximate distance to nearest visible
turbine 1.52 km



Photomontage Location PM 19 - Single frame photo detail, proposed view

Image Source WPCWP 2013



Photomontage Location PM 20 neighbour residential dwelling 155 Reve Nikia/Rocky Springs
Existing view, panorama south to west (Bearing 180° to 285°)

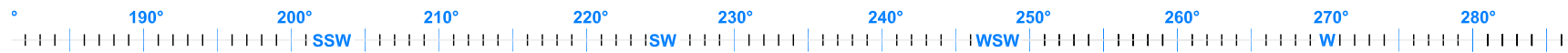


Image Source WPCWP 2013



Photomontage Location PM 20 Proposed view, neighbour residential dwelling 155 Reve Nikia/Rocky Springs
Extended panorama south to west (Bearing 180° to 285°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

Individual panorama photos taken with a Canon EOS400D digital SLR camera with 30 mm 1:14 DC HMS lens.

Photo coordinates: Easting 666663 Northing 6176379 (MGA 94z55H).
Approximate distance to nearest visible turbine 1.13 km

Image Source WPCWP 2013



Indicative extent of single frame photo
(refer detail below)

Photomontage Location PM 20, neighbour residential dwelling 155 Reve Nikia/Rocky Springs - Proposed view

Figure 73
Photomontage PM 20 Sheet 2

Refer Figure 33 for Photomontage
Location

Individual panorama photos taken with
a Canon EOS400D digital SLR camera
with 30 mm 1:14DC HMS lens.

Photo coordinates:
Easting 666663
Northing 61766379 (MGA 94z55H)

Approximate distance to nearest visible
turbine 1.13 km

Image Source WPCWP 2013



Photomontage Location PM 20 - Single frame photo detail, proposed view

Image Source WPCWP 2013



Photomontage Location PM 21 neighbour residential dwelling 155 Reve Nikia/Rocky Springs
Existing view, panorama south to west (Bearing 180° to 285°)



Image Source WPCWP 2013



Photomontage Location PM 21 Proposed view, neighbour residential dwelling 155 Reve Nikia/Rocky Springs
Extended panorama south to west (Bearing 180° to 285°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

Individual panorama photos taken with a Canon EOS400D digital SLR camera with 30 mm 1:14 DC HMS lens.

Photo coordinates: Easting 666663 Northing 6176379 (MGA 94z55H).
Approximate distance to nearest visible turbine 1.13 km

BANGO WIND FARM

Indicative extent of single frame photo
(refer detail below)



Photomontage Location PM 21, neighbour residential dwelling 155 Reve Nikia/Rocky Springs - Proposed view

Figure 75
Photomontage PM 21 Sheet 2

Refer Figure 33 for Photomontage
Location

Individual panorama photos taken with
a Canon EOS400D digital SLR camera
with 30 mm 1:14DC HMS lens.

Photo coordinates:
Easting 666663
Northing 61766379 (MGA 94z55H)

Approximate distance to nearest visible
turbine 1.13 km



Photomontage Location PM 21 - Single frame photo detail, proposed view

Image Source WPCWP 2013



Photomontage Location PM 22 neighbour weekender 172 Brookdale
Existing view, panorama north west to east north east (Bearing 301° to 67°)

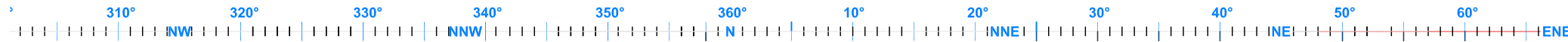


Image Source WPCWP 2013



Photomontage Location PM 22 Proposed view, neighbour weekender 172 Brookdale
Extended panorama north west to east north east (Bearing 301° to 67°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

Individual panorama photos taken with a Canon EOS400D digital SLR camera with 30 mm 1:14 DC HMS lens.

Photo coordinates: Easting 670661 Northing 6166182 (MGA 94z55H).
Approximate distance to nearest visible turbine 851 km

Image Source WPCWP 2013



Indicative extent of single frame photo
(refer detail below)

Photomontage Location PM 22, neighbour weekender 172 Brookvale - Proposed view

Figure 77
Photomontage PM 22 Sheet 2

Refer Figure 33 for Photomontage
Location

Individual panorama photos taken with
a Canon EOS400D digital SLR camera
with 30 mm 1:14DC HMS lens.

Photo coordinates:
Easting 670661
Northing 6166182 (MGA 94z55H)

Approximate distance to nearest visible
turbine 851 m

Image Source WPCWP 2013



Photomontage Location PM 22 - Single frame photo detail, proposed view

Image Source WPCWP 2013



Photomontage Location PM 23 neighbour weekender 172 Brookdale
Existing view, panorama east south east to south south west (Bearing 115° to 200°)



Image Source WPCWP 2013



Photomontage Location PM 23 Proposed view, neighbour weekender 172 Brookdale
Extended panorama east south east to south south west (Bearing 115° to 200°)

BANGO WIND FARM

Refer Figure 33 for Photomontage Location.

Individual panorama photos taken with a Canon EOS400D digital SLR camera with 30 mm 1:14 DC HMS lens.

Photo coordinates: Easting 670661 Northing 6166182 (MGA 94z55H).
Approximate distance to nearest visible turbine 851 km

BANGO WIND FARM

Indicative extent of single frame photo
(refer detail below)



Photomontage Location PM 23, neighbour residential dwelling 172 Brookvale - Proposed view

Figure 79
Photomontage PM 23 Sheet 2

Refer Figure 33 for Photomontage
Location

Individual panorama photos taken with
a Canon EOS400D digital SLR camera
with 30 mm 1:14DC HMS lens.

Photo coordinates:
Easting 670661
Northing 6166182 (MGA 94z55H)

Approximate distance to nearest visible
turbine 851 m



Photomontage Location PM 23 - Single frame photo detail, proposed view

Night time lighting

Section 12

12.1 Introduction

Although not currently proposed, the Bango 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 effects 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 effect 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 80, 81 and 82**. 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.

12.2 Existing light sources

A small number of existing night time light sources occur within the Bango 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.

12.3 Potential light sources

The main potential light sources associated with the Bango 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 effect 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.

12.4 Potential view locations and effect

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 Bango 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.

TURBINE
WITH LIGHT

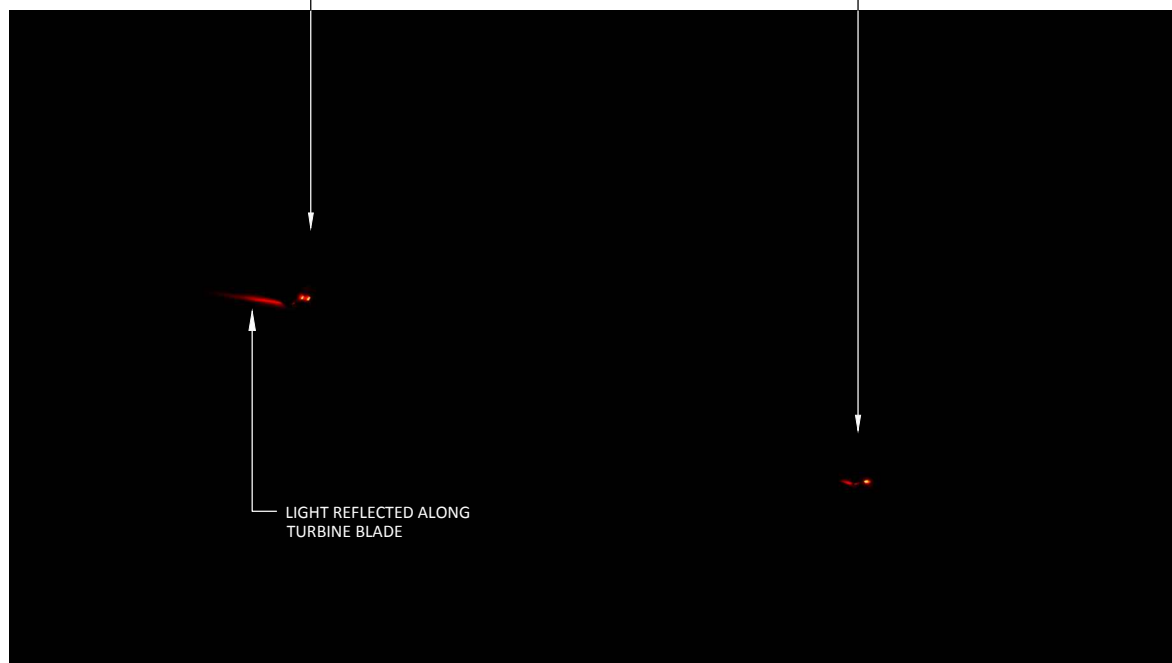
TURBINE
WITH LIGHT



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

TURBINE
LIGHT

TURBINE
LIGHT



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

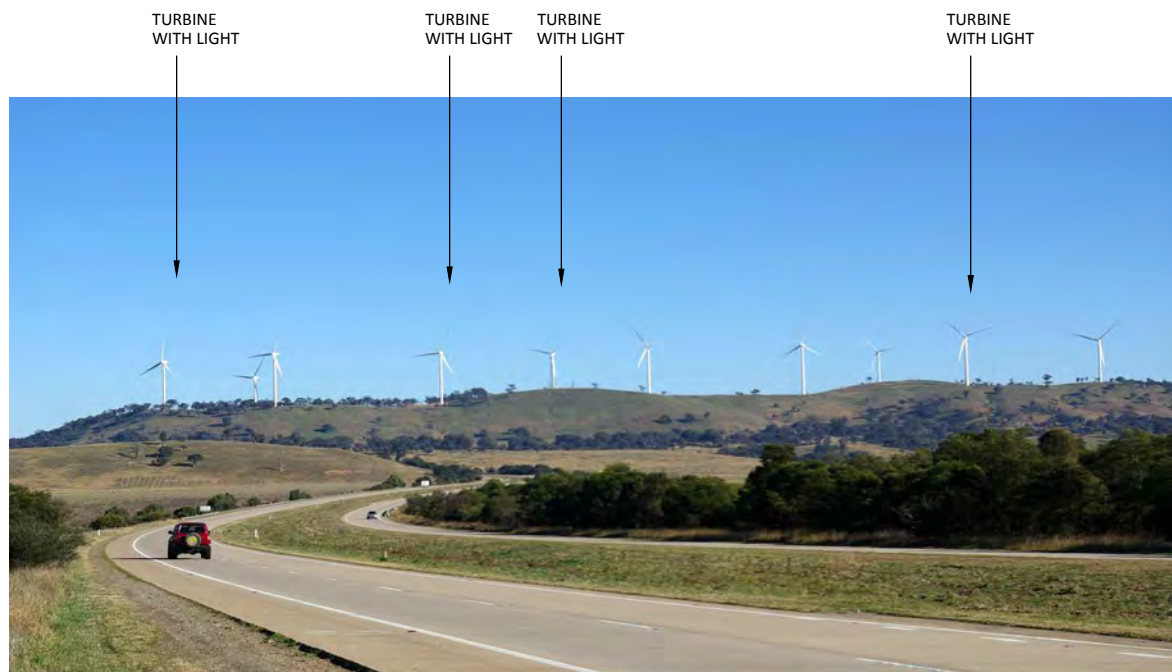
Cullerin wind farm night time lighting. View approximately 500 m west from Hume Highway

Figure 80
Night lighting Cullerin
wind farm at 500m

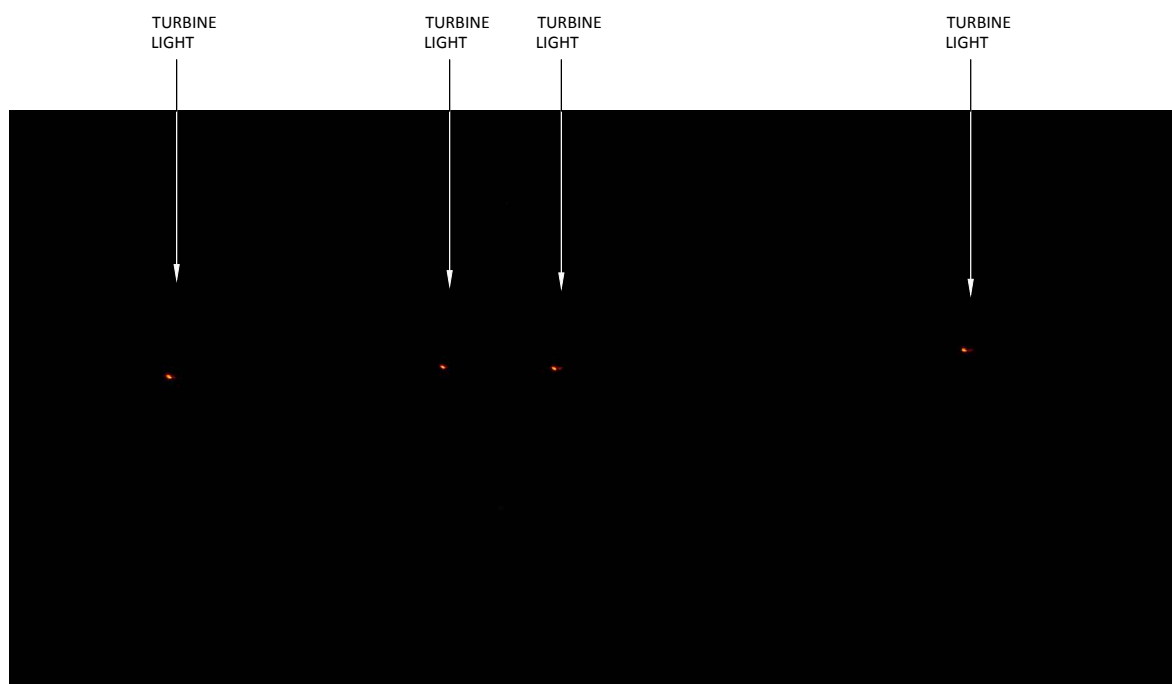


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GREEN BEAN DESIGN
landscape architects



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

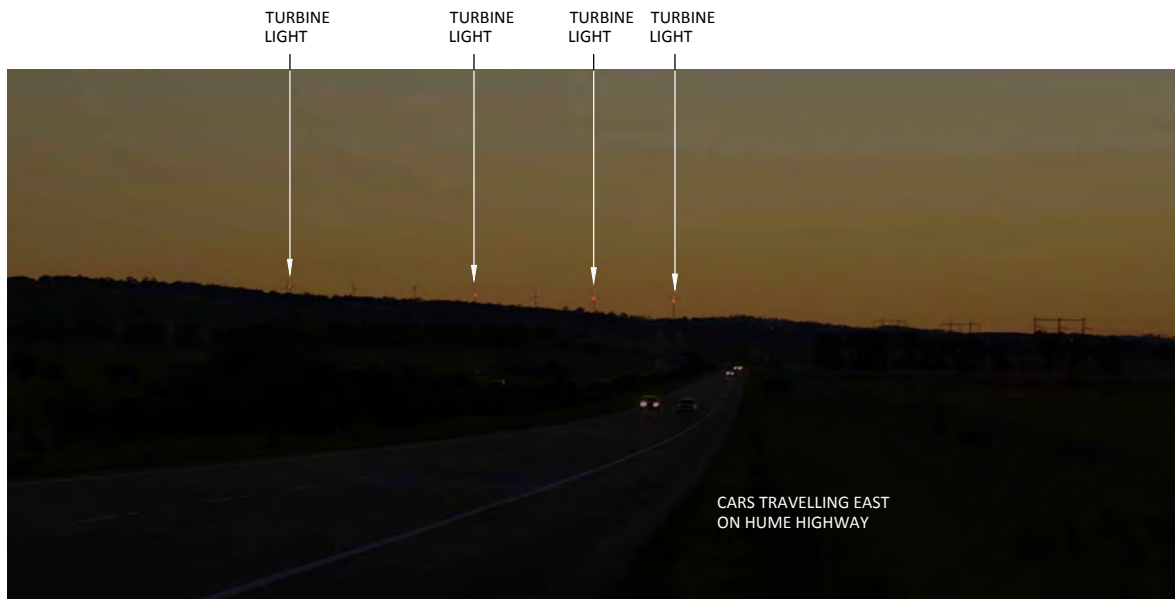
Cullerin wind farm night time lighting . View approximately 3.5 km west from Hume highway.

Figure 81
Night lighting Cullerin
wind farm at 3.5km

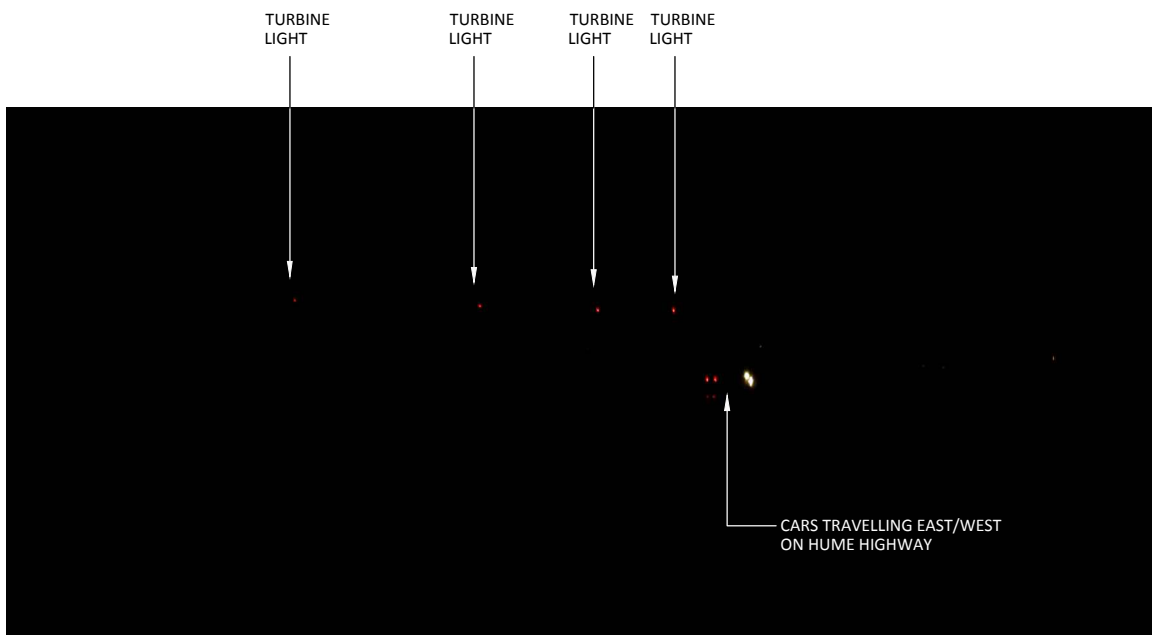


BANGO WIND FARM

GREEN BEAN DESIGN
landscape architects



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 82
Night lighting Cullerin
wind farm at 17km



Electrical works

Section 13

13.1 Introduction

The Bango 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:

- a collector substation comprising cable marshalling, switchgear, high voltage transformers and associated protection and communication assets;
- a switching station comprising switching and protection devices, busbars, circuit breakers, isolators and communications assets
- generator transformers;
- overhead powerlines (up to 132 kV) and
- underground powerlines (up to 132 kV) and control cables within and between each of the wind turbines and clusters connecting to the collector substation and switching station.

The general arrangement for the proposed electrical works is illustrated in **Figure 83**.

A typical design for a wind farm collector 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 double circuit supporting structure and angle poles is presented in **Plate 8** and **Figure 84**. 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 9** illustrates a generator transformer located below and adjacent to a wind turbine tower.



Plate 7 – Typical wind farm collector substation



Plate 8 – Typical illustration of a 132 kV double circuit powerline



Plate 9 – Generator transformer

13.2 Collector substation and switching station

The Bango wind farm project has identified three potential locations for a collector substation and switching station. Subject to detail design and engineering requirements, only one of the locations will be selected for construction. The potential collector substation and switching station locations are illustrated in **Figure 83**. The key visual components of the wind farm collector substation and switching station would include elements such as:

- 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
- low intensity lighting for security and maintenance and
- security fencing including a palisade fence and internal chainmesh fence.

The three potential collector substation and switching station locations would not be significantly visible from areas beyond the immediate project area, and would be largely screened by landform and scattered trees 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 effect from surrounding view locations.

13.3 Overhead 132 kV powerline structure

Electricity generated by the Bango wind farm would be connected to the grid via an overhead double circuit 132 kV powerline extending approximately east to west for around 9 km through the central portion of the site. The 132 kV powerline route illustrated in **Figure 83** includes 4 distinct sections extending east and west of the optional substation locations and connecting the Langs Creek and Kangiara clusters.

The key visual components of the 132 kV powerline would comprise:

- single tapered steel poles up to 35 m high
- aluminium alloy 132 kV conductors and
- an aerial earth wire and communications link.

Photographs of typical 132 kV double circuit transmission lines are illustrated in **Figure 84**.

13.4 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 132 kV powerline route is illustrated in **Figure 83**.

13.5 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 to high 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.

The overall moderate to high 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 effects to occur where views toward the existing powerline included views toward proposed electrical infrastructure elements.

13.6 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 effect 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 on 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 23** presents the view location matrix for electrical infrastructure. Involved and uninvolved residential dwelling locations within 2 km of the electrical infrastructure are illustrated in **Figure 83**.

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

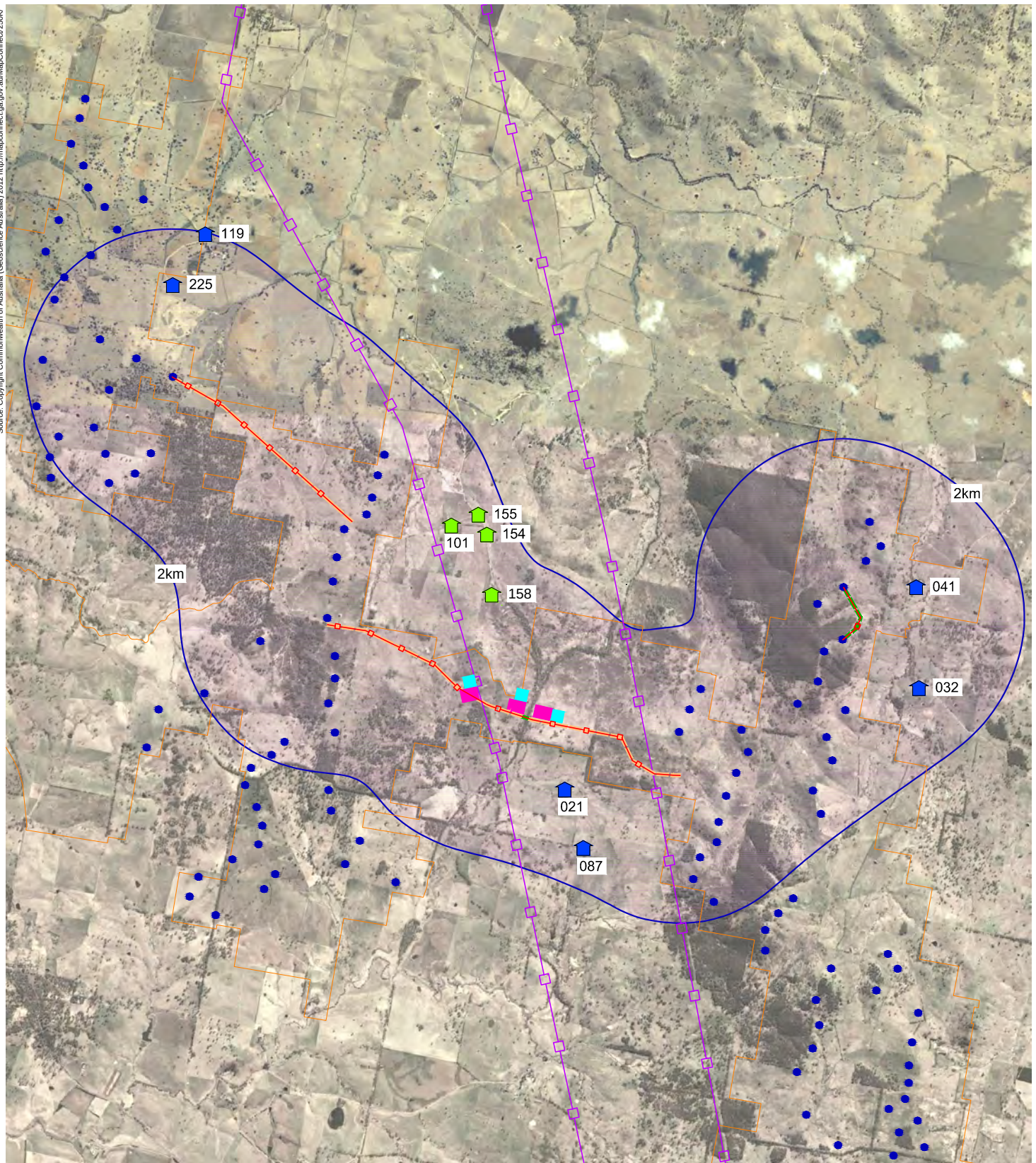
The potential visual significance of the proposed powerline is expressed as a rating of High, Medium, Low or Nil. For the purposes of this LVIA visibility ratings have been defined as:

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.



Legend

- Bango wind farm project area
- Electrical infrastructure study area
- Proposed Bango wind turbine (Layout Option 1)
- (Approximate 2 km offset from proposed 132 kV powerline
- Proposed powerline (up to 132 kV)
- Existing 132 kV overhead powerline
- Proposed collector substation (3 optional locations)
- Proposed switching station (3 optional locations)
- Involved dwelling within 2 km of proposed powerline and wind turbine
- Neighbour dwelling within 2 km of proposed powerline

Visual Absorption Capability (VAC)

- High —■—
- Medium —○—

0 km 1 km



Figure 83
Electrical works



13.7 Visual significance matrix (electrical infrastructure)

Table 23 – Visual significance matrix (Refer **Figure 83** for potential dwelling locations)

View location (Refer to Figure 59)	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
021	Involved residential dwelling High	Very low	840 m	High	Medium	Medium distance views south to south east toward the proposed overhead powerline route will be partially screened by a gently rising and undulating landform beyond the dwelling. The optional collector substation and switching station locations will not be visible from this location.	Low
032	Involved residential dwelling High	Very low	1,157 m	High	High	Long distance views north west toward the proposed overhead powerline route will be partially screened by scattered tree cover. The optional collector substation and switching station locations will not be visible from this location.	Low
041	Involved residential dwelling High	Very low	843 m	High	High	Medium distance views west to south west toward the proposed overhead powerline will be partially screened by landform rising to the west of the dwelling, together with scattered tree cover. The optional collector substation and switching station locations will not be visible from this location.	Low
087	Involved residential dwelling High	Very low	1,1360 m	High	Medium	Long distance views north will extend toward portions of the overhead powerline extending east to west between the Mt Buffalo cluster and the proposed collector substation and switching station locations. Views will be partially screened by tree cover alongside field boundaries and generally mitigated by distance between the dwelling and elements of electrical infrastructure.	Low

Table 23 – Visual significance matrix (Refer Figure 83 for potential dwelling locations)

View location (Refer to Figure 59)	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
101	Neighbour Residential dwelling High	Very low	1,331 m	High	Medium	Long distance views north west to south west toward portions of the overhead powerline will be largely screened by undulating landform. The optional collector substation and switching station locations will not be visible from this location.	Nil
119	Involved residential dwelling High	Very low	1,945 m	High	Medium	Long distance views toward the proposed overhead powerline, and the optional collector substation and switching station locations, will be screened by tree cover and landform beyond the dwelling.	Nil
154	Neighbour weekender High	Very low	1,729 m	High	Medium	Long distance views north west to south west toward portions of the overhead powerline will be largely screened by undulating landform. The optional collector substation and switching station locations will not be visible from this location.	Nil
155	Neighbour weekender High	Very low	1,458 m	High	Medium	Long distance views north west to south west toward portions of the overhead powerline will be largely screened by undulating landform. The optional collector substation and switching station locations will not be visible from this location.	Nil
158	Neighbour (caravan) High	Very low	1,208 m	High	Medium	Long distance views toward the proposed overhead powerline routes and the collector substation and switching station locations will be screened by landform.	Nil
225	Involved residential dwelling	Very low	1,227 m	High	Medium	Long distance views south toward the proposed overhead powerline are partially screened by a gently rising and undulating	Low

Table 23 – Visual significance matrix (Refer **Figure 83** for potential dwelling locations)

View location (Refer to Figure 59)	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
	High					landform. The optional collector substation and switching station locations will not be visible from this location.	

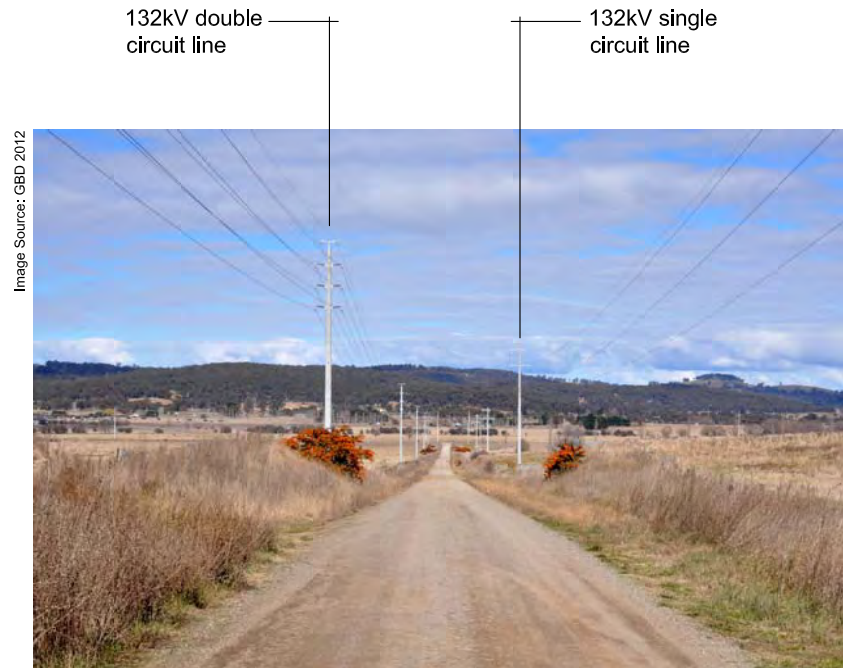
13.8 Summary of visual significance (electrical infrastructure)

A total of 10 potential dwellings have been identified within a 2 km offset from the proposed 132 kV powerline routes, optional collector substation and switching station locations.

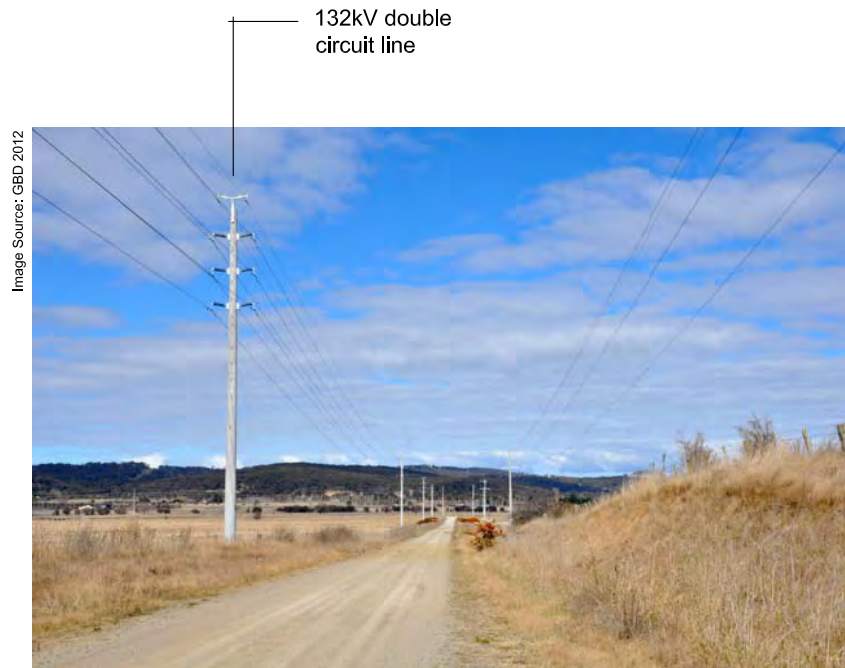
Six of the dwellings are involved landowners and four are neighbouring landowners subject to a potential agreement to place wind turbines within 2 km of their dwellings. As assessment of visual significance for the proposed overhead powerline routes, collector substation and switching station determined that:

- 5 of the 11 residential dwellings would have a Nil visual significance and
- 5 of the 11 residential dwellings would have a Low visual significance.

This LVIA has determined that the electrical works (including overhead powerline routes, a collector substation and a switching station) would be unlikely to have a significant visual effect on surrounding involved, neighbouring and uninvolved dwelling locations within 2 km of the proposed electrical works.



Comparative single and double circuit 132kV transmission line (supporting structures)



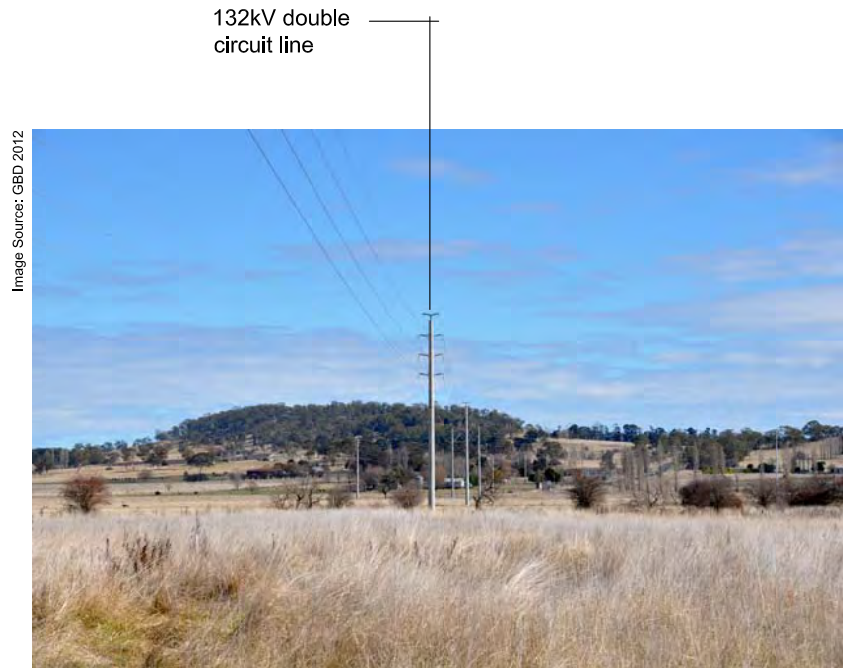
Double circuit 132kV transmission line (supporting structure) along road



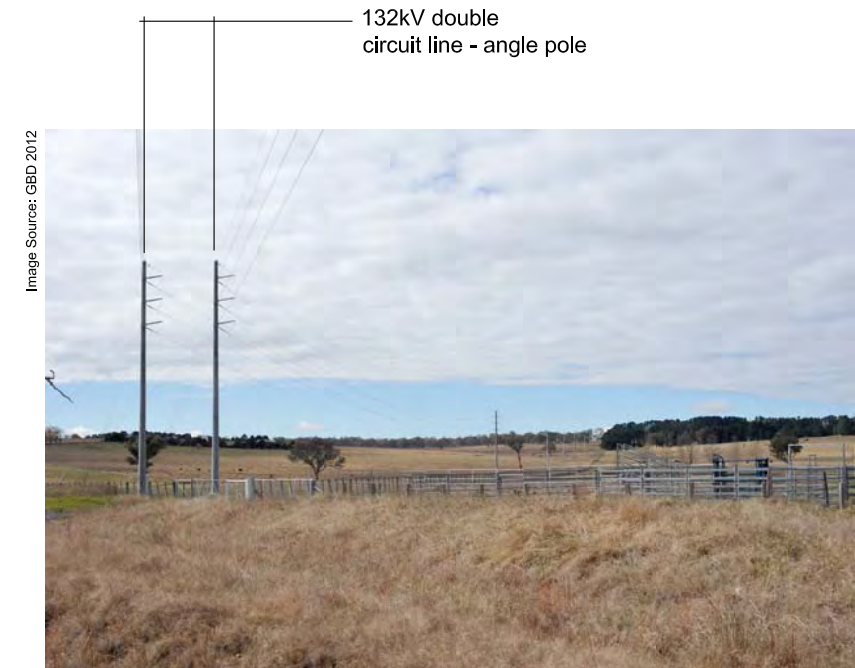
Double circuit 132kV transmission line (angle pole structure) at road crossing



132kV double circuit line crossing rural agricultural land



132kV double circuit line crossing rural agricultural land



Double circuit 132kV transmission line (angle pole structure) at road crossing

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Figure 84
Typical double circuit
132 kV powerline

Pre-construction and construction

Section 14

14.1 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 30 months, although the extent and nature of pre-construction and construction activities would vary at different locations within the project area.

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.



Plate 10 Illustrating typical construction activities during turbine construction and installation.
(Image: Wind Prospect CWP Pty Ltd).

Perception and public consultation

Section 15

15.1 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 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.

15.2 Consultation

The Proponent has undertaken a wide range of consultative activities with the local community and stakeholders for the Bango wind farm project which commenced in April 2011. 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:

- establishment of a Project website (www.bangowindfarm.com.au) for general information dissemination, announcements, feedback requests and documentation distribution
- letters of notification to various stakeholders, including local, state and national groups and agencies
- face-to-face notification (or letter drop where necessary) of neighbouring residents within a 3 km radius of the Project

- newsletters (x2), Public Opinion Surveys (x2), Landscape Values Survey, advertisements, media releases and press / radio interviews
- public open day held at Boorowa Bowling Club, Boorowa and
- ongoing consultation meetings with various stakeholders throughout the Project planning and design stages.

The public open day was held at the Boorowa Bowling Club on the 16th August 2012. The public 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 the 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.

An opportunity for members of the local community to provide feedback on potential landscape and visual impacts was provided through a landscape values questionnaire, made available at the public open day. The public open day was attended by almost forty people with one landscape values questionnaire being returned.

15.3 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 effect of distance between turbines and view locations.

15.4 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 Bango 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 16

16.1 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.

16.2 Summary of mitigation measures

A summary of the mitigation measures available for the wind farm and powerline infrastructure is presented in **Tables 24** and **25**.

Table 24 - 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 structures, except those required for safety purposes.			✓	✓
If necessary, design and construct site control building and facilities	✓		✓	

Table 24 - Mitigation measures summary

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

Table 25 – 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 17

17.1 Summary

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

This LVIA has determined that the Bango wind farm project would have a high visual significance for nine dwellings within 2 km of the Bango wind turbines. One of the nine residential dwellings would be an uninvolved landowner. The balance of residential dwellings with a high visual significance would be involved and neighbouring landowners (three with dwellings and two with weekenders) subject to a negotiated agreement. This LVIA has also determined that the project will have a medium to high visual significance for three residential dwellings within 2 km of the proposed turbines. All three dwellings with a medium to high visual significance would be involved landowners.

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.

Wind turbines within the Bango wind farm project would be visible from a number of local roads beyond the project site, such as Lachlan Valley Way, Wargeila Road and the Boorowa-Rye Park Road. This LVIA has determined that views toward the Bango wind turbines would generally result in a low impact for the majority of motorists travelling through the area beyond the project site due to the short duration and transitory nature of effects, as well as the extent of screening provided by tree planting alongside road corridors. Wind turbines would be visible from some sections of local roads, including the Tangmangaroo and Harry's Creek Roads which pass through the project site. Views from unsealed roads within proximity to the project site will include some partial filtering through roadside planting and a locally undulating landform. Overall volumes of traffic on unsealed local access roads is very low and would tend to comprise journeys made by a number of the involved and neighbouring landowners.

This LVIA has determined that the construction of the project would result in some 'direct', 'indirect' or 'sequential' cumulative effects when considered in addition to existing or proposed wind farm developments, including the proposed Rye Park and Rugby wind farm projects. The potential for 'direct' and 'indirect' cumulative visual effects 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 collector substation and switching station locations and proposed overhead powerline routes are unlikely to result in a significant visual effect for the majority of surrounding residential or public view locations. A combination of distance, undulating landform and tree cover between the collector substation, switching station and powerline structures 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 effect 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 effect 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 White Rock 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 effects 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 effect 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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Limitations

GBD has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Bango Wind Farm 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 9th July 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.

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Appendix A – Draft NSW Planning Guidelines: Wind Farms. Meeting Assessment requirements, Landscape and visual amenity

Appendix A: Meeting assessment requirements

Where a wind farm application is State significant development (SSD), specific assessment requirements are specified in Director General's Requirements (DGRs). This appendix includes information to assist applicants with assessing particular impacts from a wind farm proposal in cases where DGRs require particular impacts to be assessed. The assessment must be detailed in the proponent's EIS.

Landscape and visual amenity

The visual impact of a wind farm depends on the extent of the change to the landscape caused by the development, taking into account:

- the visibility of the development
- the locations and distances from which the development can be viewed
- landscape values and their significance
- the sensitivity of the landscape features to change

The visual impact of the development relates to:

- the number, height, scale, spacing, colour and surface reflectivity of the wind turbines
- the quantity and characteristics of lighting, including aviation obstacle lighting (subject to CASA requirements and advice)
- potential for visual clutter caused by turbine layout and ability to view through a cluster or array (visually well ordered series) of turbines in an orderly manner
- the removal or planting of vegetation
- the location and scale of other buildings and works including transmission lines and associated access roads
- proximity to sensitive areas
- proximity to an existing or proposed wind farm, having regard to cumulative visual effects.

The features of the landscape include:

- the topography of the land
- the amount and type of vegetation
- natural features such as waterways, cliffs, escarpments, hills, gullies and valleys
- visual boundaries between major landscape types
- the type, pattern, built form, scale and character of development, including roads and walking tracks
- flora and fauna habitat
- cultural heritage sites
- the skyline

Assessing landscape and visual amenity impacts

DGRs typically require a comprehensive assessment of the impact of a proposed wind farm on the landscape character, landscape values, visual amenity and any scenic or significant vistas to be undertaken. There should be a particular focus on any neighbours' houses within 2 km of a proposed wind turbine that do not host the wind farm facility. The assessment should include:

- a description of the assessment methodology and a clear justification of it including discrete justification of the methodology for assessing impacts at neighbours' houses within 2 km of a proposed wind turbine
- a description of all relevant components of the project, including turbine heights and layout – where micro-siting or a range of turbines is proposed, the assessment should be based on the 'worst case' layout and turbine height
- a description of the landscape including key features

- a description of the visibility of the development
- photomontages of the project and associated transmission lines taken from:
 - potentially affected residences (including approved but not yet developed dwellings or subdivisions with residential rights) within 2 km of a proposed wind turbine or other associated infrastructure (note that the number of photomontages may be reduced in less sensitive landscapes such as industrial areas),
 - urban settlements, and
 - significant public view points including roads, lookout points and walkways.
- identification of the zone of visual influence of the wind farm (no less than 10km)
- a description of the significance of the landscape values and character in a local and regional context
- a description of community and stakeholder values of the local and regional visual amenity and quality and perceptions of the project based on surveys and consultation.
- assessment of cumulative impacts on the landscape and any cumulative visual impacts from transmission line infrastructure and any surrounding approved or operational wind farms in the locality

Mitigating landscape and visual amenity impacts

The feasibility, effectiveness and reliability of proposed mitigation measures should be assessed. The extent of any residual impacts left over after mitigation measures have been implemented should also be described. Examples of mitigation measure that proponents can use to reduce the visual impact of a proposed wind farm include:

- where possible, locate turbines:
 - away from areas with high scenic values
 - away from areas with high visibility from local residents
- select turbines that :
 - look the same, have the same height and rotate the same way
 - are off-white or grey colouring
- minimise the removal of vegetation
- plant vegetation to provide a visual screen
- reduce impacts of night and obstacle lighting by
 - limiting lighting on towers to that required for safe operation and aviation safety and
 - use of lighting design which minimises glare
- underground electricity wires where practicable
- use alternative transmission line pole designs to minimise visual impact.