

8.0 VIEWPOINT ANALYSIS

CW29- Prices Lane



Viewpoint CW29: Prices Lane



Zoomed photograph cropped from Viewpoint CW29

VIEWPOINT CW29		LANDSCAPE DESCRIPTION:	POTENTIAL VISUAL IMPACT:
Location	Prices Lane	View from Prices Lane approximately 3.2 km from the Pyramul Road intersection looking in a generally eastern direction towards the proposed wind farm. The landscape is broadly rolling and predominantly cleared for grazing purposes. Some isolated trees are scattered though the landscape. The photograph was taken from an elevated rise. The visual sensitivity from this viewpoint has been assessed as low due to the land use.	From this viewpoint approximately 60% of the proposed wind farm may be visible in the background of the photograph. The proposed wind farm has the potential to become a noticeable visual element in the landscape. The visual effect from this viewpoint has been assessed as high due to the number of turbines visible and their proximity to the viewpoint. The overall potential visual impact has been rated as moderate.
Coordinates	S 32° 55.337' E 149°38.214'		
Elevation	891m		
LCU	Sallys Flat		
Viewing Distance (to nearest proposed turbine)	2.84km		
Land use	Grazing Land		
Visual Sensitivity	Low		
Visual Effect	High		
Potential Visual impact	Moderate		

8.0 VIEWPOINT ANALYSIS

CW30- Crudine Road



Viewpoint CW30 Crudine Road



Zoomed photograph cropped from Viewpoint CW30

VIEWPOINT CW30		LANDSCAPE DESCRIPTION:	POTENTIAL VISUAL IMPACT:
Location	Crudine Road	View from an elevated section of Crudine Road approximately 3.4 km west of Warrangunia Road. The photograph was taken looking in a eastern direction towards Crudine Ridge. Crudine Ridge forms the backdrop to the photograph containing views to the west. The landscape is broadly cleared grazing land with a sparse coverage of retained vegetation. The topography is undulating falling towards the Crudine River which is visible in the middle ground of the photograph. An isolated homestead 'Waverly' is visible in the photograph adjacent the Crudine River.	From this viewpoint approximately 60% of the proposed turbines may be visible in the distance. Due to the distance of the proposed wind turbines from the viewpoint the proposed turbines will be viewed as a small element of the landscape. The visual effect from this location has been assessed as low.
Coordinates	S 32° 55.226' E 149°44.351'		
Elevation	730m	The visual sensitivity from this viewpoint has been assessed as low.	The overall visual impact from this viewpoint has been rated low.
LCU	Crudine Valley		
Viewing Distance (to nearest proposed turbine)	5.11km		
Land use	Minor Road		
Visual Sensitivity	Low		
Visual Effect	Low		
Potential Visual impact	Low		

8.0 VIEWPOINT ANALYSIS

CW31- Box Ridge Road



Viewpoint CW31 Box Ridge Road



Zoomed photograph cropped from Viewpoint CW31

VIEWPOINT CW31	LANDSCAPE DESCRIPTION:		POTENTIAL VISUAL IMPACT:
Location	Box Ridge Road	View from property on Box Ridge Road approximately 700 metres from the Turondale Road intersection. Box Ridge Road runs along an elevated ridge line and is a sealed minor road servicing a small number of isolated homesteads. The topography of the area is undulating. Views from this viewpoint are vast and expansive extending over the study area to vegetated slopes beyond. The land use in this area is generally grazing land with a moderate coverage of retained native vegetation on slopes and scattered though paddocks where land is unsuitable for grazing.	From this viewpoint it is estimated that all of the proposed wind turbines may be visible. As the viewpoint is located over 10 km from the study area the visual effect has been rated as low. Due to the orientation of the proposed wind farm, the horizontal angle of view is low.
Coordinates	S 32° 54.174' E 149°45.228'		
Elevation	909m	The visual sensitivity from this viewpoint has been assessed as low due to the distance from the proposed wind farm.	The overall visual impact from this viewpoint has been assessed as low.
LCU	Turondale		
Viewing Distance (to nearest proposed turbine)	10.38 km		
Land use	Rural Residence		
Visual Sensitivity	Low		
Visual Effect	Low		
Potential Visual impact	Low		

8.0 VIEWPOINT ANALYSIS

CW32- Unnamed Crown Road



Viewpoint CW32 Unnamed Crown Road



Zoomed photograph cropped from Viewpoint CW32

VIEWPOINT CW32		LANDSCAPE DESCRIPTION:	POTENTIAL VISUAL IMPACT:
Location	Unnamed Crown Road	View from property on an unnamed Crown Road looking in a south eastern direction towards a section of the proposed overhead power lines. The landscape is generally cleared and slightly undulating with a local high point visible in the background of the photograph. Groupings of retained vegetation are scattered through the landscape. Views to the south are contained by the local rise in topography.	From this viewpoint the proposed power lines may be visible however it is likely scattered vegetation will obstruct some view of them It is likely the power lines will be seen as a minor visual element of landscape. The visual effect from this viewpoint has been assessed as low.
Coordinates	S 32° 54.174' E 149°45.228'		
Elevation	730m	The visual sensitivity from this viewpoint has been assessed as high due to the close proximity to the proposed power line.	The overall visual impact from this viewpoint has been assessed as moderate.
LCU	Crudine Valley		
Viewing Distance (to nearest proposed turbine)	5.73km		
Land use	Rural Residence		
Visual Sensitivity	High		
Visual Effect	Low		
Potential Visual impact	Moderate		REFER TO PHOTOMONTAGE 15

8.0 VIEWPOINT ANALYSIS

VIEWPOINT	PHOTO-MONTAGE	DISTANCE To nearest proposed turbine	POTENTIAL VISUAL PROMINENCE Based on distance	VERTICAL ANGLE Based on nearest proposed turbine	VISUAL PROMINENCE Based on vertical angle	% OF VISIBLE TURBINES Worst Case Scenario	EXISTING POTENTIAL SCREENING FACTORS	VISUAL SENSITIVITY RATING	VISUAL EFFECT RATING	VISUAL IMPACT RATING	HOUSE ID.
CW01	-	19.0 km	Insignificant	0.48°	Insignificant	80%	Distance	MODERATE	LOW	LOW	-
CW02	-	6.30 km	Potentially Noticable	1.50°	Potentially Noticable	80%	Roadside Vegetation & Topography	MODERATE	LOW	LOW	Entry to Unknown Property (Non-associated)
CW03	-	12.41 km	Insignificant	0.74°	Potentially Noticable	-	Roadside Vegetation & Topography	LOW	LOW	LOW	-
CW04	PM01	3.49 km	Potentially Noticable	2.62°	Potentially Dominant	60%	Roadside & Foreground Vegetation	HIGH	MODERATE	MODERATE	Entry to SFR11/12 (Non-associated)
CW05	PM02	2.25 km	Potentially Noticable	4.07°	Potentially Dominant	100%	Foreground planting around house	HIGH	HIGH	HIGH	Entry to SFR04 & SFR05 (Associated)
CW06	-	6.58 km	Potentially Noticable	1.38°	Potentially Noticable	-	Foreground Vegetation	MODERATE	LOW	LOW	-
CW07	-	5.78 km	Potentially Noticable	1.59°	Potentially Noticable	40%	Roadside Vegetation	MODERATE	MODERATE	MODERATE	-
CW08	PM03	3.08 km	Potentially Noticable	2.97°	Potentially Dominant	100%	Roadside Vegetation	MODERATE	MODERATE	MODERATE	-
CW09	-	0.8 km	Visually Dominant	11.31°	Potentially Dominant	20%	Roadside Vegetation	MODERATE	MODERATE	MODERATE	-
CW10	PM04	1.55 km	Visually Dominant	5.89°	Potentially Dominant	40%	Roadside Vegetation	HIGH	MODERATE	MODERATE	Entry to HER06 (Associated)
CW11	-	1.62 km	Visually Dominant	5.64°	Potentially Dominant	20%	Roadside Vegetation	HIGH	LOW	MODERATE	Entry to HER04 (Non-associated)
CW12	-	2.60 km	Potentially Noticable	3.40°	Potentially Dominant	20%	Roadside Vegetation & Topography	LOW	MODERATE	LOW	-
CW13	-	2.22 km	Potentially Noticable	4.12°	Potentially Dominant	60%	Roadside Vegetation	HIGH	MODERATE	HIGH	Entry to CR35 (Non-associated)
CW14	PM05	8.59 km	Potentially Noticable	1.07°	Potentially Noticable	60%	Distance & Roadside Vegetation	LOW	LOW	LOW	-
CW15	-	9.14 km	Potentially Noticable	1.00°	Potentially Noticable	40%	Distance & Topography	LOW	LOW	LOW	-
CW16	PM06	1.90 km	Highly Visible	4.81°	Potentially Dominant	40%	Foreground Vegetation	HIGH	HIGH	HIGH	House CR34 (Non-associated)
CW17	-	2.33 km	Highly Visible	3.93°	Potentially Dominant	80%	Roadside Vegetation	LOW	HIGH	MODERATE	-
CW18	PM07	2.46 km	Highly Visible	3.72°	Potentially Dominant	40%	Foreground Vegetation	HIGH	HIGH	HIGH	House CR33 (Non-associated)
CW19	-	3.06 km	Highly Visible	2.99°	Potentially Dominant	-	Foreground Vegetation	HIGH	-	-	Entry to CR32 (Non-associated)
CW20	PM08	2.44 km	Highly Visible	3.75°	Potentially Dominant	80%	Foreground Vegetation	HIGH	HIGH	HIGH	Entry to CR28 (Non-associated)
CW21	PM09	2.64 km	Potentially Noticable	3.47°	Potentially Dominant	100%	Foreground Vegetation	HIGH	HIGH	HIGH	Entry to CR21 (Non-associated)
CW22	PM10	2.51 km	Highly Visible	3.65°	Potentially Dominant	100%	Foreground Vegetation	HIGH	HIGH	HIGH	Entry to CR17 (Associated)
CW23	PM11	2.16 km	Highly Visible	4.21°	Potentially Dominant	60%	Foreground Vegetation	HIGH	HIGH	HIGH	Entry to CR14/15 (Associated)
CW24	-	11.40 km	Potentially Noticable	0.80°	Potentially Noticable	20%	Distance & Topography	LOW	-	-	-
CW25	-	3.61 km	Potentially Noticable	2.54°	Potentially Dominant	-	Dense Roadside Vegetation	LOW	LOW	LOW	-
CW26	PM12	4.11 km	Potentially Noticable	2.23°	Potentially Noticable	20%	Foreground Vegetation	HIGH	LOW	MODERATE	SFR 18 - 19 (Non-associated)
CW27	PM13	3.68 km	Potentially Noticable	2.49°	Potentially Noticable	60%	Foreground Vegetation	HIGH	MODERATE	MODERATE	House PL01 (Non-associated)
CW28	PM14	3.81 km	Potentially Noticable	2.40°	Potentially Noticable	80%	Foreground Vegetation	MODERATE	HIGH	HIGH	-
CW29	-	2.84 km	Potentially Noticable	3.22°	Potentially Dominant	60%	Foreground Vegetation	LOW	HIGH	MODERATE	-
CW30	-	5.11 km	Potentially Noticable	1.79°	Potentially Dominant	60%	Topography & Foreground Vegetation	LOW	LOW	LOW	-
CW31	-	10.28 km	Potentially Noticable	0.88°	Potentially Noticable	80%	Distance & Topography	LOW	LOW	LOW	Entry to Unknown Property (Non-associated)
CW32	PM15	5.73 km	Potentially Noticable	1.60°	Potentially Dominant	-	Viewing direction	HIGH	LOW	MODERATE	House CR38 (Non-associated)

TABLE 14: Summary of Viewpoint Analysis

8.0 VIEWPOINT ANALYSIS

8.2 OVERVIEW OF VIEWPOINT ANALYSIS

As was discussed in the rationale for the viewpoint selection process, these viewpoints are representative of the worst case scenario. For each viewpoint, the potential visual impact was analysed through the use of a combination of the Zone of Visual Influence, 3D terrain modelling, topographic maps and on site analysis.

The visual sensitivity and visual effect of each viewpoint have been assessed which, when combined, result in an overall visual impact for the viewpoint (Refer to Study Method Tables 1 & 2). A summary of the results for each viewpoint has been included in Table 14.

Of the 32 viewpoints assessed as part of this LVIA, the wind turbines would be visible from 27 of the viewpoints. Of the 27 viewpoints from which the wind turbines would be visible, 10 of these have been assessed as having a low visual impact, 11 have been assessed as having a moderate visual impact and 9 were assessed as having a high visual impact.

Generally, the further the viewpoint is from the proposed development the more wind turbines would be visible. However as the viewer distance increases the scale, and therefore visual impact of the wind turbines, decreases. For example, viewpoint CW08 located on Hill End Road was taken from an elevated vantage point and 100% of the proposed development is visible. However due to the distance from the proposal and other factors including roadside screen planting, the visual effect is moderate.

In contrast, viewpoints located close to the proposed wind turbines have a large vertical angle, yet generally a much smaller percentage of the turbines are visible due to obstruction by topography and existing vegetation. For example, viewpoint CW09 is located within 800m of the proposal, however the angle of view obstructs views of the majority of the wind turbines.

Of the 9 viewpoints that were rated as having a high visual impact, seven were taken along Crudine Road with 2 of these being involved landowners. The other five were taken from clearings in vegetation to represent the worst case scenario for non-involved residents within the Crudine Valley.

It is important to note these rankings are used to make a comparison between viewpoints and do not necessarily reflect the actual visual impact. Each viewpoint has local influences (such as vegetation and topography) which may potentially screen the wind farm from view. These screening factors have been noted in the viewpoint summary.

9.0 PHOTOMONTAGES

9.1 PHOTOMONTAGES

Photomontages of the proposed Wind Turbines within the existing context were prepared to assist in the impact assessment of the proposed Crudine Ridge Wind Farm. The photomontages seek to convey the final visual image of the proposal from typical vantage points. Considerable effort was made to obtain photos in clear weather conditions to ensure that the photomontages would represent the worst case scenario. In some cases where weather conditions were poor, photomontages have been altered with a blue sky to represent the worst case scenario.

The photomontages are based on worst case scenario without the inclusion of the proposed mitigation methods. Additional photomontages are provided showing measures to mitigate the impact of the proposed wind farm and how they reduce the determined impact.

9.1.1 Photomontage Viewpoint Locations

A variety of indicative photomontage viewpoints have been included for the preparation of photomontages to best represent a range of distances as well as locations with differing views. A total of 15 viewpoints were selected for the production of photomontages. Locations of the photomontages are shown in figure 13.

The DGRs state that photomontages are to be developed from potentially affected residences including approved but not yet developed dwellings and subdivisions with residential rights. Wind Prospect CWP contacted Mid-Western Regional and Bathurst Councils to obtain information on approved subdivisions, lot amalgamations and lot entitlements under consideration. At the time the field work was undertaken for the Crudine Ridge LVIA, there were no unconstructed approved developments identified in the area.

PHOTO-MONTAGE	VIEWPOINT	NUMBER OF VISIBLE TURBINES *Worst Case Scenario	VISUAL IMPACT	HOUSE ID.	PHOTO LOCATION
PM01	CW04	46	MODERATE	Houses SFR11 & SFR12	Entry to property
PM02	CW05	88	HIGH	Houses SFR04 & SFR05	Entry to property
PM03	CW08	93	MODERATE	-	Roadside
PM04	CW10	40	MODERATE	HER05	Entry to property
PM05	CW14	47	LOW	-	Roadside
PM06	CW16	35	HIGH	House CR34	On property
PM07	CW18	39	HIGH	House CR33	On property
PM08	CW20	77	HIGH	House CR28	Entry to property
PM09	CW21	82	HIGH	House CR21	Entry to property
PM10	CW22	19	HIGH	House CR17	Entry to property
PM11	CW23	55	HIGH	Houses CR14 & CR15	Entry to property
PM12	CW26	41	MODERATE	Houses SFR16-SFR19	On property
PM13	CW27	64	MODERATE	House PL01	On property
PM14	CW28	85	HIGH	-	Roadside
PM15	CW32	-	LOW	House CR38	On property

TABLE 15: Photomontage Overview

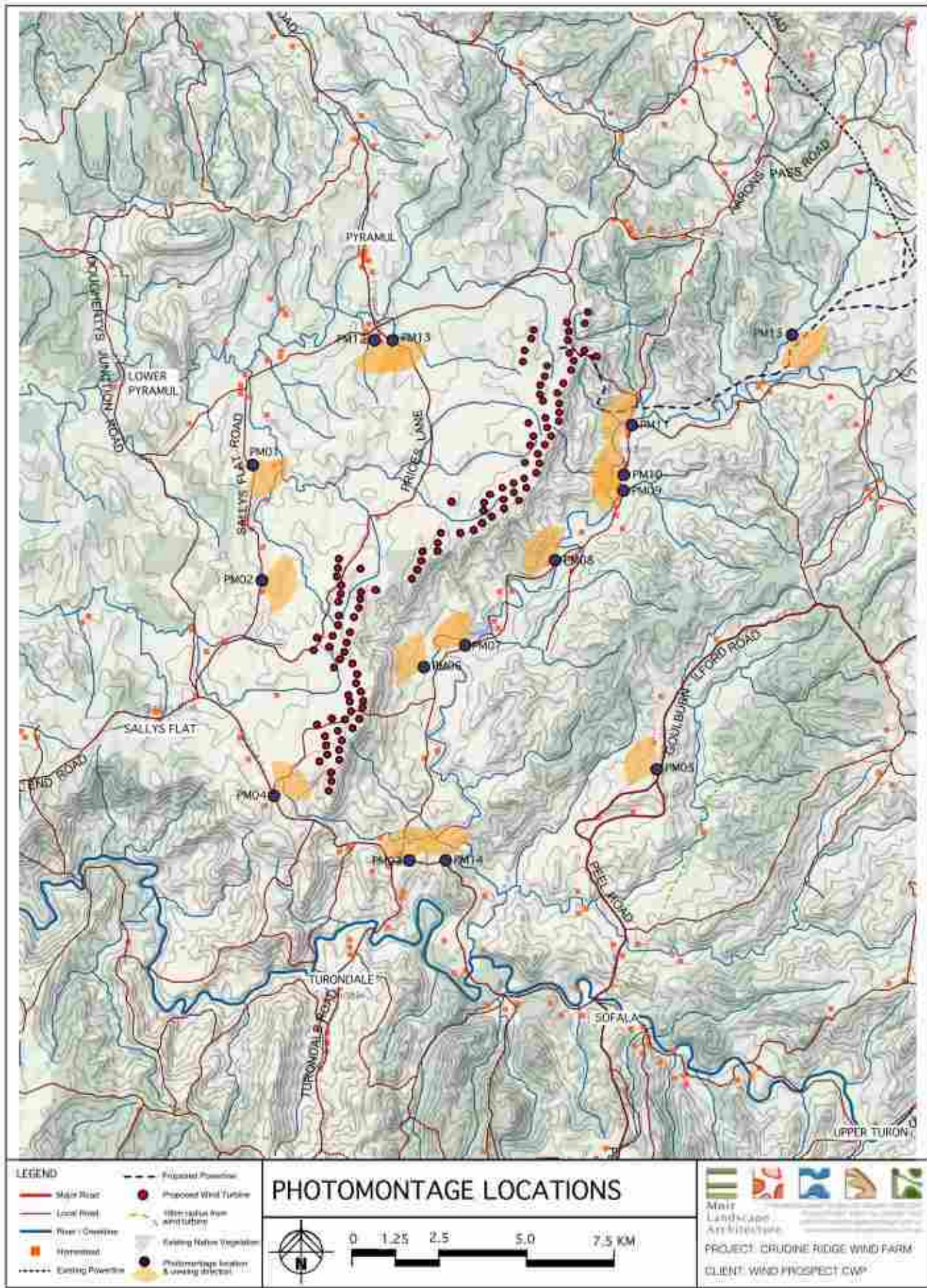


FIGURE 13: Photomontage Locations

9.0 PHOTOMONTAGES

9.1.2 Photomontage Development Process

Photomontages are representations of the Wind Farm that are superimposed onto a photograph of the Site. The process for generating these images involves computer generation of a wire frame perspective view of the Wind Turbines and the topography from each viewpoint.

The photo simulations based on photography from typical sensitive viewpoints are included within the following analysis section. The images that the photo simulations have been based on have been captured with a Canon 40D SLR digital camera with a lens of 50mm which closely represents the central field of vision of the human eye.

The process for photomontage development is demonstrated in the following example:



Location and dimensions of the wind turbines are defined in a landscape wire frame.



Wire frame and photo of existing landscape are overlaid and aligned to match.



Photomontage developed by merging wind turbines with existing landscape features.

FIGURE 14: Photomontage Development Process

9.1.3 Photomontage Sky Comparisons

In addition to generating photomontages comparing the existing and proposed views, photomontages have been developed with superimposed skies to compare different backdrops. Although efforts were made to obtain photographs in clear weather, some photographs were taken with a grey sky back drop. To assist in simulating a worst case scenario, a blue sky was overlaid into each of the photomontages to provide a comparison for each viewpoint.



Proposed photomontage developed using original grey sky photograph



Proposed photomontage developed using superimposed blue sky

FIGURE 15: Photomontage Sky Comparison Development Process

9.0 PHOTOMONTAGES

PHOTOMONTAGE 1. CW04- Sallys Flat Road (Entry to SFR11 & SF2)



PHOTOMONTAGE 1A: Existing view from Sallys Flat Road



PHOTOMONTAGE 1B: Proposed view from Sallys Flat Road



PHOTOMONTAGE 1C: Proposed view **zoomed and cropped** from Photomontage 1B.



Turbines likely to be visible from CW04

9.0 PHOTOMONTAGES

PHOTOMONTAGE 2. CW05- Sallys Flat Road (Entry to SFR04 & SFR05)



PHOTOMONTAGE 2A: Existing view from Sallys Flat Road



PHOTOMONTAGE 2B: Proposed view from Sallys Flat Road



PHOTOMONTAGE 2C: Proposed view **zoomed and cropped** from Photomontage 2B.



Turbines likely to be visible from CW05

9.0 PHOTOMONTAGES

PHOTOMONTAGE 2. CW05- Sallys Flat Road (Entry to SFR04 & SFR05)



PHOTOMONTAGE 2D: Comparison of Sky Backdrop

9.0 PHOTOMONTAGES

PHOTOMONTAGE 3. CW08- Hill End Road



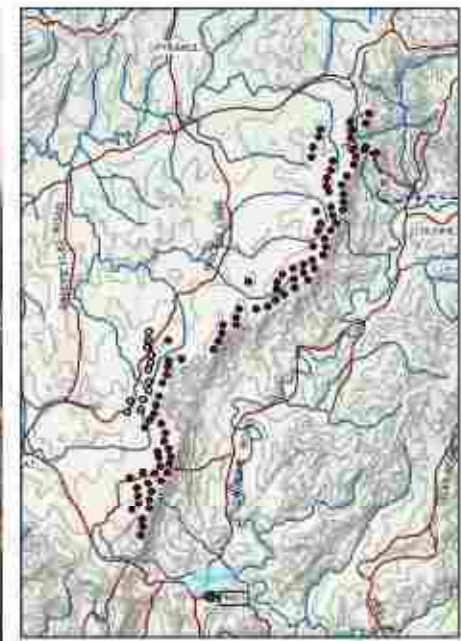
PHOTOMONTAGE 3A: Existing view from Hill End Road



PHOTOMONTAGE 3B: Proposed view from Hill End Road



PHOTOMONTAGE 3C: Proposed view **zoomed and cropped** from Photomontage 3B.



Turbines likely to be visible from CW08

9.0 PHOTOMONTAGES

PHOTOMONTAGE 4. CW10- Hill End Road (Entry to HER06)



PHOTOMONTAGE 4A: Existing view from Hill End Road



PHOTOMONTAGE 4B: Proposed view from Hill End Road



PHOTOMONTAGE 4C: Proposed view **zoomed and cropped** from Photomontage 4B.



Turbines likely to be visible from CW10

9.0 PHOTOMONTAGES

PHOTOMONTAGE 5. CW14- Peel Road



PHOTOMONTAGE 5A: Existing view from Peel Road



PHOTOMONTAGE 5B: Proposed view from Peel Road



PHOTOMONTAGE 5C: Proposed view **zoomed and cropped** from Photomontage 5B.



Turbines likely to be visible from CW14

9.0 PHOTOMONTAGES

PHOTOMONTAGE 6. CW16- Crudine Road (House CR34)



PHOTOMONTAGE 6A: Existing view from Crudine Road



PHOTOMONTAGE 6B: Proposed view from Crudine Road



PHOTOMONTAGE 6C: Proposed view **zoomed and cropped** from Photomontage 6B.



Turbines likely to be visible from CW16

9.0 PHOTOMONTAGES

PHOTOMONTAGE 6. CW16- Crudine Ridge (House CR34)



PHOTOMONTAGE 6D: Comparison of Sky Backdrop

9.0 PHOTOMONTAGES

PHOTOMONTAGE 7. CW18- Crudine Road (House CR33)



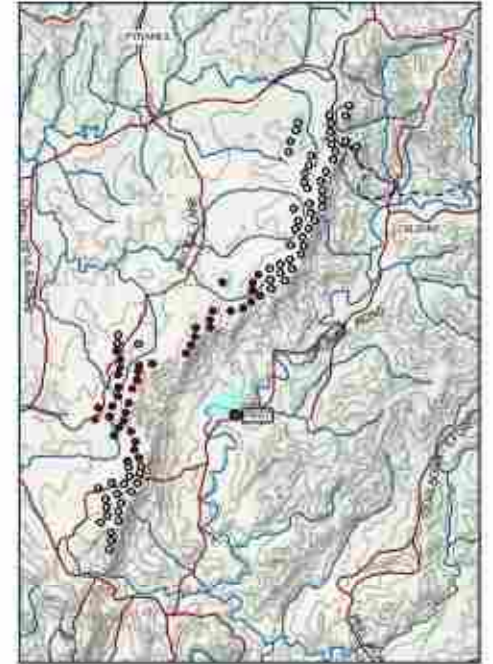
PHOTOMONTAGE 7A: Existing view from Crudine Road



PHOTOMONTAGE 7B: Proposed view from Crudine Road



PHOTOMONTAGE 7C: Proposed view **zoomed and cropped** from Photomontage 7B.



Turbines likely to be visible from CW18

9.0 PHOTOMONTAGES

PHOTOMONTAGE 7. CW18- Crudine Road (House CR33)



PHOTOMONTAGE 7D: Comparison of Sky Backdrop

9.0 PHOTOMONTAGES

PHOTOMONTAGE 8. CW20- Crudine Road (Entry to House CR28)



PHOTOMONTAGE 8A: Existing view from Crudine Road



PHOTOMONTAGE 8B: Proposed view from Crudine Road



PHOTOMONTAGE 8C: Proposed view **zoomed and cropped** from Photomontage 8B.



Turbines likely to be visible from CW20

9.0 PHOTOMONTAGES

PHOTOMONTAGE 9. CW21- Crudine Road (Entry to House CR21)



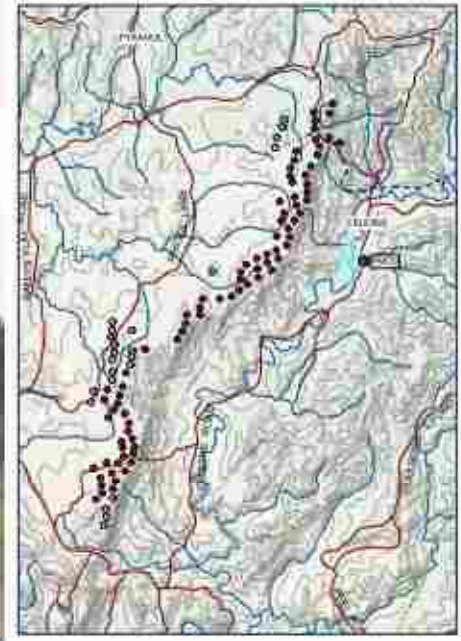
PHOTOMONTAGE 9A: Existing view from Crudine Road



PHOTOMONTAGE 9B: Proposed view from Crudine Road



PHOTOMONTAGE 9C: Proposed view **zoomed and cropped** from Photomontage 9B.



Turbines likely to be visible from CW21

9.0 PHOTOMONTAGES

PHOTOMONTAGE 9. CW21- Crudine Road (Entry to House CR21)



PHOTOMONTAGE 9D: Comparison of Sky Backdrop

9.0 PHOTOMONTAGES

PHOTOMONTAGE 10. CW22- Crudine Road (Entry to House CR17)



PHOTOMONTAGE 10A: Existing view from Crudine Road



PHOTOMONTAGE 10B: Proposed view from Crudine Road



PHOTOMONTAGE 10C: Proposed view **zoomed and cropped** from Photomontage 10B.



Turbines likely to be visible from CW22

9.0 PHOTOMONTAGES

PHOTOMONTAGE 10. CW22- Crudine Road (Entry to House CR17)



PHOTOMONTAGE 10D: Comparison of Sky Backdrop

9.0 PHOTOMONTAGES

PHOTOMONTAGE 11. CW23- Crudine Road (Entry to Houses CR14 & CR15)



PHOTOMONTAGE 11A: Existing view from Crudine Road



PHOTOMONTAGE 11B: Proposed view from Crudine Road



PHOTOMONTAGE 11C: Proposed view **zoomed and cropped** from Photomontage 11B.



Turbines likely to be visible from CW23

9.0 PHOTOMONTAGES

PHOTOMONTAGE 12. CW26- Prices Lane (House SFR16-19)



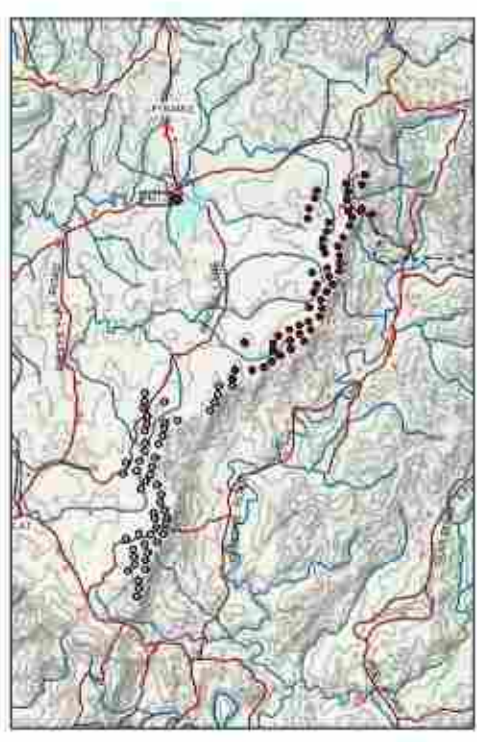
PHOTOMONTAGE 12A: Existing view from Prices Lane



PHOTOMONTAGE 12B: Proposed view from Prices Lane



PHOTOMONTAGE 12C: Proposed view **zoomed and cropped** from Photomontage 12B.



Turbines likely to be visible from CW26

9.0 PHOTOMONTAGES

PHOTOMONTAGE 12. CW26- Prices Lane (House SFR16-19)



PHOTOMONTAGE 12D: Comparison of Sky Backdrop

9.0 PHOTOMONTAGES

PHOTOMONTAGE 13. CW27- Prices Lane (House PL01)



PHOTOMONTAGE 13A: Existing view from Prices Lane



PHOTOMONTAGE 13B: Proposed view from Prices Lane



PHOTOMONTAGE 13C: Proposed view **zoomed and cropped** from Photomontage 13B.



Turbines likely to be visible from CW27

9.0 PHOTOMONTAGES

PHOTOMONTAGE 13. CW27- Prices Lane (House PL01)



PHOTOMONTAGE 13D: Comparison of Sky Backdrop

9.0 PHOTOMONTAGES

PHOTOMONTAGE 14. CW28- Sofala Road



PHOTOMONTAGE 14A: Existing view from Sofala Road



PHOTOMONTAGE 14B: Proposed view from Sofala Road



PHOTOMONTAGE 14C: Proposed view **zoomed and cropped** from Photomontage 14B.



Turbines likely to be visible from CW28

9.0 PHOTOMONTAGES

PHOTOMONTAGE 15. CW32- Crudine Road (House CR38)



PHOTOMONTAGE 15A: Existing view from Sofala Road



PHOTOMONTAGE 15B: Proposed view from Sofala Road



PHOTOMONTAGE 15C: Proposed view **zoomed and cropped** from Photomontage 15B.



Turbines likely to be visible from CW32

10.0 VISUAL EFFECTS

10.1 SHADOW FLICKER

Shadow flicker is a visual effect that occurs when rotating turbines cause intermittent shadowing as the blades momentarily block the sun's path. The effect will occur under circumstances where the turbine location is such that at certain times of the day the sun's rays pass through the swept area of the rotating blades and affect the viewpoint. The effect is diminished by distance between the turbine and the viewpoint. Shadowing is reduced by increased cloud cover and is dependent on the angle of the sun's rays (Connel Wagner, 2006).

Wind Prospect CWP has undertaken a Shadow Flicker Assessment for the proposed Crudine Ridge Wind Farm (Refer to Figure 16). The zones where there is potential for shadow flicker to occur have been assessed using ReSoft WindFarm software. The analysis was based on a proposal for Crudine Ridge Wind Farm that consisted of 106 turbines at a height of 160m to represent worst case scenario.

Variable factors which may significantly reduce the potential impact of shadow flicker include:

- the direction of the residence relative to the turbine(s);
- the distance from the turbine(s);
- the turbine hub-height and rotor diameter;
- the time of year;
- the proportion of daylight hours in which the turbines operate;
- the frequency of bright sunshine and cloudless skies (particularly at low elevations above the horizon);
- and,
- the prevailing wind direction (Department of Planning NI).

Local influences including screen planting should also be considered when assessing the potential shadow flicker resulting from the proposed development.



Example of shadow intensity variation with distance & turbine blocking small proportion of sunlight. (Source: Aurecon, 2011).

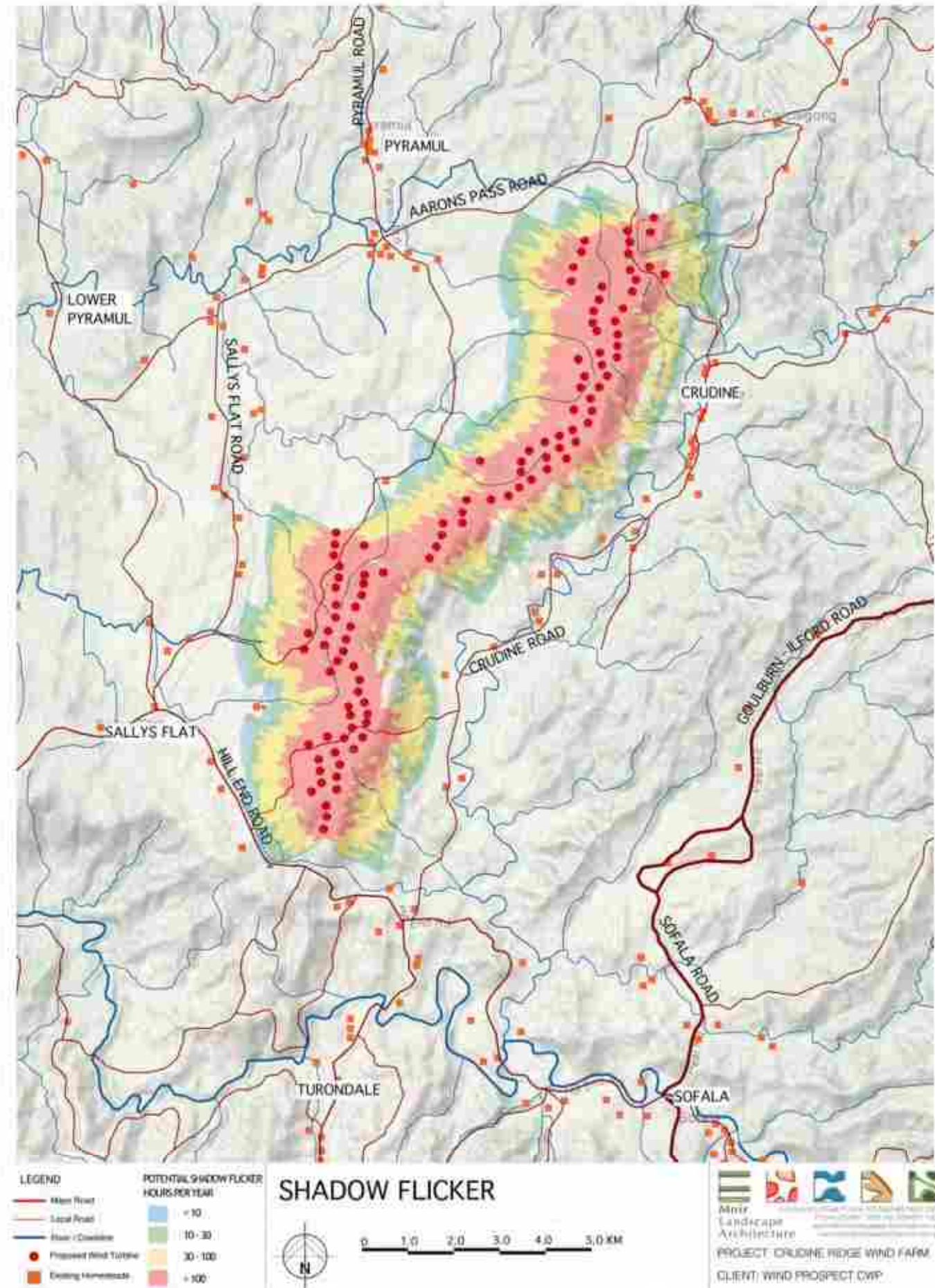


FIGURE 16: Shadow Flicker for Layout A (Adapted from assessment by Wind Prospect CWP, 2011).

10.0 VISUAL EFFECTS

10.1.2 Standard Limits of Shadow Flicker

The Environmental Protection and Heritage Council (EPHC) refers to both Australian and International standards when considering the standard acceptable limits of shadow flicker. The intensity of shadow flicker lessens with distance and a general setback limit of 10 times the rotor diameter is commonly used. The maximum shadow time that can occur as the sun passes behind a single turbine is 23 minutes.

A limit of 30 hours per year and 30 minutes per day of modelled shadow flicker has been applied for many years around the world. In some cases a limit of 8 hours of actual measured shadow flicker is applied (EHPC).

A receptor height of 2 metres above ground level is generally recognised as a standard. The shadow flicker modelling developed for Crudine Ridge is based on a viewing height of 1.7 metres and represents a worst case scenario.

10.1.1 Shadow Flicker Assessment Results- Homesteads

Overall, the shadow flicker effects caused by the proposed Crudine Ridge Wind Farm are minimal due to the location of the wind turbines in relation to nearby residential properties. Figure 16 shows the extent of shadow flicker as assessed for Layout A by Wind Prospect CWP.

The analysis found that only one homestead will potentially experience shadow flicker as a result of the proposed wind farm. The homestead will experience up to 10 hours per year. As the limit of shadow flicker is generally 30 hours per year, the annoyance caused by shadow flicker at this residence is insignificant.

Local influences including topography, vegetation, sheds and other buildings that block sunlight at times when shadow flicker would occur effectively eliminates modelled shadow flicker (EHPC).

The proposed limit of acceptable shadow flicker duration is aimed at protecting the public. Higher limits may be applicable to landowners involved in the project who will potentially experience shadow flicker. In addition, local influences such as screen and foreground planting are not taken into account when developing the shadow flicker analysis. Mitigation methods utilised for visual amenity (including screen planting) would significantly reduce the annoyance caused by shadow flicker.

10.1.2 Shadow Flicker Assessment Results- Public Roads

Due to the nature of the Study Area, there are a number of unsealed minor local roads close to the Site. The results of the shadow flicker analysis indicates shadow flicker may occur on a small section of Hill End Road, Prices Lanes, Sallys Flat Road and Tabrabucca Road.

There is a negligible risk associated with distraction of motorists who experience shadow flicker. The effects of shadow flicker are similar to the phenomenon created when a vehicle in motion passes a static object eg. travelling along a tree lined road.



Example of shadow flicker on roads created by shadows from trees.

10.2 BLADE GLINT & REFLECTIVITY

Blade Glint refers to the regular reflection off one or more rotating blades. This can be a temporary effect at any particular location, though the vast bulk of any glint occurs where the viewer is located above the altitude of the turbine hub. The occurrence of blade glint depends on a number of conditions including the orientation of the nacelle, angle of the blade, and the angle of the sun (Aurecon, 2009).

At present there are no formal regulations or guidelines in NSW pertaining to Blade Glint. However, the Victorian Wind Farm Guidelines proposes the following recommendations for managing blade glint:

- Blades should be finished with a surface treatment of low reflectivity to ensure that glint is minimised.
- Blade glint can be effectively and cost effectively managed through the use of matt coatings on the turbine blades and, if so done, is not considered to be a visual impact.

Implementation of these recommendations should result in the mitigation of any actual or perceived impact.

10.0 VISUAL EFFECTS

10.3 NIGHT LIGHTING

The requirement of obstacle night lighting for the proposed Crudine Ridge Wind Farm is subject to the advice of the Civil Aviation Safety Authority (CASA). It is noted that the wind turbines proposed for use in the Crudine Ridge Wind Farm will possibly be up to 160 m in height and CASA has indicated that "this height could be a hazard to aircraft traversing the area" and recommends "that the proponent takes this into consideration when assessing their duty of care in deciding whether or not the wind farm should be obstacle lit or otherwise marked". CASA also noted that reference is made to the fact that "aircraft are generally permitted to fly as low as 500 ft (152 m) above ground level, and certain operations are permitted to fly below this height."

Wind Prospect CWP engaged HART Aviation to undertake an aviation assessment for the proposed Crudine Ridge Wind Farm. The view of HART Aviation is similar to that of CASA. It is their view that if wind turbines with a tip of 160m are proposed to be used, obstacle lights are necessary to minimise risk to aviation operators in the region.

As a wind turbine height of 160m has been selected to represent worst case scenario it is very possible a turbine will be selected that is below a height of 152m.

10.3.1 Potential Light Sources

In accordance with the CASA medium density obstacle lights are required on turbines, installed in a manner consistent with CASA Manual of Standards 139. Obstacle lighting for aviation safety may also be required both during and prior to the construction period such including lighting for large construction equipment such as cranes.

The key CASA requirements for lighting are:

- Two flashing red medium intensity obstacle lights should be provided per turbine where required.
- The light fixtures should be mounted sufficiently above the surface of the nacelle so that the lights are not obscured by the rotor hub, and are at a horizontal separation to ensure an unobstructed view of at least one of the lights by a pilot approaching from any direction.
- All lights on a wind farm should flash simultaneously.
- Sufficient individual wind turbines should be lit to indicate the extent of the group of turbines.
- The interval between obstacle lighted turbines should not exceed 900m, and the most prominent (highest for the terrain) turbine(s) should be lit.

In addition to the standards of CASA, for operational safety reasons, TransGrid requires the provision for night lighting that is not low-intensity on the switching station. This is would only be used intermittently for operational and emergency maintenance reasons (Wind Prospect CWP).

10.3.2 Potential Visual Impact

Night lighting of the wind turbines would potentially result in the alteration of the night time landscape character of the region. It has the potential to impact receptors including motorists and residents.

Potential visual impacts associated with obstacle marking and lighting at night time have not been extensively researched or tested in New South Wales, although some site investigations have been carried out at existing wind farms in Victoria. Investigations have generally concluded that although night time lighting mounted on wind turbines may 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) may help to minimise the potential visual impact of the wind turbine lights (Epuron 2008).

Existing night lighting is present in the Crudine Ridge area, associated with homesteads dispersed around the study area. Headlights and brake lights from vehicles travelling through the area along local roads create an intermittent source of illumination.

The visual impact from night lighting in the area is unlikely to have a significant visual impact on receptors including motorists and residents in the area. If required, there is a potential for lighting to incorporate shields to minimise the visibility of lighting below the horizontal plane (Refer to Section 14).

As HART Aviation's study outlines, nightlighting is only recommended if turbines exceed 152m. It is very possible a wind turbine height will be selected which is below this threshold and therefore no night lighting would be required. If nightlighting were required it would be in accordance with the recommendations in the Aviation report which describe downward shielding and low light intensity. Measures to further reduce any potential impacts are outlined in the Mitigation Methods section of this report.



Example of obstacle lighting at Waubra Wind Farm (Source: Flickr)



Example of obstacle lighting at Waubra Wind Farm (Source: Flickr)

11.0 CULMULATIVE VISUAL IMPACT

11.1 CUMULATIVE VISUAL IMPACT

Cumulative landscape and visual effects result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it) or actions that occurred in the past, present or are likely to occur in the foreseeable future (The Landscape Institute et al 2008). Cumulative effects may also affect the way a landscape is experienced and can be positive or negative. Where they comprise benefits, they may be considered to form part of the mitigation measures.

The Planning NSW Guidelines state that "Cumulative impacts may result from a number of activities with similar impacts interacting with the environment in a region. They may also be caused by the synergistic and antagonistic effects of different individual impacts interacting with each other and may be due to temporal or spatial characteristics of the activities' impacts."

The landscape and visual assessment for the proposed Crudine Ridge wind farm needs to consider the cumulative effects on the immediate and broader regional context it is part of. The proposal needs to take into account change of scale and the potential for the receiving landscape to accommodate the larger composite feature.

The review of the cumulative impact has several dimensions:

- The impact of the wind farm, when added to the combined impacts of all other existing developments and environmental characteristics of the area.
- The impact of this development in the context of the potential for development of wind energy developments in the local, regional and national context.
- The impact of developments which are ancillary to or otherwise associated with the proposed wind farm eg. the development of transmission lines.
- The potential for future development of wind farms in the region.

11.1.1 Proposed development in the region

In addition to the Crudine Ridge Wind Farm project there are a number of wind farm projects proposed and awaiting approval within the regional context that may commence works in the near future. A plan showing the location of these proposed projects is included as Figure 17 of this report. The distance radius of 12km has been mapped for each proposal to identify any potential visual overlap. The EPHC notes a wind turbine viewed by an observer from a distance of more than 12km is deemed visually insignificant.

It is important to note the Liverpool Range Wind Farm is not shown on Figure 17 due to the distance exceeding 100km.

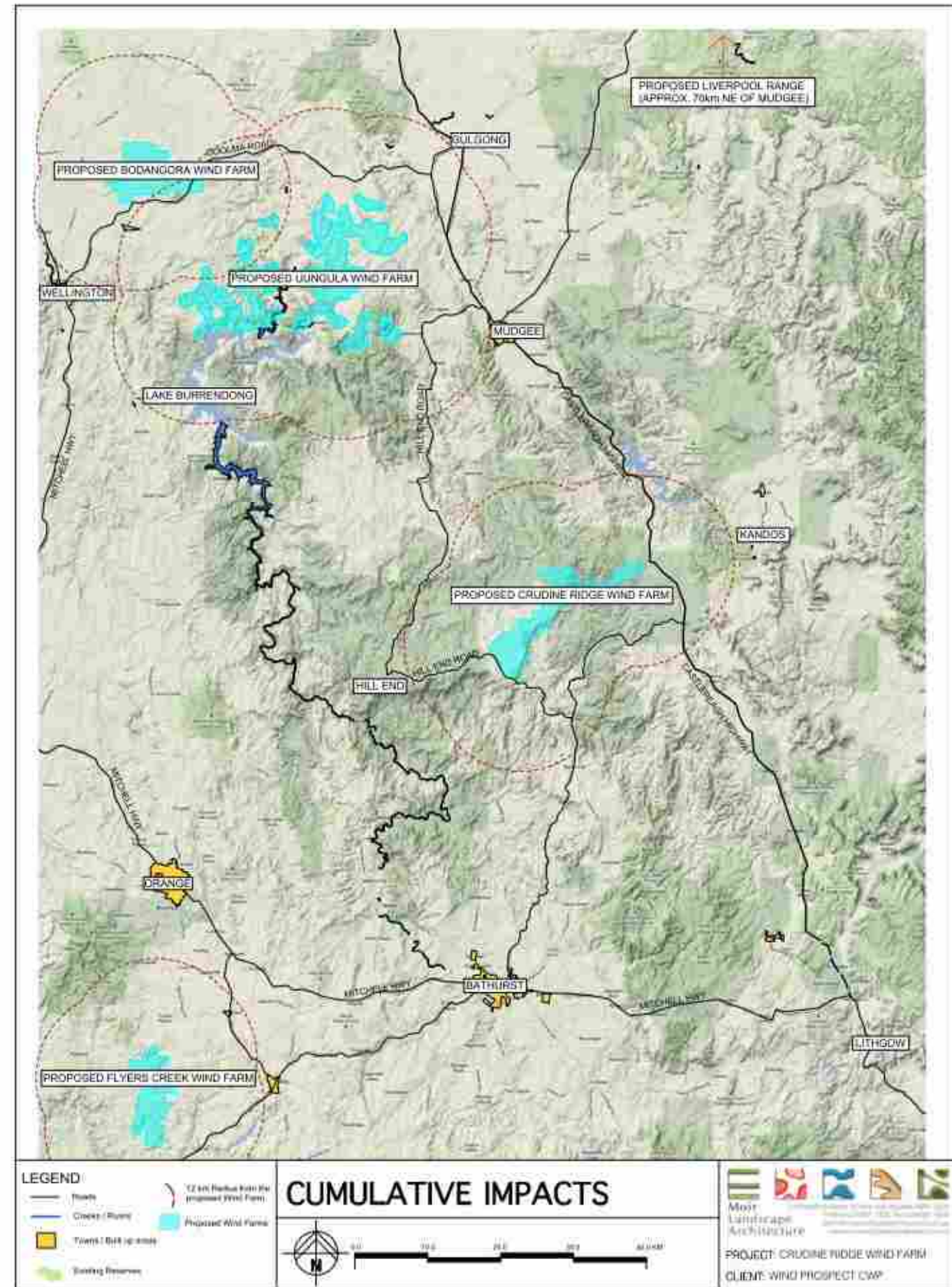


FIGURE 17: Cumulative Impacts Map

11.0 CULMULATIVE VISUAL IMPACT

Proposed wind farm projects in the area (as of July, 2012) have been summarised in the table below.

PROJECT	DISTANCE	NO. OF TURBINES	PLANNING STATUS
Uungula Wind Farm	> 40km North west	Up to 250	DGR's Issued
<p>An application was submitted to the Department of Planning for the proposed Uungula Wind Farm in March 2011 and DGRs have since been issued to the developer. The Uungula Wind Farm proposes up to 250 wind turbines and associated infrastructure located to the south of Mudgee Road on land surrounding Uungula. The Uungula Wind Farm is located over 40 kilometres north west of Crudine Ridge and there are no opportunities to view both wind farms concurrently. The Castlereagh Highway is the closest major transport route passing both wind farms, however Crudine Ridge is not visible from the Highway and there would therefore be no opportunity to view the wind farms sequentially. Hill End Road is a tourist road which runs west from Sofala through to Hill End then north towards Mudgee. Views to Crudine Ridge are accessible from Hill End Road (refer to PM03 & PM04). As the layout is yet to be developed, it is unknown whether the proposed Uungula Wind Farm would be visible from Hill End Road. Due to the distance between the proposals and the low frequency of travel along this specific route, the cumulative impact would be minimal.</p>			
Bodangora Wind Farm	> 70km North west	Up to 33	Exhibition phase
<p>An application was submitted to the Department of Planning and Infrastructure for the proposed Bodangora Wind Farm in December 2011 and the project is currently on exhibition. The Bodangora Wind Farm proposes a maximum of 33 wind turbines located between 40 and 60 kilometres south-east of Dubbo. The Bodangora Wind Farm is located in excess of 70 kilometres north west of Crudine Ridge and there are limited opportunities to view both wind farms from the same location. There are no major transport routes which would allow both wind farms to be viewed sequentially along a single journey.</p>			
Flyers Creek Wind Farm	> 70km South west	Up to 44	Proponent reviewing submissions
<p>An application was submitted to the Department of Planning for the construction of up to 44 wind turbines and associated infrastructure at Flyers Creek, approximately 20 kilometres south of Orange. The proposed Flyers Creek Wind Farm is located over 70km south west of Crudine Ridge and there are limited opportunities for concurrent visibility from the one viewpoint. There are no major transport routes which would allow the proposed wind farms to be viewed sequentially.</p>			
Liverpool Range Wind Farm	> 100km North	Up to 550	DGR's Issued
<p>The proposed Liverpool Range Wind Farm was submitted to the Department of Planning and Infrastructure in February 2011 with DGRs issued in March 2011. The Liverpool Range Wind Farm proposes between 300-500 wind turbines and associated infrastructure. The proposal spans across four Local Government Areas including Warrumbungle, Upper Hunter Shire, Liverpool Plains with transmission lines to the south located within the Mid Western Regional Council. Due to the distance exceeding over 100km between the proposed Crudine Ridge Wind Farm and the proposed Liverpool Range wind farm, there would be no combined visibility. As there are no major travel routes passing both wind farms, there is limited opportunity for sequential viewing along a single journey.</p>			

TABLE 16: Regional Wind Farm Projects Summary

11.1.3 Overview of Cumulative Visual Impact

Due to both the topography of the landscape and the distance between Crudine Ridge and the other proposed wind farms, there is no opportunity to view more than one proposal from a single viewpoint. The nearest proposed wind farm to Crudine Ridge Wind Farm is the Uungula Wind Farm which is in excess of 40 kilometres to the north west.

The potential cumulative visual impact must also be assessed in relation to the potential visual impact when viewed sequentially. If a number of wind farms are viewed in succession as a traveller moves through the landscape (eg. motorist travel routes or walking tracks) this may result in a change in the overall perception of the landscape character. The viewer may only see one wind farm at a time, but if each successive stretch of the road is dominated by views of a wind farm, then that can be argued to be a cumulative visual impact. (EPHC, 2010).

Major travel routes surrounding the proposed wind farms have been identified on Figure 17. The Crudine Ridge Wind Farm is a relatively isolated development, set back from major transport routes and views from these major routes are generally obstructed by topography and vegetation. There are minimal opportunities to view the proposed Crudine Ridge Wind Farm from Hill End Road and the Castlereagh Highway, and therefore it is unlikely it would be viewed in succession with another proposed wind farm along the one journey.

11.1.4 Visual Impact on the Broader Landscape Character

The existing landscape character of the region allows for optimum harvest of wind energy due to elevated topography, expanses of uninhabited land and minimal obstructions in the landscape. These characteristics are beneficial to the output of wind energy and it is likely that overtime this will be utilised.

The reoccurrence of wind farms within a region has the ability to alter the perception of the overall landscape character irrespective of being viewed in a single viewshed. As wind farm developments prevail it is important to determine whether the cumulative effect of wind farms and other major infrastructure within the region would combine to become the dominant visual element, altering the perception of the general landscape character.

The region has the capability to visually accommodate the proposed Crudine Ridge wind farm development when assessed in combination with the other proposed developments without eroding the broad landscape character. The Crudine Ridge Wind Farm is generally obstructed from view by topography and existing vegetation from major transport routes. As the cumulative impact of the proposals in the region is negligible wind farms as an element would not emerge as a dominant feature. Subsequently it is unlikely the perceptions of the regions broad landscape character would be altered as a result of the proposal.

12.0 SUMMARY OF VISUAL IMPACT

12.1 OVERVIEW OF ROADS & RESIDENCES

In addition to the viewpoint assessment and zone of visual influence analysis, the following provides an overview of the potential visibility from residences and roads surrounding the site. The analysis of the visibility from nearby residences has been undertaken using the receptors identified by Wind Prospect CWP within 10km of the project site (See figure 18).

An analysis of these individual receptors was undertaken using a combination of the zone of visual influence, aerial photography and topographic maps. This analysis has been used to provide an overview of the potential visual impact from these public and private receptors and assist in developing mitigation methods. Receptors identified as having a high visual impact were assessed in further detail during the field work and viewpoint analysis process.

A table summarising local influences and the potential visual impact as assessed for each occupied residential property and road within the local area has been included as appendix A of this report.

Aarons Pass Road & Associated Residences

Aarons Pass Road is a minor, unsealed road which connects the Castlereagh Highway to Pyramul. The road runs along a densely vegetated ridge line to the north east of the study area. A total of 11 receptors have been identified along Aarons Pass Road. Of these 11 receptors that have been assessed, it is unlikely there will be a visual impact at any of these residences.

Houses along Aarons Pass Road are typically sited on the northern side of Aarons Pass Road on the northern slopes of the ridge line. The houses are generally orientated to the north to gain solar access and expansive views across to Lake Windamere. A combination of the topography associated with the ridge line and the dense woodland vegetation obstructs any views towards the project site.

Land along Aarons Pass Road to the east, close to the Castlereagh Highway is generally cleared due to soils with higher fertility for grazing. The topography in this area is undulating and views from both the road and properties would be obstructed by the topography.

Travelling along Aarons Pass Road some fleeting glimpse views of the proposed wind turbines may be available, however, travelling west, and closer to the site, the vegetation becomes denser. Considering these factors, and that Aarons Pass is a minor road, there will be no visual impact.

Bombandi Road & Associated Residences

Bombandi Road is a very minor unsealed road running from the Castlereagh Highway, servicing three isolated properties. Views of the proposed wind farm from these receptors would be impeded by a combination of topography and distance. Some glimpse views of the proposed wind turbines may be visible whilst travelling south along Bombandi Road, however these would be very short term and the visual impact would be insignificant.

The proposed overhead power lines will potentially be visible from the southern two residences (BR02 &

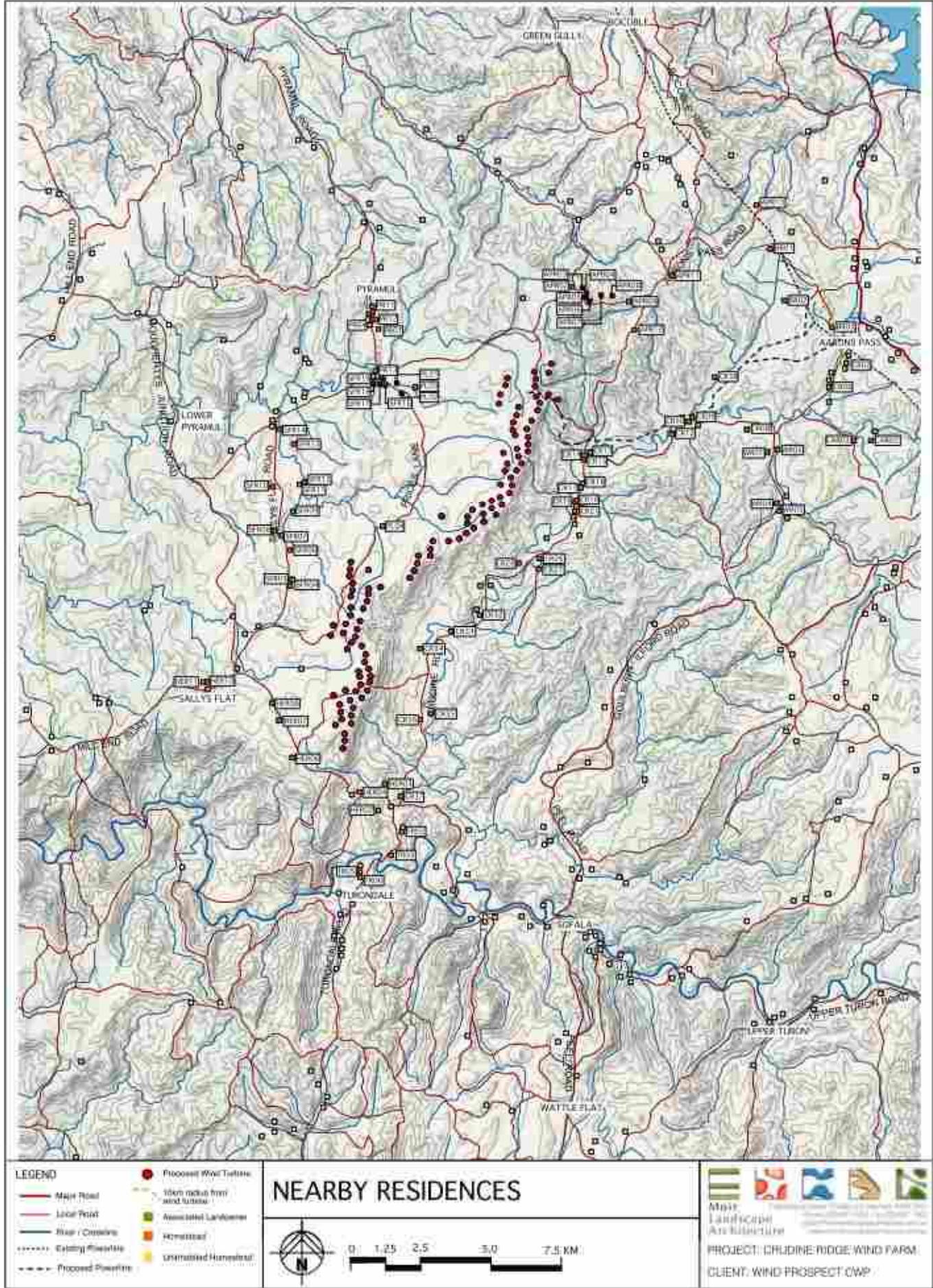


FIGURE 18: Nearby Residences

12.0 SUMMARY OF VISUAL IMPACT

BR03), however these would appear as an extension of the existing power lines in the area and would be seen as a minor visual element in landscape.

Cafes Road & Associated Residences

Cafes Road is a very minor road running off the Castlereagh Highway which services a few homesteads. Two homesteads have been selected as receptors and from both of these a combination of distance, topography and cultural screen planting surrounded the residence restricts views of the proposed wind farm. In addition, the direction of travel and low use of the road will also impede any potential views. There will be no visual impact resulting from the proposed wind farm on Cafes Road.

Castlereagh Highway

There are a number of isolated homesteads to the east of the Castlereagh Highway, however as the distance to the wind farm exceeds 10 kilometres from these properties they have not been assessed as receptors in this report. There is the potential for motorists travelling along the Castlereagh Highway to view the proposed wind farm. However a combination of intermittent roadside vegetation, the speed of travel along this road, direction of view and distance from the site would limit potential views to fleeting glimpses which would be unnoticeable.

Crudine Road & Associated Residences

A number of isolated residential properties associated with Crudine Road are located close to the Site. Crudine Road runs along the base of the Crudine Valley running along the Crudine Creek. A total of 25 occupied homesteads were selected as receptors by Wind Prospect CWP and assessed as part of this LVIA ranging from nil to high.

The overall visual impact from each homestead varies depending on a variety of factors including: the orientation of the house, topography, distance and local landscape features (eg. wind break planting, topography etc.). Typically, the homesteads associated with Crudine Road are generally orientated towards the road.

The potential visual impact felt by motorists ranges from low to high along Crudine Road. Travelling along Crudine Road, the visual impact is likely to be moderate along the southern portion of the road, and significantly lessened as motorists reach the northern section of the road. Existing vegetation along the roadside will assist in filtering views towards the proposed wind turbines.

Receptors with a higher visual impact are also likely to be those towards the southern end of Crudine Road. This is due to their close proximity to the wind turbines, the topography and a lack of native vegetation. Towards the northern end of Crudine Road, the road runs in a north eastern direction, veering away from Crudine Ridge. Views from houses along the northern end of Crudine Road are likely to be obstructed by topography.

Established screen planting is common around homesteads generally to the west to block sunlight. This screen planting will in some cases assist in reducing potential views from homesteads.

Hill End Road & Associated Residences

Hill End Road is a tourist road which generally navigates along the route of the Turon River. A total of 8 receptors have been identified and assessed for Hill End Road. Of the 8 receptors assessed, all have nil to low visual impact.

The undulating topography combined with roadside screen planting along Hill End Road and surrounding homesteads lowers the potential visual impact along Hill End Road and from associated residences. Travelling along Hill End Road some views of the proposed wind farm will be visible, however these views will be short term due to the changes in the direction of view along the road. Roadside vegetation is predominant along the northern edge of Hill End Road, reducing views from most sections of the road to glimpses.

Prices Lane & Associated Residences

Prices Lane is a minor unsealed road servicing several isolated homesteads. Four homesteads have been selected as receptors. These four receptors have been assessed as having a low to moderate visual impact.

From Prices Lane the proposed wind farm is located in a generally eastern direction from the road. The proposed wind farm will lie to the east of Prices Lane, while homesteads are orientated predominantly to the north to maximise solar access. Retained vegetation is common throughout the landscape, assisting in screening views towards Crudine Ridge.

Views of the proposed wind farm are available travelling in a southern direction along Prices Lane. Some retained roadside vegetation, the low frequency of vehicular movement and the speed of travel along the road minimises the visual impact.

Pyramul Road & Associated Residences

Pyramul Road is a sealed local road which runs in a north easterly direction from Windeyer to Pyramul. Travelling along Pyramul Road in a southern direction, some very short term glimpse views may be available however views are predominantly screened to the south due to the undulating topography and roadside planting.

The proposed wind turbines would not be visible from residences associated with the town of Pyramul. The residences are located in a group, orientated in an east or west direction towards the road. Screen planting associated with the properties and along the road in this area contain views.

Some isolated homesteads are located along Pyramul Road, however views from these homesteads are generally obstructed by topography, distance and screen planting.

12.0 SUMMARY OF VISUAL IMPACT

Sallys Flat Road & Associated Residences

Sallys Flat Road is a minor, unsealed road which runs from Pyramul Road to Hill End Road along the western foothills of the Crudine Ridge. Sallys Flat Road services a number of isolated homesteads, with a total of 15 being included as receptors for this report.

Travelling along Sallys Flat Road, dense roadside vegetation is likely to screen views to the proposed wind turbines for the most part. A number of houses along Sallys Flat Road are surrounded by dense screening vegetation.

The highest visual impact is likely to be felt from the southern section of Sallys Flat Road due to the close proximity of the proposed wind turbines. Some existing screen planting may assist in reducing the visual impact which has been rated as moderate for Sallys Flat Road and the associated residences.

Turondale Road & Associated Residences

Turondale Road is located to the south of the Site and runs along the valley associated with the Turon River. A number of isolated residences are located along Turondale Road, however four inhabited homesteads have been used as receptors. Of these four receptors the proposed wind farm will be visible from two, having a very low visual impact.

Houses along Turondale Road are generally surrounded by a moderate coverage of native vegetation as, due to the slope and low soil fertility, the area is unsuitable for agricultural use. Views to the proposed wind farm will be available for vehicles travelling in a northern direction only. The visual impact travelling north would be low as the undulating topography, roadside vegetation and windy road limit views to glimpses. It has been assessed that there will be a low visual impact from Turondale Road and the associated residences.

Warrangunia Road & Associated Residences

Warrangunia Road runs south from Crudine Road, following a tributary of Crudine Creek and connects to the Goulburn- Ilford Road. A total of four receptors have been identified along the road. The road runs through a small valley and views are contained to the road by the surrounding undulating topography. Travelling along Warrangunia Road, the proposed wind turbines will not be visible due to the topography and distance to the Site. The proposed wind turbines will be screened from residences assessed for this report.

12.2 SUMMARY OF VISUAL IMPACT

Wind turbines create a strong contrast in the landscape as a result of their large scale and lack of visual integration. To take advantage of the climatic conditions of the region, the proposed Crudine Ridge wind turbines are sited at high altitudes along a visually prominent ridgeline. As a result the proposed wind turbines are likely to be visible from a number of locations throughout the Study Area.

Due to the large scale and significant contrast to the rural landscape, the proposed turbines will most likely become a dominant feature of the landscape when viewed within a close proximity. The highest visual impact of the proposed development has been assessed from areas within a 2km radius of the Site. As a result of their close proximity to the proposal, the highest visual impact is likely to be felt from Sallys Flat Road and Crudine Road. Crudine Ridge currently forms a dominant visual backdrop to Crudine Road and Sallys Flat Road, and the addition of the proposed wind turbines along the ridgeline will undoubtedly have a significant effect on the existing visual landscape.

The visual effects of the wind turbines are lessened as the distance from the Site is increased. Due to the undulating topography of the landscape surrounding the proposed wind farm, there are limited opportunities to view the proposal in its entirety. An overview of the roads found that due to a combination of existing roadside vegetation, local alterations in topography and the distance of roads from the site, the visual impact for motorists would typically be low.

A number of isolated residences are located close to the Site however, due to a variety of factors, visual impacts vary between receptors. Screen planting and areas of retained native vegetation form part of the existing landscape character of the area. The proposed mitigation methods included in section 14 of this report aim to build on the existing landscape character to assist in ameliorating the potential visual impact resulting from the proposal. If mitigation methods are employed it is likely the visual impact of the proposal could be significantly reduced.

13.0 COMMUNITY PERCEPTION

13.1 COMMUNITY PERCEPTION

Research from previous projects, both national and international has found that community perceptions and general acceptance of wind farms varies greatly. Viewers perception of cultural and natural elements is difficult to define and can differ on the basis of a variety of elements eg. whether the viewer is a resident or a visitor.

According to Gipe (1995) 'People unconsciously realise that opposition on aesthetic grounds is subjective, and is therefore, often dismissed by public officials. Opinion shapes policy and aesthetics, or how the public views the wind industry, shapes opinion. Stanton (1995) puts forward that wind farms should not be judged solely on their visual properties ; indeed, they may be greatly valued for other qualities, such as what they symbolise.

As visual resources belong to the public it is of utmost importance to utilize guidelines derived from background research and past experience to ensure the outcomes contribute positively to the evolving landscape character of the area.

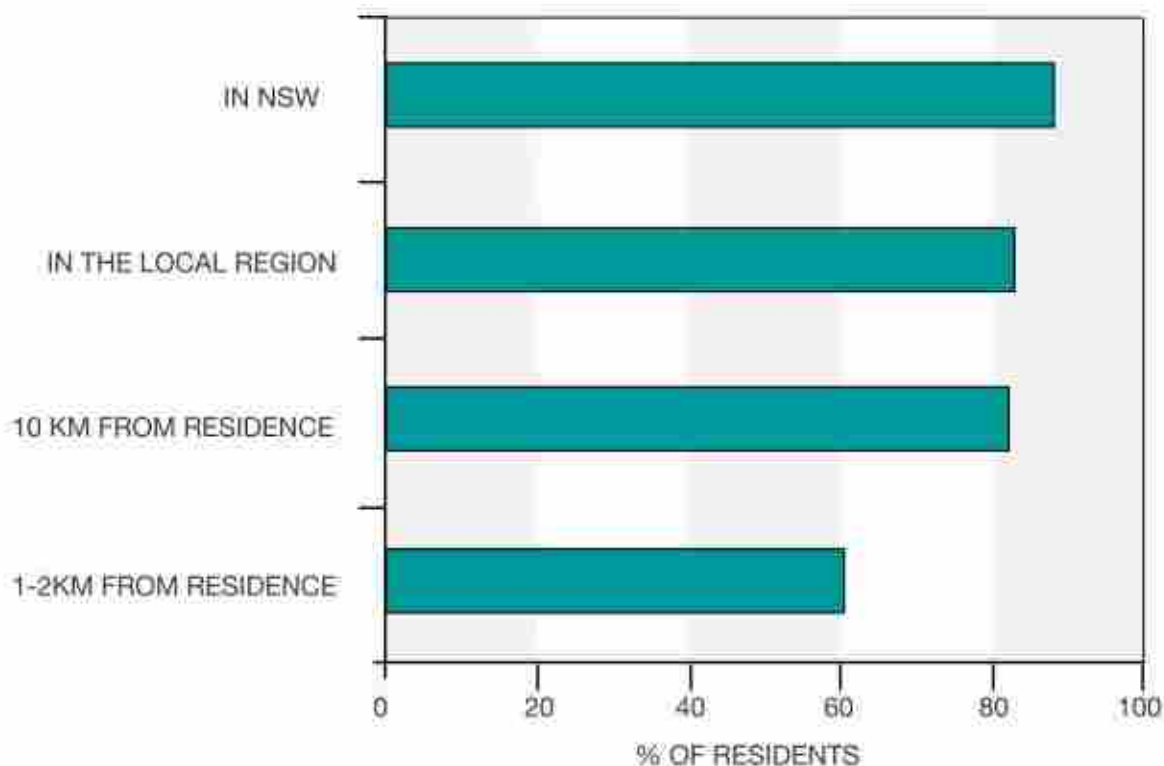


FIGURE 19: Support for Wind Farms in NSW (EPHC)

13.1.1 Community perception of Crudine Ridge Wind Farm

Since the project was announced in March 2011, Wind Prospect CWP has received a high degree of support for the proposed project both informally through conversations with community members and formally through responses to surveys.

The results of the survey found that the majority of the community was supportive of the proposal.

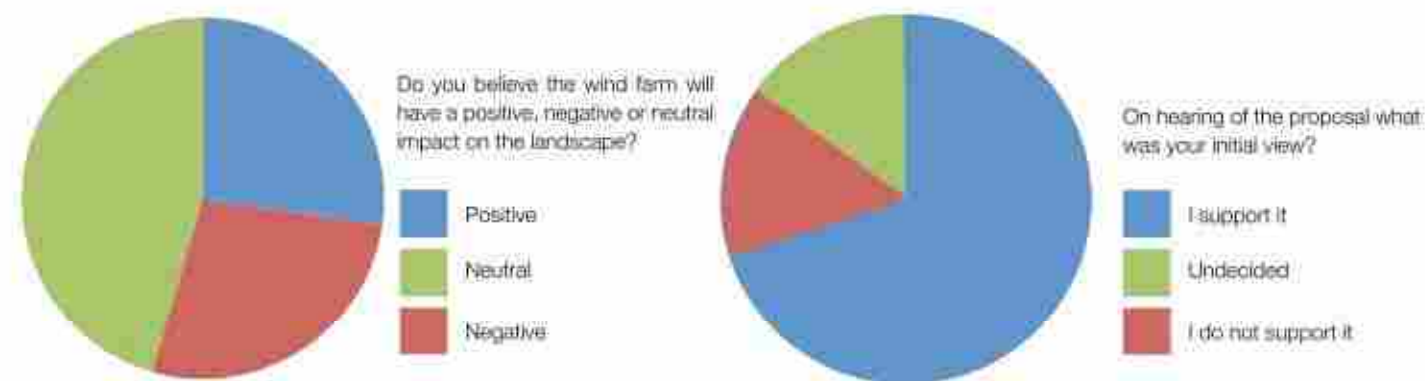


FIGURE 20: Support for Crudine Ridge (Source: Wind Prospect CWP, September 2011)

13.1.1 Community benefits of Crudine Ridge Wind Farm

Construction of the Crudine Ridge Wind Farm can have a positive effect on the local economy through increased demand for local goods and services during the feasibility, construction, and operation phases of development. Ways in which the Crudine Ridge Wind Farm can have a positive effect on the economy and local community include;

- The creation of temporary employment during the construction phase of the development; and permanent jobs during the lifetime of the wind farm.
- Contribution to the Federal Government's enhanced Renewable Energy Target (RET) of 20% by 2020.
- Additional energy supply to help meet the growing demands across the State.
- Wind Prospect developments include the establishment of a Community Fund. The purpose of the Fund is to provide support for the local community to develop, maintain, and enhance facilities, amenities, projects and activities in the region. The Community Fund can be administered by local community representatives with assistance from the local council and is usually established around the time that the wind farm begins producing electricity. (Source: Wind Prospect CWP)

13.0 COMMUNITY PERCEPTION

13.2 COMMUNITY & STAKEHOLDER CONSULTATION

Since the announcement of the Wind Farm on the 7th of March 2011, consultation has been undertaken with both stakeholders and the community.

A summary of the consultation process to date is outlined in Table 17 below.

PROJECT ACTIVITY	APPROXIMATE DATE
Project Announced	March 2011
Face-to-face meetings, Newsletter #1, Opinion Survey #1, Website, News & Radio	
Presentation to Council	
Letters to 37 Key Stateholders	
Public Open Day #1	July 2011
Face-to-face meetings, Newsletter #2, Opinion Survey #1, Website, News & Radio	
Brief Presentation to Council	
Formal Presentation to Council	Between November 2011 to January 2012
Public Open Day #2	
Face-to-face meetings, Newsletter #3, Website, News & Radio	
Project Exhibition	Quarter 1 & 2 2012
Public Comment	
Project Determination	
Community Information Dissemination	Ongoing

TABLE 17: Summary of Community Consultation

Community consultation and engagement is key to the success and acceptance of large infrastructure projects. A community information day was held on the 13th of July 2011, at Pyramul Town Hall. All landowners within 3km of the project were contacted directly and informed of the details in addition to a notice advertising the details in the Mudgee Guardian.

Wind Prospect CWP has also set up a website which provides community members and stake holders with up to date information on the wind farm project.



Photographs taken at the Public Open Day on July 13th at Pyramul Hall.

14.0 MITIGATION METHODS

14.1 SUMMARY OF MITIGATION METHODS

These recommendations seek to achieve a better visual integration of the proposal and the existing visual character at both local and regional scales. The mitigation measures attempt to lessen the visual impact of the proposed wind farm extension whilst enhancing the visual character of the surrounding environment.

Mitigation measures are best considered as two separate phases. These include:

- primary measures that forms part of the development of design through an interactive process;
- secondary measures designed to specifically address the remaining (residual) negative (adverse) effects of the final development proposals (The Landscape Institute et al 2008).

A range of methods for mitigating the visual impact of the proposed Crudine Ridge Wind Farm have been identified and are outlined in this section of the LVIA. The recommendations seek to achieve a better visual integration of the proposed Crudine Ridge Wind Farm and retention of existing landscape character at both local and regional scales.

It is important to note that the mitigation methods proposed in this report are made notwithstanding issues raised by other consultants (eg. engineering, ecology, geology etc.). During planning and design, some or all of the the wind farm should consider following mitigation strategies to lessen the visual impact of the proposal. This is by no means an exhaustive list, however the adoption of these recommendations will assist considerably in ensuring the proposal contributes positively to the visual quality and character of the area.

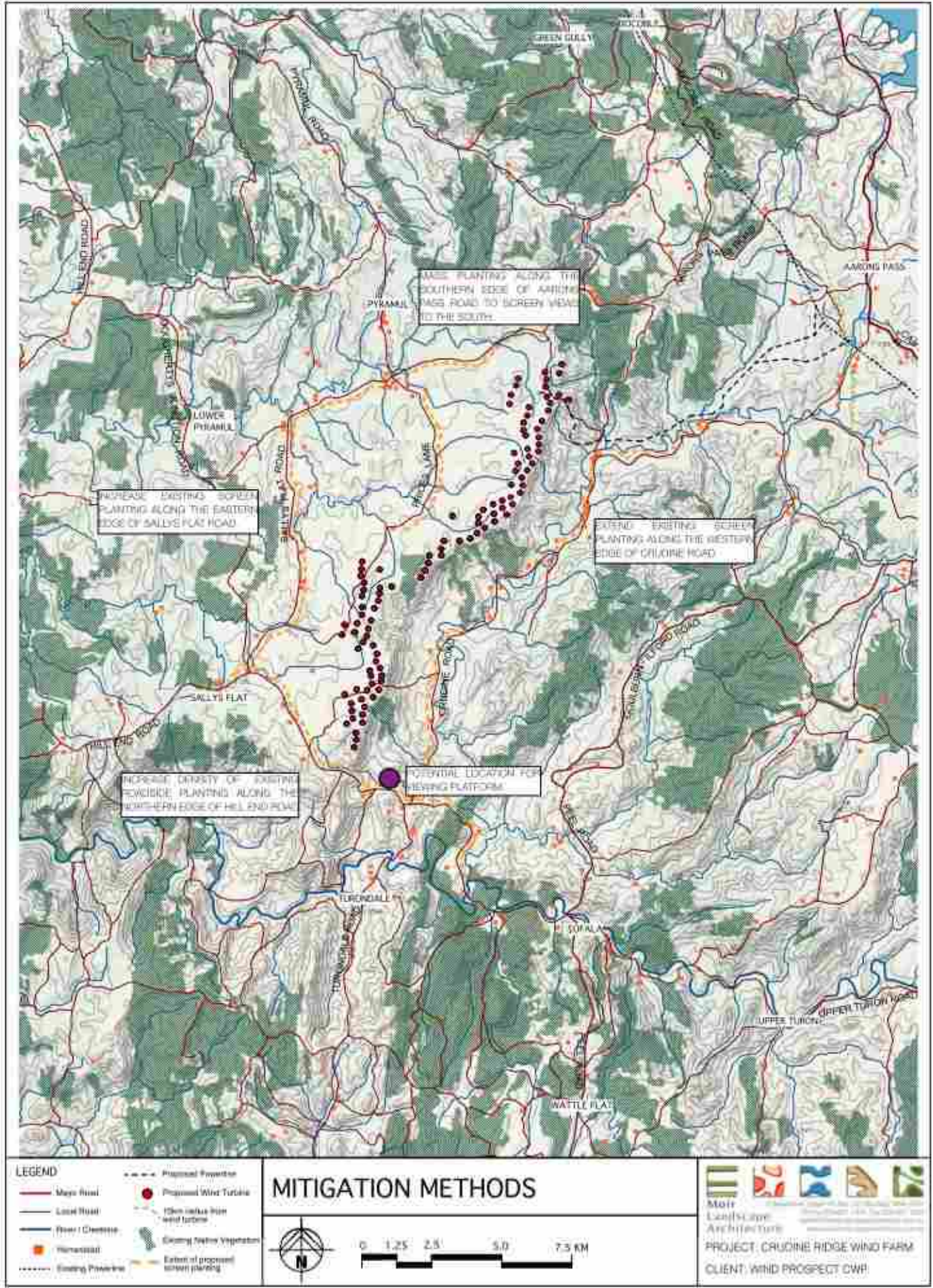


FIGURE 21: Mitigation Methods

14.0 MITIGATION METHODS

14.2 WIND FARM DESIGN CONSIDERATIONS

The design of the proposed wind farm is a primary measure of mitigation. The general principles employed through the project design phase can significantly reduce the visual impact. These include siting, access, layout and other principles which directly impact the appearance of the proposed development. General guidelines for the design development of the proposed wind farm have been outlined in the following section.

14.2.1 Wind Turbines Layout and Size

The layout and size of the wind farm is a significant factor in the visual impact on the landscape. According to Stanton (1995) the intrusiveness of a wind plant is not directly proportional to the number of turbines in an array, and instead, more a factor of design feature. For example, large wind plants (defined as more than 70 turbines) may appear less dominating than a smaller project when the large wind plant is subdivided into several visually comprehensible units.

It is suggested that fewer and more widely spaced turbines present a more pleasing appearance than tightly packed arrays. (URBIS, 2009)

The following principles should guide the design process of the wind farm:

- Controlling the location of different turbine types, densities and layout geometry to minimise the visual impacts.
- The lines of turbines should reflect the contours of the natural landscape as best as possible.
- Ensure the turbines are evenly spaced to give a regular pattern creating a better balance within the landscape.

14.2.2 Wind Turbine Design and Colouring

Turbine design and colouring are an important factor. The turbines have a matte white finish and consist of three blades which is consistent with the current turbine models being considered. It is understood that wind turbines with three blades are generally more balanced than turbines with only two blades (Arkesteijn and Westra, 1991).

The important factors to achieving a visual consistency through the landscape include:

- Uniformity in the colour, design, rotational speed, height and rotor diameter.
- The use of simple muted colours and nonreflective materials to reduce distant visibility and avoid drawing the eye.
- Blades, nacelle and tower to appear as the same colour.

14.2.3 Associated Infrastructure

The following section outlines principles to assist in reducing the visual impact of the associated infrastructure.

ACCESS ROADS

- Existing access roads will be utilised as much as possible to reduce the need for new roads.
- Allow for the provision for down sizing roads or restoring roads to existing condition following construction.
- Where possible utilise or upgrade existing roads, trails or tracks to provide access to the proposed turbines.
- Any new roads must minimise cut and fill and avoid the loss of vegetation.

TRANSMISSION LINES

- Where possible underground cabling is to be used to connect wind turbines to the electricity grid.
- Utilise existing transmission lines where possible.
- The route for any proposed overhead transmission lines should be chosen to reduce visibility from surrounding areas.

GENERAL PRINCIPLES

- No above ground infrastructure apart from the turbine itself and the transformer at the base of the turbine.
- Avoid the use of brand names and logos etc.
- Avoidance of unnecessary lighting, signage on fences, logos etc.
- Consideration should be given to controlling the type and colour of building materials used especially with the use of light, highly reflective cladding and brick and tile materials which contrast dramatically with the landscape character.
- Any proposed buildings to be sympathetic to existing architectural elements in the landscape.
- Minimise cut and fill throughout the construction process

14.0 MITIGATION METHODS

14.3 LANDSCAPING AND VISUAL SCREENING

Visual screen planting is a beneficial mitigation method used to assist in the reduction of the wind farms visual impact. Wind break screen planting around homesteads and along property boundaries and roadsides forms part of the existing visual character of the Crudine Ridge region. General guidelines to adhere to when planning for landscaping and visual screening include:

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

In order to achieve concealment of the proposed wind turbines from certain viewpoints, screen planting is to be undertaken. The existing character of the landscape allows for a variety of methods of visual screening which will remain in keeping with the landscape character.

Foreground visual planting is to be undertaken in areas of high visual sensitivity, such as close to residences and other areas requiring amelioration. Due to the large scale nature of the wind turbines, the most effective method of visual mitigation is through off-site screen planting. This is best undertaken close to the viewpoint. Locations of recommended foreground visual screening are shown in Figure 21 and examples of screen planting in place are demonstrated in the Figure 22 below.

In circumstances where residences are subject to a high level of visual impact, screen planting is proposed. In order to achieve visual screening planting between the intrusive element and the homestead, tree planting should be undertaken in consultation with the relevant landowners to ensure that desirable views are not inadvertently eroded or lost in the effort to mitigate views of the turbines.

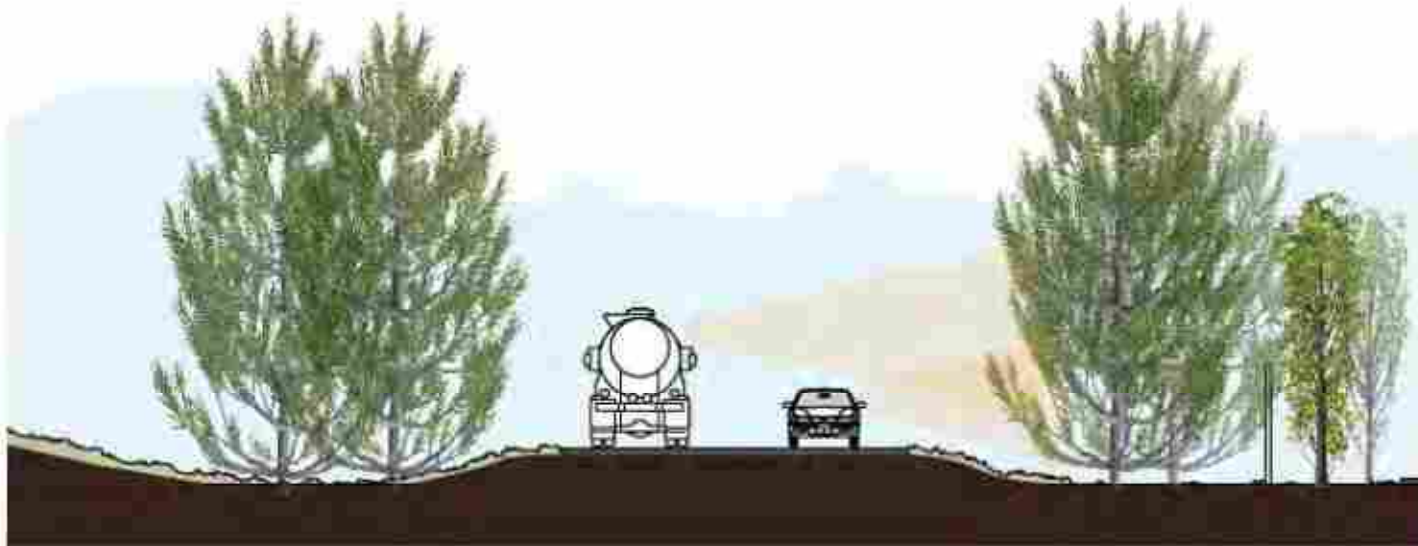


FIGURE 22: Example of roadside screen planting

As roadside planting is a character of the landscape, there is an opportunity to increase the density and extent of roadside planting through the study area. Hill End Road, Crudine Road, Sallys Flat Road and Prices Lane provide opportunities for screen planting to reduce the visual impact for motorists. Screen planting around homesteads may assist in the amelioration of visual impact from receptors with a potentially high visual impact.

14.3.1 Screen Planting- Photomontage



Photomontage of proposed wind turbines from CW27.



Photomontage of proposed wind turbines from CW27 with mature screen planting.

FIGURE 23: Photomontage mitigation method- Screen Planting.



Photomontage of proposed wind turbines from CW10- Hill End Road.



Photomontage of proposed wind turbines from CW10 with mature screen planting.

FIGURE 24: Photomontage mitigation method- Roadside Planting.

14.0 MITIGATION METHODS

14.4 NIGHT LIGHTING

Security lighting throughout the wind farm, switching station and the substation should be minimised to decrease the contrast between the wind farm and the nighttime landscape of the area. Motion detectors should be used to activate nighttime security lighting when required, which would only be intermittently for operational and emergency maintenance reasons.

If used, air navigation lights should be spaced over the array, particularly at the extremities. They are not required on every tower. According to the CASA requirements, shielding may be provided to restrict the downward spill of light to the ground plane through the following measures:

- No more than 5% of the nominal light intensity should be emitted at or below 5° below horizontal (Refer to Figure 24).

To assist in the amelioration of the effect of night lighting the following should be applied:

- No light should be emitted at or below 10° below horizontal. (Refer to Figure 24).
- Where two lights are mounted on a nacelle, dynamic shielding or light extinction for the period that a blade is passing in front of the light is permissible providing that at all times at least one light can be seen, without interruption, from every angle in azimuth.
- Treatment of the rear of blades with a non-reflective coating to reduce reflection off the rotating blade at night.

The CASA lighting requirements should be monitored by proponents and shielding or lower light should be implemented to lower illumination as much as possible.

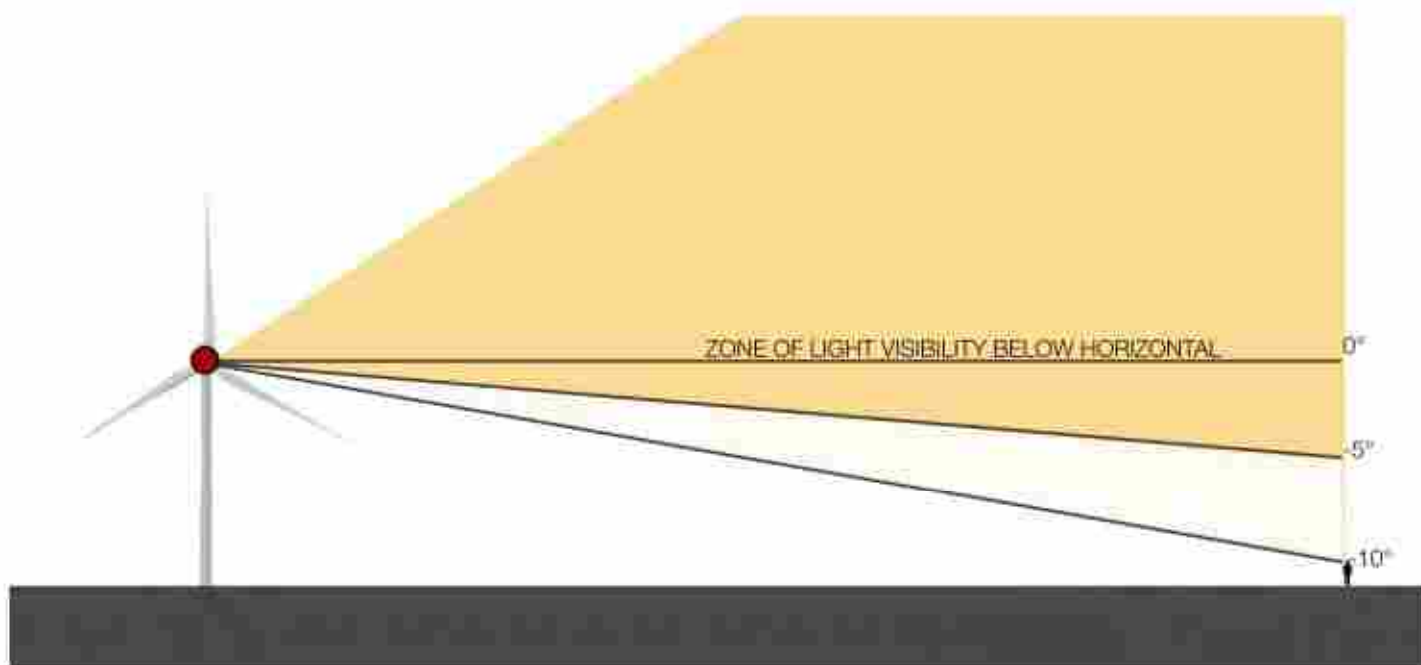


FIGURE 25: CASA Recommended Obstacle Lighting Spread (Adapted from Urbis 2009)

14.5 VISUAL OPPORTUNITIES

The proposed Crudine Ridge Wind Farm is a progressive development for renewable energy which, due to the relatively large scale renewable energy production is often of viewing interest to the wider community, and to facilitate this, viewing platforms or areas may be considered. Opportunities exist for the provision of educative viewing areas at various locations around the site. The integration of a viewing area where visitors would be able to safely view the wind farm, and surrounding landscape would be a positive attribute to the development. Combined with interpretive signage these viewing areas would provide insight into the function, output and benefits of large scale wind farms.

A possible locations for a viewing area has been identified on Figure 21 on Hill End Road.



Waubra Wind Farm Viewing Platform (Source: Joh Architects)



Informative Signage- Hopetoun WA.



Informative Signage- Starfish Hill Wind Farm

15.0 CONCLUSION

The proposed development will produce renewable energy for up to 80,000 homes, and is located in an area of low inhabitancy. However, it is inevitable that the placement of wind turbines in the rural landscape will alter the existing landscape character of the area to some degree.

The Crudine Ridge Wind Farm will result in impacts on the existing surrounding environment in terms of landscape and scenic values. The proposed wind farm contrasts with the existing landscape character of the region which is typically rural, pastoral land with large expanses of vegetation.

With all visual impact assessments the objective is not to determine whether the proposed impact is visible or not visible, but to determine how the proposal will impact on the existing visual amenity, landscape character and scenic quality. If there is potential for negative impact, this impact, and any mitigation methods must be investigated in order to reduce the impact to an acceptable level.

Although this LVIA quantifies the visual impact of the proposed wind turbines, the overall visual impact of the wind farm will vary greatly depending on the individual viewers sensitivity to and acceptance of change. The sensitivity towards change varies greatly depending on the users connection with the landscape. For example visitors to the region travelling along Hill End Road may perceive the wind farm as an interesting feature of the landscape. This may contrast with a residents perception of the visual presence of the wind farm who may be more critical of the development.

The greatest visual effect is most likely to be felt from residents in the immediate vicinity of the wind farm. However, in most instances the homesteads have dense screening vegetation protecting the house from strong winds which may assist in screening views to the wind farm.

The visual effects of the wind turbines are lessened as the distance of the vantage point from the Site is lengthened. The topography surrounding the wind turbines significantly alters the visibility of the proposed development from many vantage points. Within the local setting, a combination of the topography and local influences such as existing natural and introduced vegetation significantly reduce visibility towards the proposed turbine locations.

Amelioration methods incorporated into the design process in conjunction with landscape and visual screening will have a positive effect on reducing any visual impact of proposed wind farm. Through mitigation methods described it will be possible to significantly reduce the visual impact to an acceptable level at sensitive viewpoints such as rural residential properties.

Wind turbines have the potential to create a strong contrast in the landscape as a result of their large scale and lack of visual integration. However due to their simplicity in form (especially when compared to transmission lines, towers and associated infrastructure) wind turbines can be considered a temporary installation in the landscape due to their modular construction and relatively low impact during the construction phase.

Overall, Crudine Ridge Wind Farm would have a low to moderate visual impact within the local context. Through the implementation of mitigation methods as recommended in the report and ongoing consultation with local residents, the potential visual impact could be significantly reduced to a very low range.

When implemented with appropriate environmental management, the development of wind farms can

be undertaken with low impact on the surrounding environment whilst providing positive local, regional and national benefits.

It is the professional opinion of Moir Landscape Architecture that the social, environmental and economical benefits of the proposed wind farm far outweigh the identified visual impacts associated with the proposed Crudine Ridge Wind Farm.

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APPENDIX A. SUMMARY OF VISUAL IMPACT

A.1 Summary of visibility from nearby residences

RECEPTOR	INVOLVED LANDOWNER	DISTANCE TO NEAREST PROPOSED WIND TURBINE	POTENTIAL % OF VISIBLE TURBINES (BASED ON ZVI-Worst case scenario)	POTENTIAL VISUAL IMPACT	DESCRIPTION / COMMENTS
AARONS PASS ROAD					
APR02 - 831 Aarons Pass Road	NO	2.84 km	30%	-	Extensive retained vegetation typical of the Aarons Pass LCU surrounds the house in all directions. Views of the proposed wind farm will be screened by this vegetation and therefore there will be no visual impact.
APR03 - Unknown	NO	2.96 km	30%	-	A local rise to the south of the residence obstructs views to the proposed wind farm. In addition a combination of vegetation and the orientation of the residence further eliminates any potential visual impact.
APR04 - Kaleth	NO	2.84 km	30%	-	The property is surrounded by dense woodland vegetation both on the property and along Aarons Pass Road. Views from this homestead are contained by the vegetation and therefore views to the proposed wind farm are obstructed.
APR05 - 907 Aarons Pass Road	NO	2.66 km	30%	-	The property is located on the northern slope of the ridgeline and views extend to the north (looking away from the proposed wind farm). In addition to this a combination of topography and vegetation screen views to Crudine Ridge.
APR06 - Dusty Height	NO	2.73 km	90%	-	The residence is located on the northern slope of the ridgeline. The house is surrounded by dense woodland vegetation retained on the property and views towards the proposed wind farm are inhibited.
APR07	NO	3.06 km	10%	-	The property is sited on a local rise in elevation and surrounded by dense retained woodland vegetation. Views from the residence would be obstructed by the dense vegetation.
APR08 - 1005 Aarons Pass Road	NO	3.26 km	-	-	The residence is surrounded by an extensive coverage of retained woodland vegetation in all directions. In addition to the screening provided by the vegetation, views are impeded by topography.
APR09 - 1081 Aarons Pass Road	NO	3.57 km	90%	-	The residence is surrounded by dense vegetation in all directions. Views of the proposed wind turbines would be screened by a combination of the dense vegetation and local rises in topography.
APR10 - Glencoe	NO	3.24 km	10%	-	The residence, to the west of the property, is orientated to the north, away from the site. In addition, a combination of dense screen planting to the west and retained vegetation to the south would eliminate any potential view of the site.
APR11 - 1276 Aarons Pass Road	NO	5.30 km	10%	-	The residence is orientated to the east and the study area is located to the south west of the property. The proposed wind turbines would therefore not be visible.
APR13 - Riama	NO	9.32 km	-	-	Undulating topography and distance prevents views to the site from this receptor.
BOMBANDI ROAD					
BR01	NO	8.91 km	-	-	Property at the northern end of Bombandi Road, Views are impeded by a combination of distance and topography.
BR02- Walteela	NO	8.73 km	10%	-	Views from this residence are contained by a minor ridge line to the south west of the property. The proposed wind farm will not be visible from this receptor. The proposed power line may be visible, however existing power lines run to the east of the property, so additional lines would have a negligible visual impact.
BR03- Eldon Court	NO	10.27 km	-	-	Sloping topography in the foreground of views from the residence inhibit views of the proposed wind farm. The proposed power line may be visible from this residence, however existing power lines are already a visual element in the landscape and therefore the potential visual impact will be insignificant.

TABLE A1: Summary of occupied nearby residences- Aarons Pass Road & Bombandi Road

APPENDIX A. SUMMARY OF VISUAL IMPACT

RECEPTOR	INVOLVED LANDOWNER	DISTANCE TO NEAREST PROPOSED WIND TURBINE	POTENTIAL % OF VISIBLE TURBINES (BASED ON ZVI-Worst case scenario)	POTENTIAL VISUAL IMPACT	DESCRIPTION / COMMENTS
CAFES ROAD					
CAR02	NO	10.77 km	10%	-	Views to the west in the direction of the proposed wind turbine are obstructed by a local rise in topography. There will be no visual impact from this receptor.
CAR03 - Waterview	NO	11.36 km	-	-	A combination of topography and screen planting surrounding the receptor impede views of the proposed wind farm.
CRUDINE ROAD					
CR02 - Donasville	YES	10.41km	-	-	Views of the proposed wind turbines would be obstructed by topography from this homestead.
CR06 - Nolac	YES	9.66km	10%	-	Views of the proposed wind turbines would be obstructed by topography & vegetation from this homestead.
CR08 - Waterview	YES	6.82km	20%	NIL -LOW	For the most part, views of the proposed wind turbines would be obstructed by topography from this viewpoint. Some turbines may be visible in the distance.
CR09 - Unknown	NO	4.84km	10%	NIL -LOW	For the most part, views of the proposed wind turbines would be obstructed by topography from this viewpoint. Some turbines may be visible in the distance.
CR10 - Rossvale	YES	4.68km	50%	LOW	Homestead is orientated to the north, away from the proposed wind turbines. Screen planting surrounds the homestead. Views would be limited and the visual impact from this house would be low.
CR12 - Waverly	YES	4.31km	50%	NIL -LOW	Views from this homestead would be obstructed by a combination of topography, ancillary buildings adjacent the house and screen planting.
CR13 - Athlone	YES	2.27km	50%	NIL -LOW	Homestead appears to be orientated towards the north, away from the proposed wind turbines. The homestead is surrounded by screen planting and farm ancillary buildings which would screen views of the proposal.
CR14 - Athlone	YES	2.04km	50%	NIL -LOW	Homestead appears to be orientated towards the north, away from the proposed wind turbines. The homestead is surrounded by screen planting and farm ancillary buildings which would screen views of the proposal.
CR15 - Glenvale	NO	2.07km	50%	LOW	House appears to be orientated towards the north east away from the proposal. A combination of screen planting, ancillary buildings and farm equipment would filter views of the proposed wind turbines from the homestead.
CR16 - Havelock 2	NO	2.31km	50%	LOW - MODERATE	Views of the proposed wind turbines would be filtered by existing riparian vegetation associated with Crudine River.
CR18 - Glen Daire	NO	2.36km	80%	MODERATE	Homestead appears to be surrounded by dense screen planting. Views of the proposed would be filtered, however due to the close proximity the visual impact has been assessed as moderate from this homestead.
CR19 - Unknown	NO	2.35km	70%	MODERATE	Homestead appears to be orientated towards the north east and is surrounded by dense screen planting. Views of the proposal would be limited, however due to the close proximity the visual impact would be moderate.

TABLE A2: Summary of occupied nearby residences- Cafes Road & Crudine Road

APPENDIX A. SUMMARY OF VISUAL IMPACT

RECEPTOR	INVOLVED LANDOWNER	DISTANCE TO NEAREST PROPOSED WIND TURBINE	POTENTIAL % OF VISIBLE TURBINES (BASED ON ZVI- Worst case scenario)	POTENTIAL VISUAL IMPACT	DESCRIPTION / COMMENTS
CRUDINE ROAD					
CR21 - 1548 Workers Cottage	NO	2.40km	70%	MODERATE-HIGH	Homestead appears to be orientated to the north west towards the proposed wind turbines. The proposed wind turbines would be visible from this viewpoint.
CR24 - Squatters Gully	NO	2.93km	90%	MODERATE-HIGH	The majority of the proposed wind turbines will be visible from this homestead. Some screen planting surrounds the house which will reduce the views to filtered views.
CR25 - Rose Hill	YES	2.06km	50%	MODERATE-HIGH	It is likely views of the proposed turbines would be unobstructed from this homestead. Although some screening does exist, views from this property would be highly modified. Note: Abandoned House.
CR26 - Rivendell	NO	2.27km	60%	MODERATE-HIGH	It is likely views of the proposed turbines would be unobstructed from this homestead. Although some screening does exist, views from this property would be highly modified.
CR27 - Willow Downs cottage	NO	2.49km	90%	MODERATE-HIGH	Property is located on the eastern side of Crudine Road. Dense roadside planting along Crudine Road would filter some views of the proposed wind turbines.
CR28 - Willow Downs	NO	2.44km	80%	MODERATE-HIGH	Property is orientated to the east and west. Farm ancillary buildings screen views from the homestead towards the west. Existing vegetation is likely to obstruct views of the southern portion of wind turbines from this house.
CR32 - Willow Bend	NO	3.06km	60%	-	Property is located adjacent the Crudine River with dense native vegetation surrounding the property. Vegetation contains views from this homestead and therefore it is unlikely the proposed wind turbines will be visible.
CR33 - Trelawney	NO	2.33km	50%	MODERATE-HIGH	House is orientated to the road and surrounded by exotic plantings. Views from the homestead would be filtered and have a moderate visual impact due to the close proximity of the proposal.
CR34 - Linwood / Hill View	NO	1.99km	50%	MODERATE-HIGH	Views from the property towards the wind turbines would mostly be screened from view by the existing dense screen planting that is located on the western edge of the property. However due to the close proximity, visible turbines would have a high visual prominence.
CR35 - Karinya	NO	2.48km	70%	NIL - LOW	Homestead appears to be orientated to the north east with a substantial coverage of screen planting immediately surrounding the house. Views of the proposed wind turbines would be limited from the homestead.
CR36 - Nayla	NO	2.31km	70%	MODERATE	A number of wind turbines will be visible from this homestead along the ridge towards the east. Views may be filtered slightly by existing roadside vegetation and some vegetation surrounding the homestead.
CR37 - Lornya	NO	2.85km	80%	LOW-MODERATE	Views of the majority of wind turbines would be obstructed by a combination of screen planting surrounding the property and dense roadside vegetation associated with Crudine Road.
CR38 - Sunnyside	NO	5.63km	-	NIL - LOW	Views from this property would be screened by topography in the foreground. It is likely the proposed powerlines would be visible from the homestead, however the visual landscape would be altered only slightly.

TABLE A3: Summary of occupied nearby residences- Crudine Road (continued)

APPENDIX A. SUMMARY OF VISUAL IMPACT

RECEPTOR	INVOLVED LANDOWNER	DISTANCE TO NEAREST PROPOSED WIND TURBINE	POTENTIAL % OF VISIBLE TURBINES (BASED ON ZM- Worst case scenario)	POTENTIAL VISUAL IMPACT	DESCRIPTION / COMMENTS
HILL END ROAD					
HER02 - Toron Hill	YES	2.52 km	30%	NIL -LOW	Views of the southern wind turbines will be visible from this receptor. It appears the property is orientated to the north west. Some screening may be provided by existing roadside planting associated with Hill End Road.
HER03 - Buckleys View	NO	2.10 km	10%	-	From this receptor approximately 10% of the proposed wind turbines would be visible, however dense screening associated with the homestead is likely to obstruct views resulting in a low visual impact,
HER04 - Round Hill	NO	1.81 km	20%	-	Dense roadside vegetation associated with Hill End Road is likely to impede views of the potentially visible wind turbines resulting in no visual impact at this receptor.
HER06 - Illoura	YES	1.84 km	50%	-	The residence appears to be orientated to the west and the proposed wind turbines are sited to the north east. It is unlikely there will be any significant visual impact at this receptor.
HER07 - Clare Hills	YES	2.02 km	30%	-	Views to the north east from this receptor are screened by a group of retained native trees.
HER08 - Kilarney	YES	2.24 km	40%	-	Homestead is orientated to the north east towards the site. The majority of wind turbines are visually obstructed by topography.
HER10 - Glen Willow	NO	4.61km	30%	NIL - LOW	Views to the north west towards the proposed wind turbines are generally screened by retained vegetation surrounding the homestead and associated ancillary buildings.
HER11 - Glen Maye	NO	4.74 km	50%	NIL - LOW	Views from this receptor are significantly impeded by dense screen planting surrounding the homestead.

TABLE A4: Summary of occupied nearby residences- Hill End Road

APPENDIX A. SUMMARY OF VISUAL IMPACT

RECEPTOR	INVOLVED LANDOWNER	DISTANCE TO NEAREST PROPOSED WIND TURBINE	POTENTIAL % OF VISIBLE TURBINES (BASED ON ZVI-Worst case scenario)	POTENTIAL VISUAL IMPACT	DESCRIPTION / COMMENTS
PRICES LANE					
PL01 - Burra Brae	NO	3.68 km	40%	MODERATE	The residence is orientated to the north and the proposed wind turbines are located to the east of the property. In addition, moderate screen planting in the form of retained vegetation screens the majority of views to the east.
PL02 - Tunnabidgee	NO	4.11 km	40%	MODERATE	Views are generally orientated in a northern direction from the house. Views to the west extend towards approximately 40% or less of the proposed turbines.
PL03 - Boiga View	YES	3.11 km	50%	MODERATE	Views are impeded by screen planting that surrounded the house.
PL04 - Glenmore	YES	1.63 km	50%	MODERATE	Extensive views of the proposed wind turbines to the east and south. A sparse coverage of existing screen planting around the house may potentially screen views.
PYRAMUL ROAD					
PR01 - Four Winds (Biella)	NO	4.97km	70%	NIL - LOW	Views from the homestead are orientated to the east. A dense band of screen planting screens views to the east. The proposed wind turbines are located to the south east and will be broadly screened by vegetation.
PR04 - Athol	YES	5.37 km	70%	NIL - LOW	Views of the proposed wind turbines are likely to be reduced to filtered views due to a small group of existing vegetation to the south of the homestead.
PR05 - Limerick House	YES	5.37 km	70%	NIL - LOW	Views of the proposed wind turbines from properties along Pyramul Road are likely to be screened by a combination of distance, retained vegetation, orientation of houses towards the road and local topography. Some glimpse views may be available, however these would be limited.
PR06 - Glenroy	YES	5.37 km	70%	NIL - LOW	As above.
PR07 - Oak Hills	YES	5.37 km	70%	NIL - LOW	As above.
PR09 - East View	NO	5.37 km	70%	NIL - LOW	As above.
PR10 - Wattle Farm	NO	5.37 km	70%	NIL - LOW	As above.
PR11 - 1290 Pyramul Road	NO	5.37 km	70%	NIL - LOW	As above.
PR12 - Unknown	YES	5.37 km	70%	NIL - LOW	As above.
PR13 - Green Hills	YES	5.37 km	80%	LOW	From this homestead, views of the proposed wind turbines are likely to be available. Some existing vegetation close to the property may filter some views.

TABLE A4: Summary of occupied nearby residences- Prices Lane & Pyramul Road

APPENDIX A. SUMMARY OF VISUAL IMPACT

RECEPTOR	INVOLVED LANDOWNER	DISTANCE TO NEAREST PROPOSED WIND TURBINE	POTENTIAL % OF VISIBLE TURBINES (BASED ON ZVI- Worst case scenario)	POTENTIAL VISUAL IMPACT	DESCRIPTION / COMMENTS
SALLY'S FLAT ROAD					
SFR04- Windradeen	YES	2.05km	70%	MODERATE - HIGH	Homestead appears to be surrounded by a moderately dense screen of planting. It is likely views of the proposed wind turbines would be filtered from the homestead, however for the most part the visual impact would be high due to the close proximity and elevated position of the wind turbines.
SFR05- Kotara	YES	2.08 km	60%	MODERATE - HIGH	It is likely views of the proposed wind turbines from this homestead of the proposed wind turbines would be unobstructed. Although some screen planting surrounds the property, for the most part the existing landscape character, as viewed from this property, would be highly modified.
SFR06- Bindawalla	NO	2.20km	60%	LOW- MODERATE	The homestead is surrounded by vegetation associated with a small creekline that runs to the east of the property. Some of the proposed wind turbines will be visible from this viewpoint through clearings in the vegetation.
SFR07- Kooringle	NO	2.68km	50%	NIL - LOW	It is unlikely views of the proposed wind turbines would be available from this homestead due to a combination of foreground topography and dense vegetation containing views.
SFR08- Kildare	NO	2.87km	90%	NIL - LOW	Dense vegetation surrounds the homestead and Sally's Flat Road. Some filtered views of the tips of the proposed wind turbines may be visible.
SFR09- Carlo 773	NO	2.77km	60%	LOW	The homestead appears to be orientated towards the north, away from the proposed wind turbines. In addition, some screen planting surrounds the house.
SFR10- Seeview	NO	3.82 km	50%	LOW- MODERATE	The house appears to be orientated towards the north west, away from the proposed development. The residence is also surrounded by dense vegetation to the south east.
SFR11 - Lochiel	NO	3.37km	60%	LOW- MODERATE	Filtered views of the proposed wind turbines may be available through vegetation surrounding the homestead.
SFR12	NO	4.82km	40%	LOW- MODERATE	A group of wind turbines may be visible to the east of the residence. Existing screen planting and the orientation of the homestead would reduce the visual impact.
SFR13	NO	4.65km	30%	LOW	Views to the south east towards the proposed wind turbines are generally screened by vegetation surrounding the homestead and a local rise in topography.
SFR14 - Bidgee	NO	5.31km	30%	NIL - LOW	Views to the south east towards the proposed wind turbines are generally screened by retained vegetation surrounding the homestead and associated ancillary buildings.
SFR16 - Woodlands	NO	3.68km	50%	LOW	Homestead is orientated to the north, away from the proposed wind turbines. Dense screening vegetation surrounds the homestead. Filtered views would be available from the property's yard.
SFR17 - Woodlands cottage	NO	4.38km	50%	LOW	Homestead appears to be orientated to the north. Some planting surrounds the homestead.
SFR18 - Woodlands cottage	NO	4.50km	50%	LOW	Homestead appears to be orientated to the north, away from the proposed wind turbines. It is likely there would be views of the proposed wind turbines from the homestead.
SFR19- Woodlands	NO	4.55km	50%	LOW	Views of the proposed wind turbines would be obstructed by dense screen planting to the east of the homestead.

TABLE A5: Summary of occupied nearby residences- Sally's Flat Road

APPENDIX A. SUMMARY OF VISUAL IMPACT

RECEPTOR	INVOLVED LANDOWNER	DISTANCE TO NEAREST PROPOSED WIND TURBINE	POTENTIAL % OF VISIBLE TURBINES (BASED ON ZVI- Worst case scenario)	POTENTIAL VISUAL IMPACT	DESCRIPTION / COMMENTS
TURONDALE ROAD					
TR02	NO	3.59 km	-	-	Homestead is surrounded by dense vegetation in all directions. Views to the proposed wind turbines from this receptor will be screened by the vegetation.
TR03	NO	4.20 km	10%	-	Views in all directions are obstructed by an extensive coverage of dense woodland vegetation. There will be no visual impact from this residence.
TR05	NO	4.45 km	20%	NIL - LOW	The southern extent of the proposed wind turbines will potentially be visible from this residence. A combination of distance, topography and the orientation of the homestead lower the potential visual impact.
TR06	NO	4.60 km	20%	NIL - LOW	Views from this receptor contained to the north by a moderate coverage of retained native vegetation. The residence is orientated to the west and the wind farm is sited to the north.
WARRANGUNIA ROAD					
WR01	NO	7.80 km	-	-	Residence is surrounded by dense woodland vegetation. The proposed wind turbines will not be visible.
WR02	NO	8.13 km	-	-	A small degree of screen planting combined with topography and distance impede views of the proposed wind turbines from this homestead.
WR04	YES	8.74 km	-	-	Dense established screen planting surrounds the homestead in the direction of the proposed wind farm and views will therefore be obstructed.
WR05	YES	9.27 km	-	-	Views from this receptor are significantly impeded by dense screen planting surrounding the homestead.

TABLE A5: Summary of occupied nearby residences- Turondale Road & Warrangunia Road

APPENDIX A. SUMMARY OF VISUAL IMPACT

A.2 Overview of Roads

LOCATION	DISTANCE TO NEAREST WIND TURBINE	PERIOD OF VIEW	POTENTIAL VISUAL IMPACT	VIEWING CONTEXT
MAJOR TRAVEL CORRIDORS				
CASTLEREAGH HIGHWAY	11.34 km	Nil- Very Short Term	Nil - Low	Due to a combination of both the topography and distance from the site it is highly unlikely views of the proposed wind turbines would be available from the Castelreagh Highway. The speed of travel combined with the direction of travel along the highway would limit views.
GOULBURN - ILFORD	7.60 km	Nil- Very Short Term	Nil - Low	The Goulburn-Ilford Road runs along the base of a valley and views are generally contained by topography. Some glimpse views may occur along elevated sections of the road however it is unlikely the proposed wind farm will be visible from most of this road.
LOCAL / TOURIST ROADS				
HILL END ROAD	0.88 km	Short Term	Low - Moderate	The proposed wind farm will be visible whilst travelling along Hill End road between the Turon River and Hill End. However due to a combination of topography and roadside planting for the most part these views will be short term. Views would be indirect and the wind farm would only form a small visual element in the view.
PEEL / SOFALA ROAD	7.43 km	Very Short Term	Nil - Low	Sofala and Peel road are predominately elevated and views are expansive. The proposed wind turbines will be visible from some sections of the road, however due to the speed and direction of travel views will be fleeting.
TURONDALE ROAD	2.82 km	Very Short Term	Nil - Low	Turondale Road follows the valley floor and is surrounded by steep topography for the most part. Glimpse views of the proposed wind farm are potential for vehicles travelling in a southerly direction. The speed of travel and existence of roadside vegetation and local rises in topography reduces views.
PYRAMUL ROAD	4.43 km	Nil- Very Short Term	Nil - Low	Views from Pyramul Road towards the proposed wind farm would be obstructed by the undulating topography and foreground vegetation. Some very short term glimpse views of the proposed wind farm may potentially exist travelling in a southern direction.
UNSEALED MINOR ROADS				
AARONS PASS ROAD	1.29 km	Nil- Very Short Term	NIL - LOW	Aarons Pass Road is heavily vegetated by roadside vegetation. Views from Aarons Pass Road would be fleeting and indirect through the dense roadside vegetation. In addition to the roadside vegetation, the direction of travel is perpendicular to the wind farm.
BOMBANDI ROAD	9.52 km	Very Short Term	LOW	It is likely the proposed wind farm will be visible from a small section of Bombandi Road. Bombandi Road services a few isolated homesteads and use is intermittent and very low. The visual effect is negligible due to distance, short period of view and low frequency of use of the road.
CAFES ROAD	8.87 km	Nil- Very Short Term	NIL - LOW	It is unlikely the proposed wind turbines will be visible from Cafes Road. A combination of distance, the direction of travel and undulating topography obstruct views.
CRUDINE ROAD	1.64 km	Short - Moderate Term	Moderate	Crudine Road runs along the foothills of the Crudine Ridge, adjacent to the proposed wind farm. The proposed wind turbines have the potential to have a moderate-high visual impact for motorists travelling in both directions along Crudine Road. However, due to the low use of the road combined with the short - moderate term period of view, the visual impact from Crudine Road would be moderate.
PRICES LANE	1.05 km	Short Term	Low - Moderate	Prices lane is located to the west of Crudine Ridge running from Sallys Flat to Pyramul. Views of the proposed wind turbines will be inevitable travelling south along Prices Lane. Due to the intermittent use and small number of homesteads located along the road and the short term view the visual impact will be low-moderate.
SALLY'S FLAT ROAD	2.16 km	Very Short Term	Low	Views from Sallys Flat Road are generally contained by roadside vegetation. Any potential views of the proposed wind turbines would be very short term, reduced to glimpses for the most part. The visual impact from Sallys Flat Road has been assessed as low.
WARRANGUNIA ROAD	8.80 km	Nil	-	Warrangunia Road generally follows a creekline and views are contained by surrounding topography. In addition to this, distance and the direction of travel would prevent views.

TABLE A6: Summary of occupied nearby roads

APPENDIX B. LAYOUT OPTION B

B.1 Proposed Layout Option B (Up to 77 Wind Turbines)

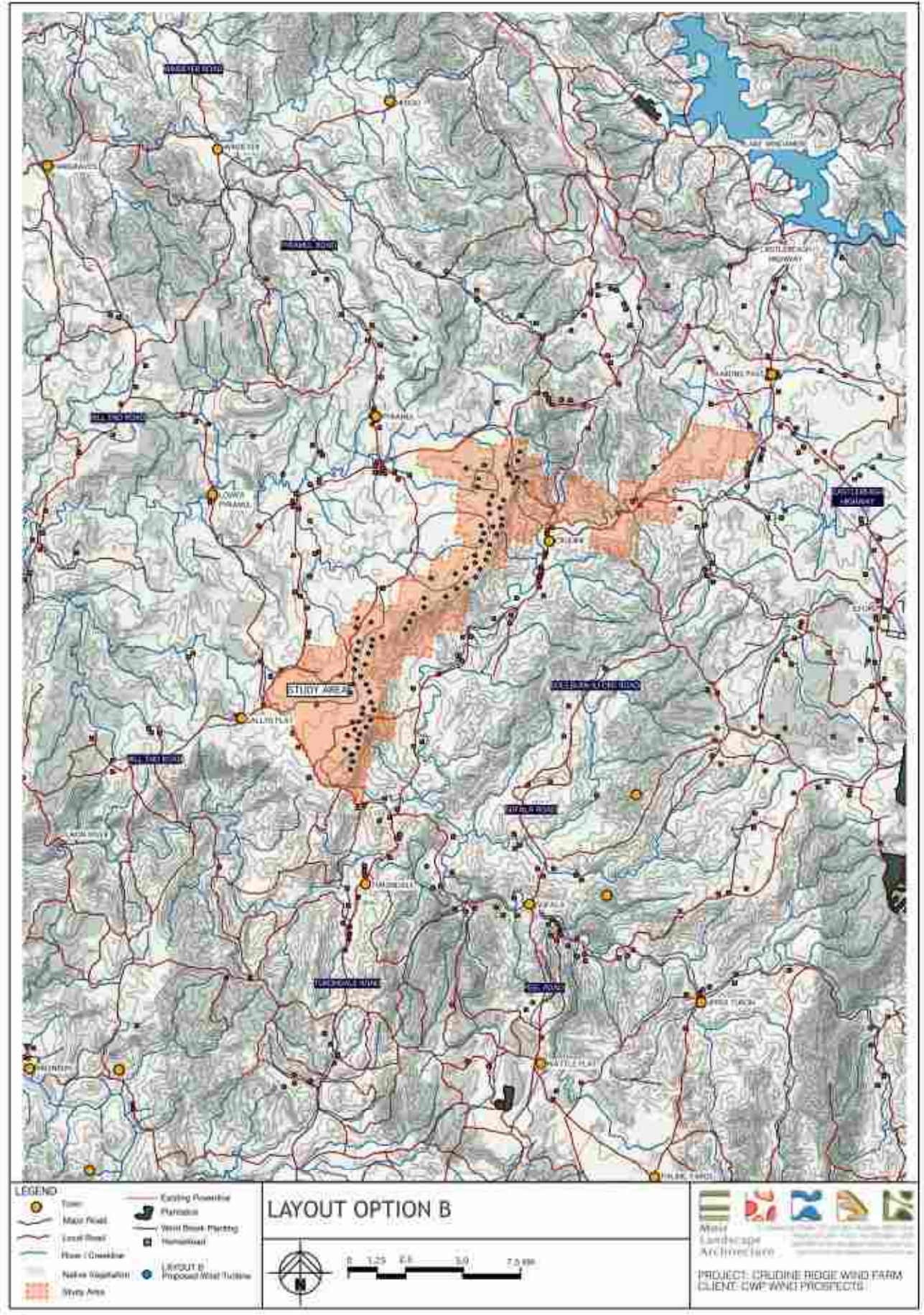


FIGURE B1: Proposed Layout Option B (Up to 77 Turbines)

B.2 Zone of Visual Influence - Layout Option B

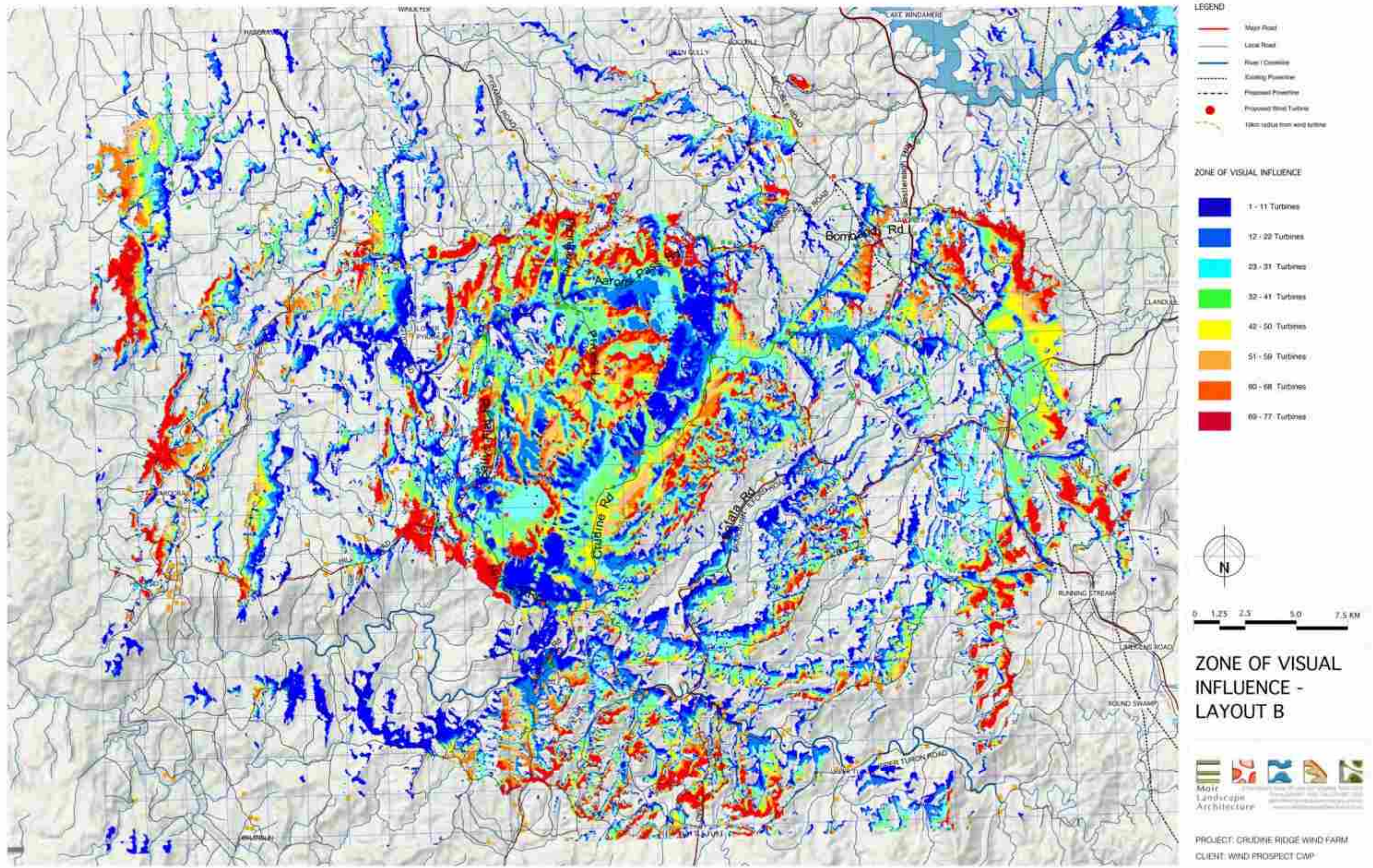


FIGURE B2: Zone of Visual Influence- Layout Option B (Up to 77 Turbines)

APPENDIX B. LAYOUT OPTION B

B.3 Photomontage Comparison - Layout Option B



FIGURE B3: Existing view from CW21 - Crudine Road



FIGURE B4: Proposed view from CW21 - Crudine Road - Layout Option A



FIGURE B5: Proposed view from CW21 - Crudine Road - Layout Option B