7.2.2 ZONE OF INFLUENCE

For the purposes of the VIA, the assessment has been based on the highest impact scenario of 55 turbines each with a tower of 100 metres above ground level, including a degree of flexibility to allow the location of each wind turbine to be slightly modified (<100 metres).

The Zone of Visual Influence (ZIA) identifies the areas of surrounding land from which the Project may be partially or completely visible. The ZIA is based solely on topographic information and represents the highest impact scenario as it has not considered the height and coverage of existing vegetation or buildings.

The ZIA focuses on distances of less than 10kms away as per the Director-General's Requirements. The Project may be visible from further than 10kms away from some viewpoints however, as the distance increases visibility decreases.

Figure 55 illustrates the extent to which the proposed wind turbines would be visible (shown in blue) based on the highest impact scenario (wind turbines with a height of 150 metres above ground level).

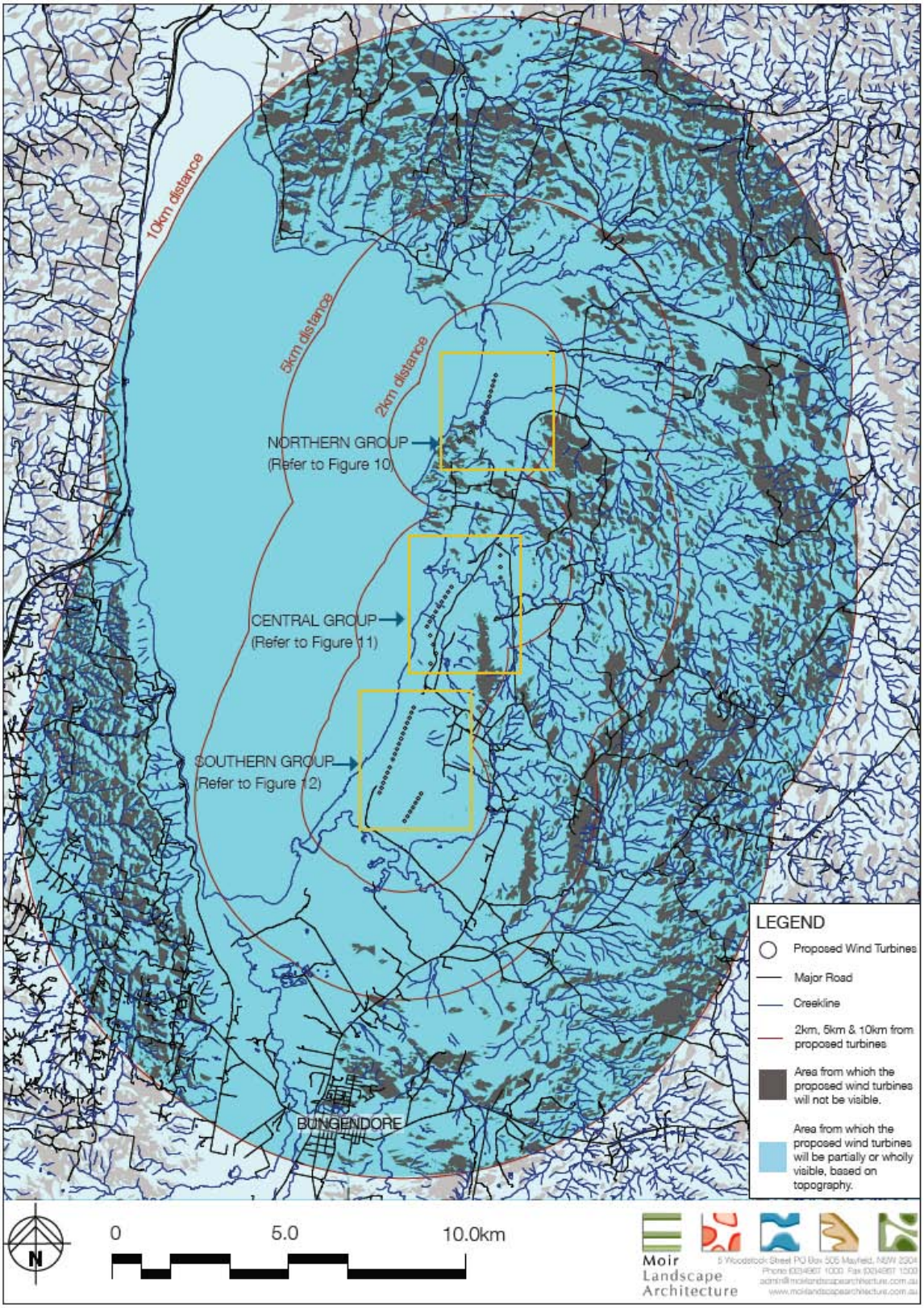

Figure 55: Zone of visual influence

The ZVI model identifies a large percentage of land surrounding the Project as areas where the wind turbines will be visible (**Figure 55**). Overall low lying and generally flat topography associated with the Lake George Plain and rural plains associated with Bungendore are contained within the ZVI. The Lake George escarpment to the west and the Great Dividing Range to the east provide a visual barrier on a large scale. The highest visual impact of the wind turbines based on the ZVI is likely to be within the 0-5km radius. The ZVI is impeded to the east and to the west by the undulating topography.

7.2.3 COMMUNITY AND STAKEHOLDER VALUES

Community perceptions and general acceptance of wind farms varies greatly. Community perception to cultural and natural elements is difficult to define and can differ based on a variety of elements.

Community consultation with residents in the vicinity of the Capital Wind Farm precinct has encountered a range of views. The Proponent held a community open day that provided an opportunity for the community to convey their opinions and perceptions of the Project. Some concerns have been raised on a range of issues including the potential noise generated from the operation of the Project. The Proponent responded to these concerns by outlining the design process that was implemented that considered potential noise impacts and suitably located each WTG to reduce and minimise any potential noise impacts. The visual impacts of the proposed wind farm were mentioned briefly and considered only a minor issue.

Overallr, there is a considerable degree of support for the Project from the local community and the Project is considered to be warranted based on the overall benefits delivered by this renewable energy project.

7.3 ASSESSMENT OF POTENTIAL IMPACTS

The significance of visual impacts to identified receptors and viewpoints is based on a combination of factors including:-

- The visibility of the wind turbines;
- The degree of visual contrast between the wind turbines and the surrounding landscape, including the capability of the landscape to visually accommodate the wind turbines;
- The nature of the receptors viewpoints;
- The distance between the receptor and the wind turbines;

- The potential number of receptors from a viewpoint;
- The duration of time that a receptor may view the wind turbines; and
- The land use sensitivity of the receptor.

Of the 29 properties located within a 5km radius of the Project site, 16 are owned by wind farmers. The potential visual impact has been assessed from each of the remaining 13 residential properties which are not wind farmers.

7.3.1 VIEWPOINT ANALYSIS

The Viewpoint Analysis considered the likely impacts that the Project would have on the existing landscape character and visual amenity, by selecting prominent sites, otherwise referred to as viewpoints.

Viewpoints are selected to be representative of the range of views within the study area. Viewpoints are selected by ZVI, topographical maps, field work observations and other relevant influences such as access, landscape character and the popularity of vantage points.

The visual sensitivity (**Table 11**) and visual effect (**Table 12**) of each viewpoint was assessed which would result in an overall visual impact for the viewpoint[1].

Table 11: Visual Sensitivity Table

VISUAL SENSITIVITY					
VISUAL USE AREA	FOREGROUND		MIDDLEGROUND		BACKGROUND
	Local setting		Sub-Regional setting		Regional setting
	0-1	1-2km	2-4.5	4.5-7	> 7kms
Townships	High	High	High	Mod	Low
Rural residences	High	High	High	Mod	Low
Main Highway	Mod	Mod	Low	Low	Low
Local Roads	Mod	Mod	Low	Low	Low
Railway Line (Freight)	Low	Low	Low	Low	Low
Agricultural Land	Low	Low	Low	Low	Low

[1] Sections 3.2.3 and 3.2.5 of Appendix A provides a definition for Visual Sensitivity and Visual Impact.

Table 12: Visual Impact Table

VISUAL IMPACT				
		VISUAL EFFECT ZONES		
		HIGH	MODERATE	LOW
VISUAL SENSITIVITY LEVELS	HIGH	High Impact	High Impact	Moderate Impact
	MODERATE	High Impact	Moderate Impact	Low Impact
	LOW	Moderate Impact	Low Impact	Low Impact

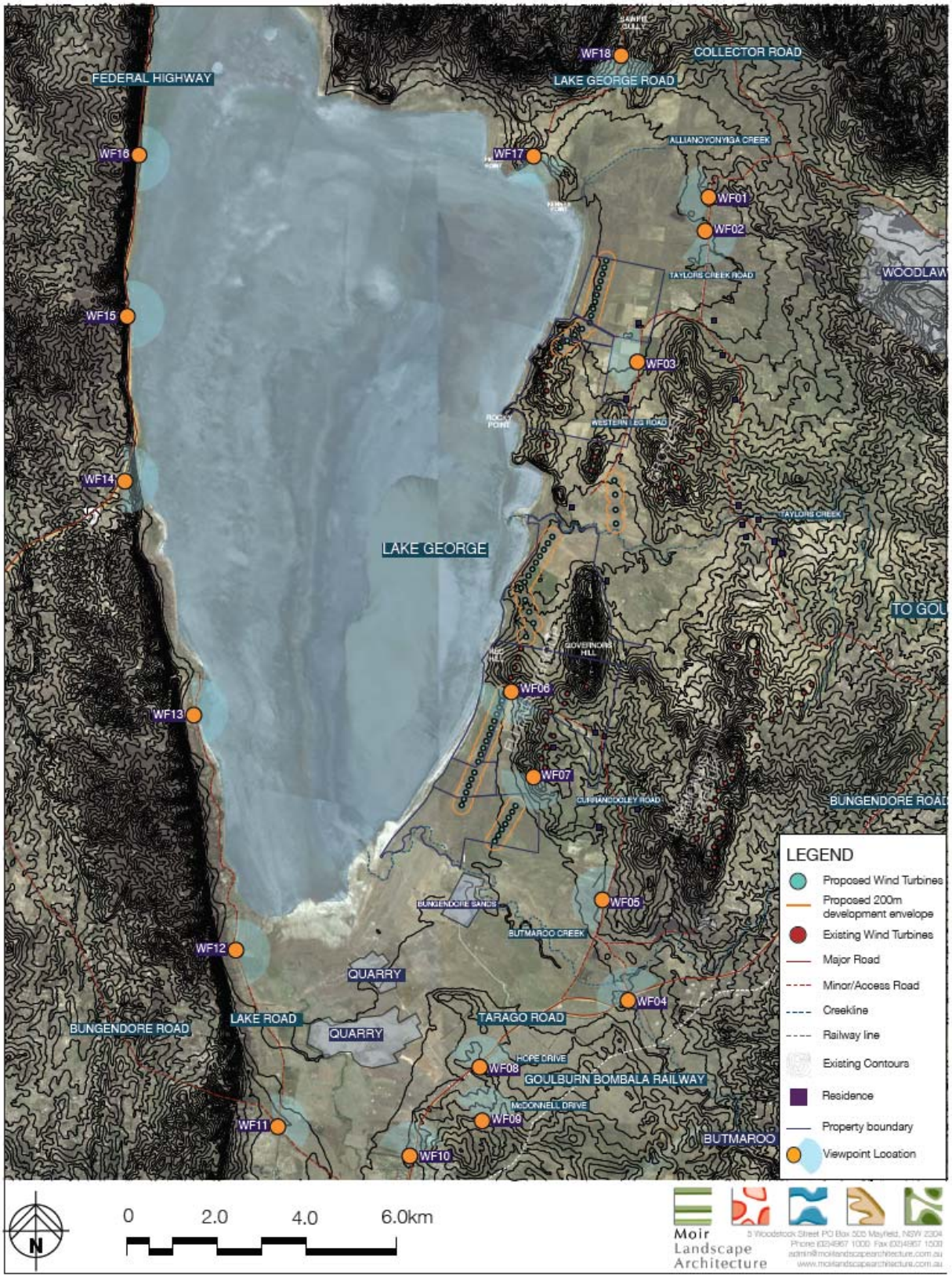

Figure 56: View point locations

Of the 18 viewpoints assessed, the wind turbines would be visible from all 18 viewpoints. Of the 18 viewpoints, 15 of these have been assessed as having a low visual impact, three have a moderate visual impact and none were assessed as having a high visual impact. **Table 13** summarises the results of the Viewpoint Visual Impact analysis.

Table 13: Viewpoint Visual Impact Summary

VIEWPOINT	VISUAL SENSITIVITY	VISUAL EFFECT	VISUAL IMPACT
WF01	Low	Low	Low
WF02	Moderate	Moderate	Moderate
WF03	Moderate	Moderate	Moderate
WF04	Low	Moderate	Low
WF05	Low	High	Moderate
WF06	Low	Moderate	Low
WF07	Low	Moderate	Low
WF08	Low	Low	Low
WF09	Moderate	Low	Low
WF10	Low	Low	Low
WF11	Low	Low	Low
WF12	Low	Moderate	Low
WF13	Low	Moderate	Low
WF14	Low	Moderate	Low
WF15	Low	Low	Low
WF16	Low	Low	Low
WF17	Moderate	Low	Low
WF18	Low	Low	Low

In addition to an assessment of the visual impact, **Table 14** summarises the potential visual prominence of the Project.

Table 14: Viewpoint Visibility Assessment Summary (Note: The Viewpoint Visible Assessment Summary is based on the visibility assessment criteria outlined in Section 3.4 of Appendix A)

VIEW-POINT	VIEWSHED Based on distance	DISTANCE To nearest proposed turbine	POTENTIAL VISUAL PROMINENCE Based on distance	VERTICAL ANGLE Based on nearest proposed turbine	VISUAL PROMENENCE Based on vertical angle	NUMBER OF VISIBLE EXISTING TURBINES Capital I Wind Farm	NUMBER OF VISIBLE PROPOSED TURBINES Proposed Capital II	CUMULATIVE PERCENTAGE OF VISIBLE TURBINES Capital I & II	POTENTIAL SCREENING FACTORS
WF01	Sub-regional	4.3km	Potentially noticable	2	Potentially noticable	34	14	40%	Screen planting & topography
WF02	Sub-regional	2.2km	Potentially noticable	3.90	Potentially Dominant	24	31	60%	Screen planting & topography
WF03	Local	1.6km	Potentially dominant	5.36	Potentially Dominant	6	14	20%	Topography
WF04	Sub-regional	4.6km	Potentially noticable	1.87	Potentially noticable	14	24	40%	Topography
WF05	Sub-regional	2.8km	Potentially noticable	3.07	Potentially Dominant	10	24	40%	Topography
WF06	Local	0.2km	Potentially dominant	36.87	Potentially Dominant	67	55	100%	-
WF07	Local	0.7km	Potentially dominant	12.09	Potentially Dominant	3	24	20%	-
WF08	Sub-regional	5.0km	Potentially noticable	1.72	Potentially noticable	32	24	60%	Screen planting & topography
WF09	Sub-regional	6.2km	Potentially noticable	1.39	Potentially noticable	29	24	60%	Screen planting & topography
WF10	Regional	7.5km	Potentially noticable	1.15	Potentially noticable	13	24	40%	Screen planting & topography
WF11	Regional	7.6km	Potentially noticable	1.13	Potentially noticable	25	24	60%	Topography
WF12	Sub-regional	5.2km	Potentially noticable	1.65	Potentially noticable	67	41	100%	Topography
WF13	Sub-regional	5.7km	Potentially noticable	1.51	Potentially noticable	58	55	100%	Topography
WF14	Regional	8.9km	Potentially noticable	0.97	Potentially noticable	67	55	100%	-
WF15	Regional	9.4km	Potentially noticable	0.91	Potentially noticable	67	55	100%	-
WF16	Regional	10.2km	Visibility Diminishing	0.84	Potentially noticable	67	55	100%	-
WF17	Sub-regional	2.9km	Potentially noticable	2.96	Potentially Dominant	51	14	60%	Screen planting & topography
WF18	Sub-regional	4.6km	Potentially noticable	1.87	Potentially noticable	42	18	60%	Screen planting & topography

Table 15: Visual impact assessment from residences within 5km of the wind turbines.

RESIDENCE	DISTANCE TO NEAREST WTG	WIND FARMER	POTENTIAL VISUAL IMPACT	DESCRIPTION
E01- M Osborne	1.52km	YES	-	Capital I Wind Farmer
E02- L Orizon A	1.33km	YES	-	Capital I Wind Farmer
E03- L Orizon B	1.22km	YES	-	Capital I Wind Farmer
E04- Ellenden A	2.08km	YES	-	Capital II Wind Farmer
E05- Ellenden B	2.29km	YES	-	Capital I Wind Farmer
E06- Vacant	2.23km	YES	-	Capital I Wind Farmer
E07	1.83km	YES	-	Capital I Wind Farmer
G01- Panhandle	0.96km	YES	-	Capital II Wind Farmer
G02- Luckdale	0.97km	YES	-	Capital II Wind Farmer
G03- Kalingrah	1.27km	YES	-	Capital I Wind Farmer
G04- Lakoona	1.24km	YES	-	Capital II Wind Farmer
G05	2.55km	NO	LOW	A dense band of wind break planting immediately south west of the residence. Some filtered views of the northern extent of proposed turbines may be visible.
G06- Widgemore	3.11km	NO	LOW	Surrounded by topography associated with Groses Hill. A dense band of wind break planting in the foreground of the residence to the north west.
G07- Euroka	2.85km	YES	-	Capital I Wind Farmer
G08- Sunnybrook 1	2.92km	YES	-	Capital I Wind Farmer
G09- Sunnybrook 2	2.72km	YES	-	Capital I Wind Farmer
G10- LaGranja	2.97km	NO	LOW	Potential views to central group of proposed turbines. These views would be filtered by existing foreground planting surrounding the residence.
G11	3.31km	NO	LOW	Screen planting in the foreground, roadside planting along Taylors Creek Road and topography will screen views of the proposed wind turbines.
G12- Narine Green	3.16km	NO	LOW	Topography impedes views to the majority of proposed wind turbines. The existing wind break planting to the south west of the residence will screen views.
G13	3.75km	NO	LOW	A combination of foreground wind break planting, roadside planting (associated with Taylors Creek Road) and topography screens views.
G14	3.61km	NO	LOW	A lineal band of existing vegetation in the foreground immediately west of the residence screen views towards the proposed wind turbines.
G15	3.66km	NO	LOW	A lineal band of existing vegetation in the foreground immediately west of the residence screen views towards the proposed wind turbines.
G16	3.53km	NO	MODERATE	Northern and southern groups of proposed turbines impeded by topography. Central group of turbines visible.
G17	3.77km	NO	MODERATE	Northern and southern groups of proposed turbines will be mostly screened by topography. Proposed central group will be visible.
G18- Torokina	4.56km	NO	LOW	Groses Hill topography in conjunction with a dense band of pine wind break planting immediately west of the property screen views to turbines.
Gundry	4.69km	NO	LOW	Dense foreground planting surrounding the residence in all directions eliminate views of the proposed turbines from the residence.
H01- Currandooley	2.50km	YES	-	Capital I Wind Farmer
H02- Currandooley	2.63km	YES	-	Capital I Wind Farmer
Roth	3.12km	NO	MODERATE	Minor ridgeline to the south of the residence associated with Kennys Point & existing foreground vegetation partially screens views of the proposed turbines.

7.3.2 PHOTOMONTAGES

Photomontages of the Project within the existing context were prepared to assist in the impact assessment. The photomontages seek to convey the final visual image of the proposal from typical vantage points and are based on highest impact scenarios.

A variety of indicative photomontage viewpoints have been prepared to best represent a range of distances as well as locations with differing views. Locations of the photomontages are shown in **Figure 58, Figure 59, Figure 60, Figure 61, Figure 62, Figure 63** and **Plates 1–6 Appendix A**).

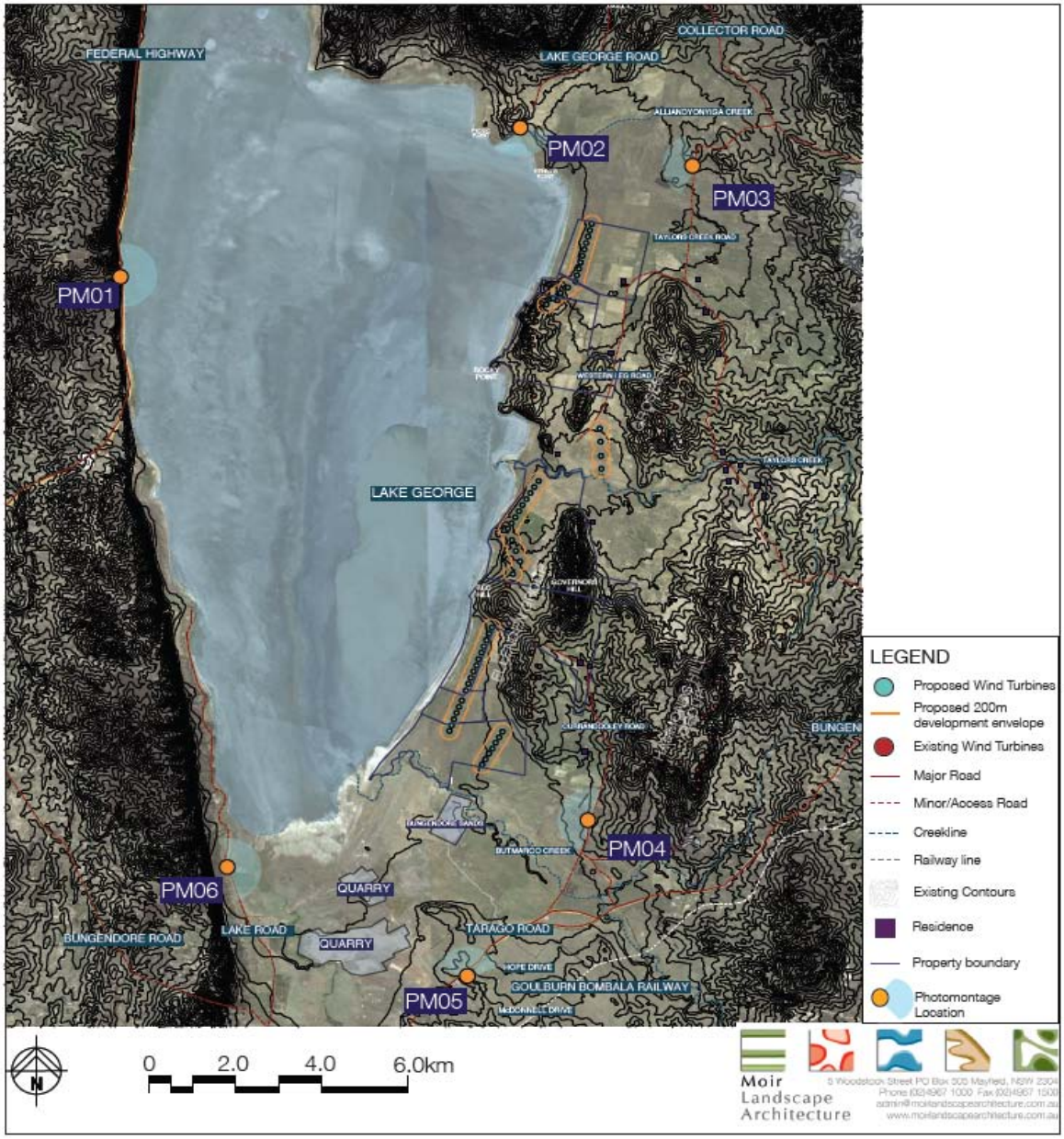

Figure 57: Photomontage view point locations

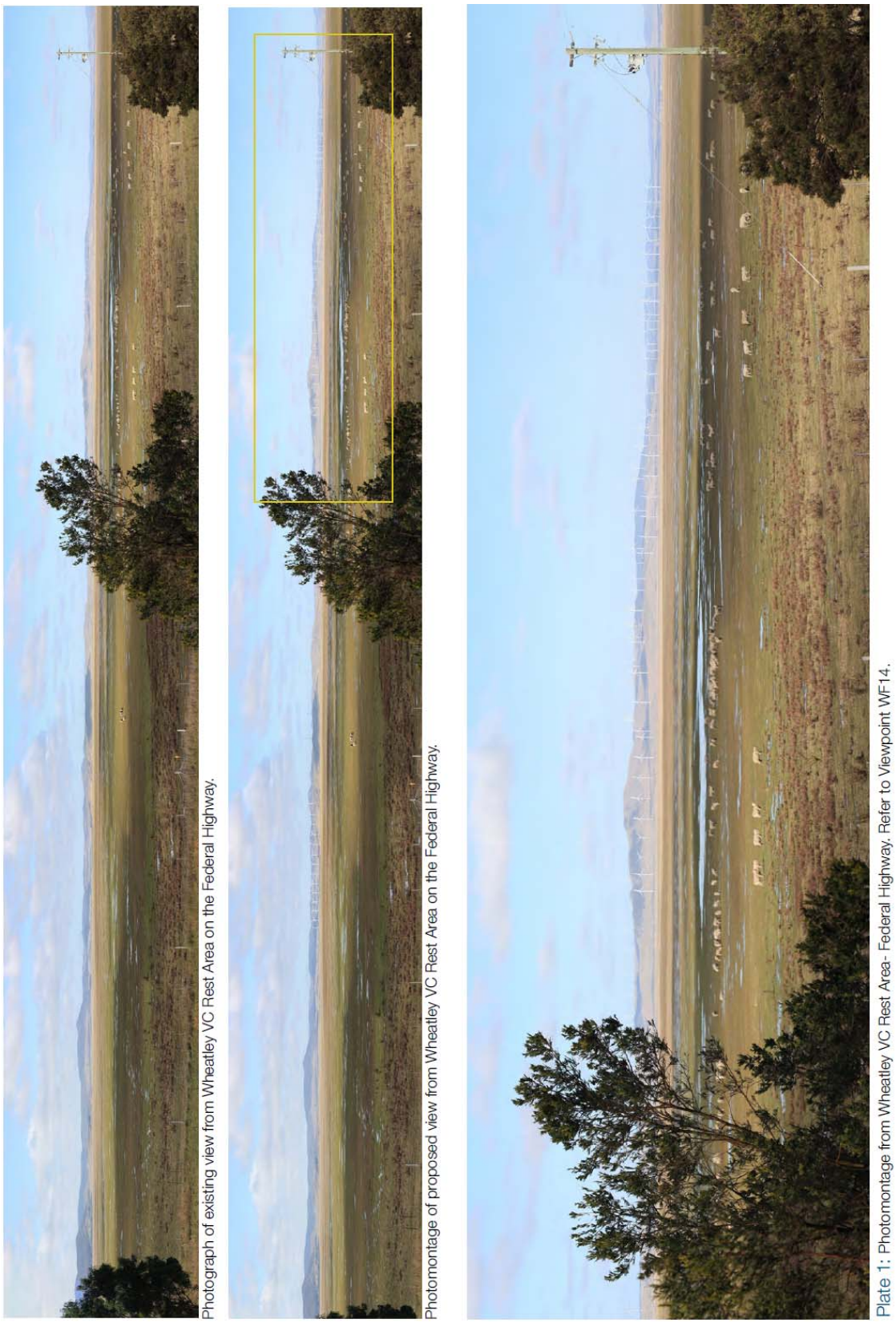

Figure 58: Photomontage from Wheatley VC Rest Area

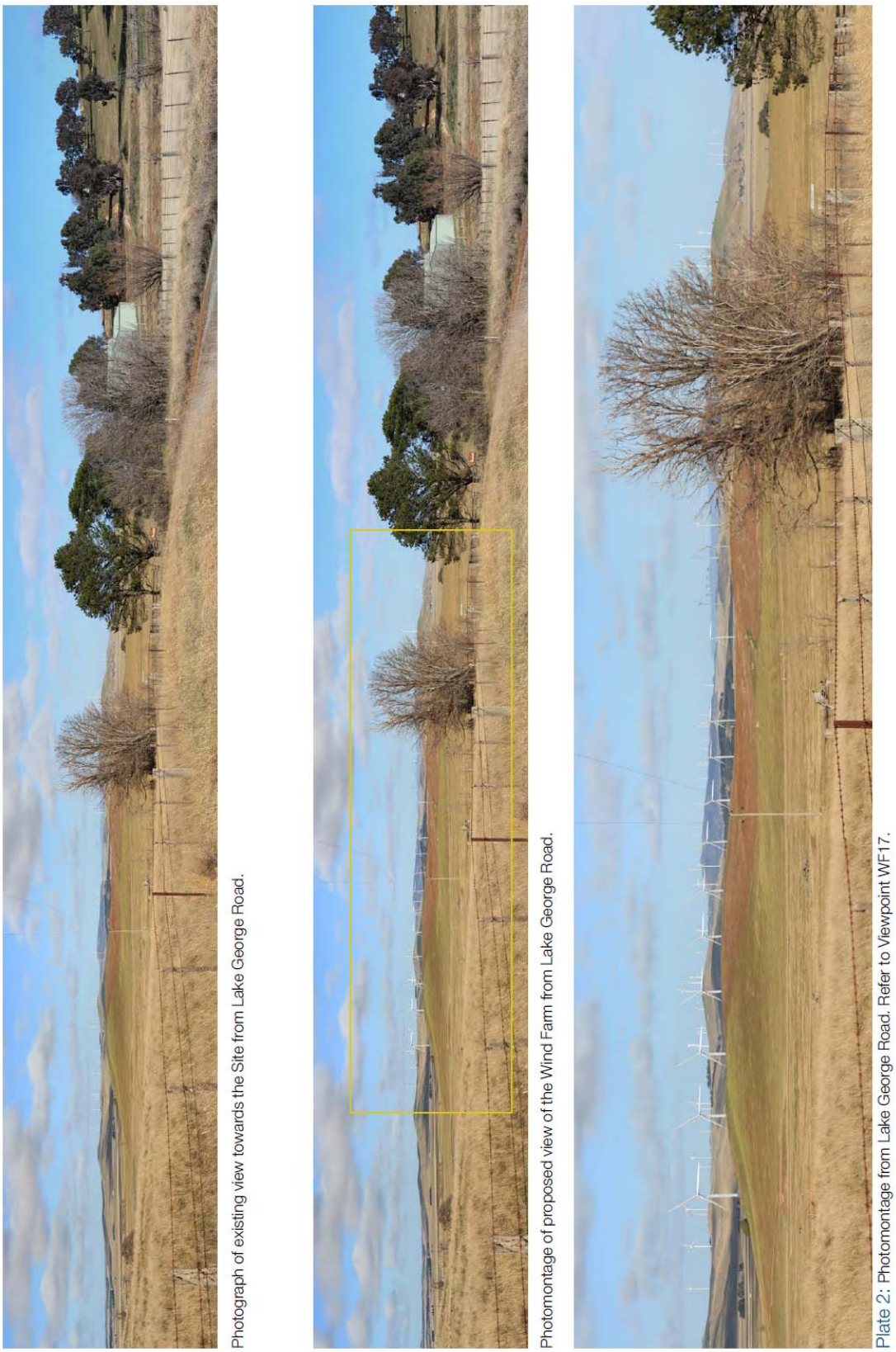

Figure 59: Photomontage from Lake George Road

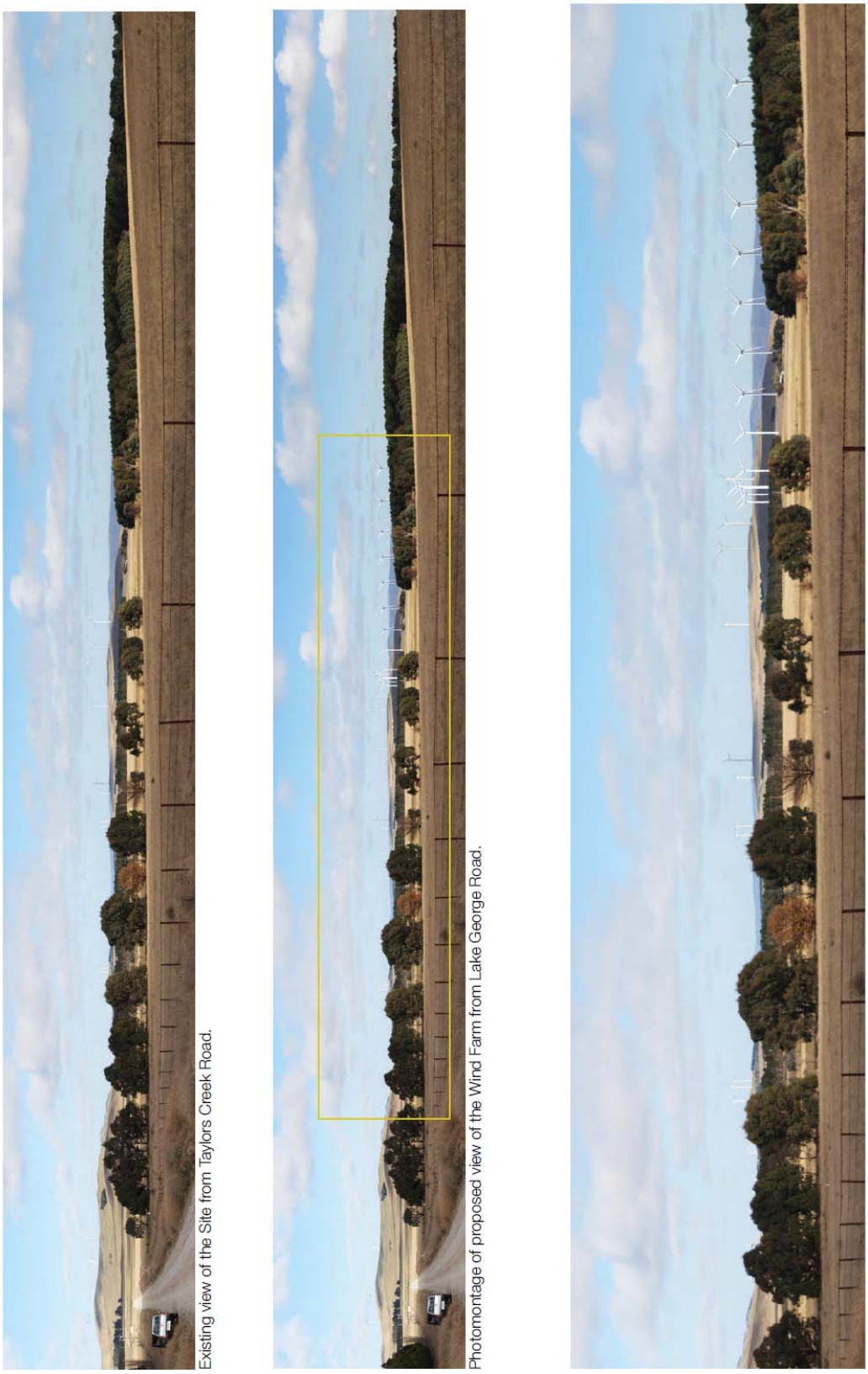

Figure 60: Photomontage from Taylors Creek Road

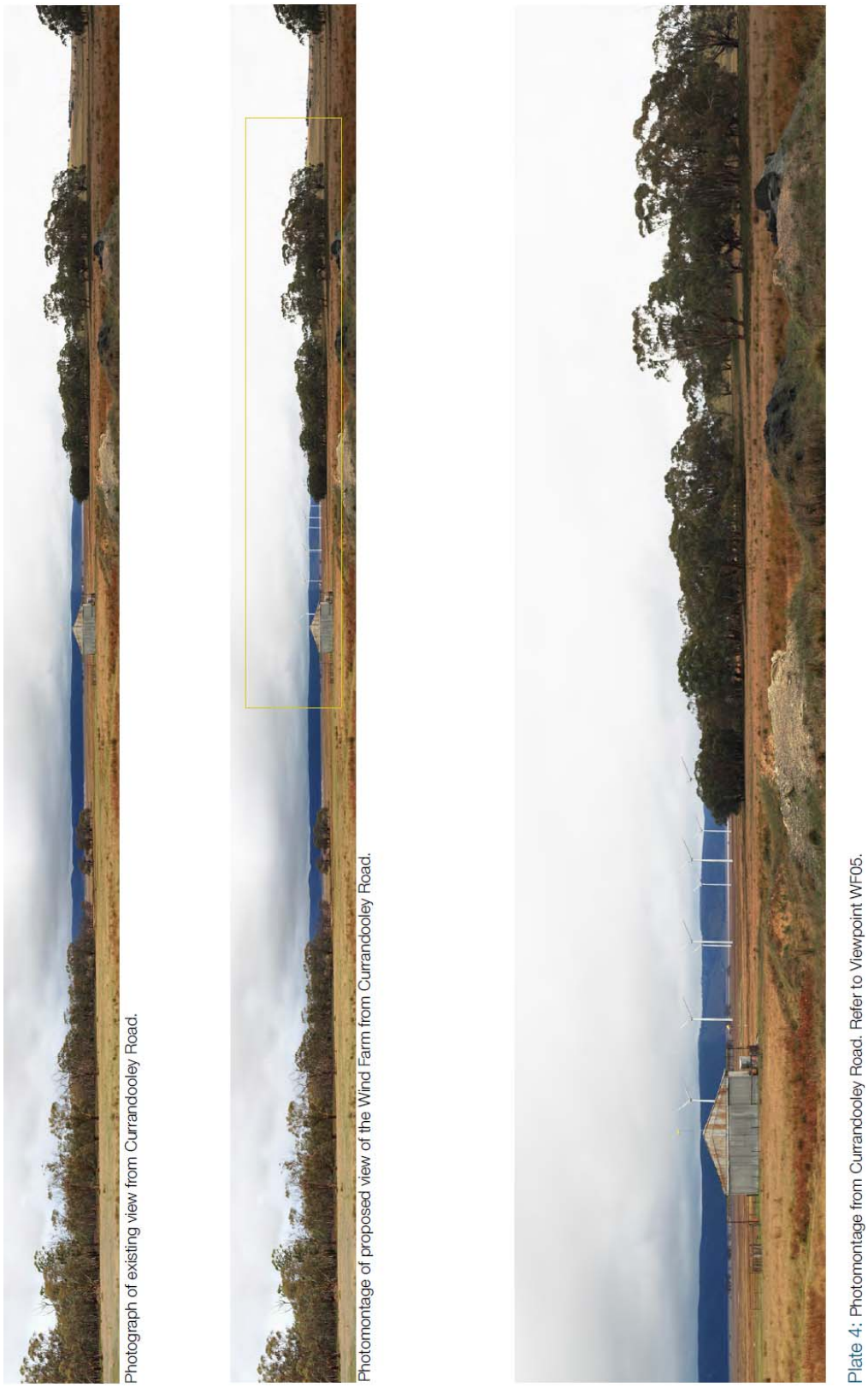

Figure 61: Photomontage from Currandooley Road

Figure 62: Photomontage from Tarago Road

Figure 63: Photomontage from Lake Road

7.3.3 SHADOW FLICKER

Shadow flicker is a visual effect that occurs when rotating turbines causing intermittent shadowing as the blades momentarily pass between the sun and a viewer. It is a phenomenon that is caused when the sun is low in the sky in either the morning or the afternoon. The duration of shadow flicker takes into account the relative positions of the sun throughout the year, the wind turbines at the site and the viewer. The effect is diminished by distance between the wind turbine and the viewpoint and is also reduced by increased cloud cover, thus allowance must be made when assessing shadow flicker impact for the number of cloudy days.

Figure 64: Potential shadow flicker scenario

There are no specific guidelines in NSW as to how to assess shadow flicker generated by wind turbines. However, the relevant Victorian Planning Guidelines propose that no dwelling on a non-associated property should be subject to more than 30 hours of shadow flicker in any 12 month period. Garrad Hassan undertook a Shadow Flicker Assessment for the proposed CWFII (**Appendix B**).

The shadow flicker assessment was undertaken using both the existing CWFI and proposed CWFII wind turbines to illustrate the cumulative impacts. The analysis was based on the highest impact scenario of 55 wind turbines at a height of 157 metres.

Figure 65: Approaching shadow flicker

Figure 66: Shadow flicker is reduced as a result of cloud cover

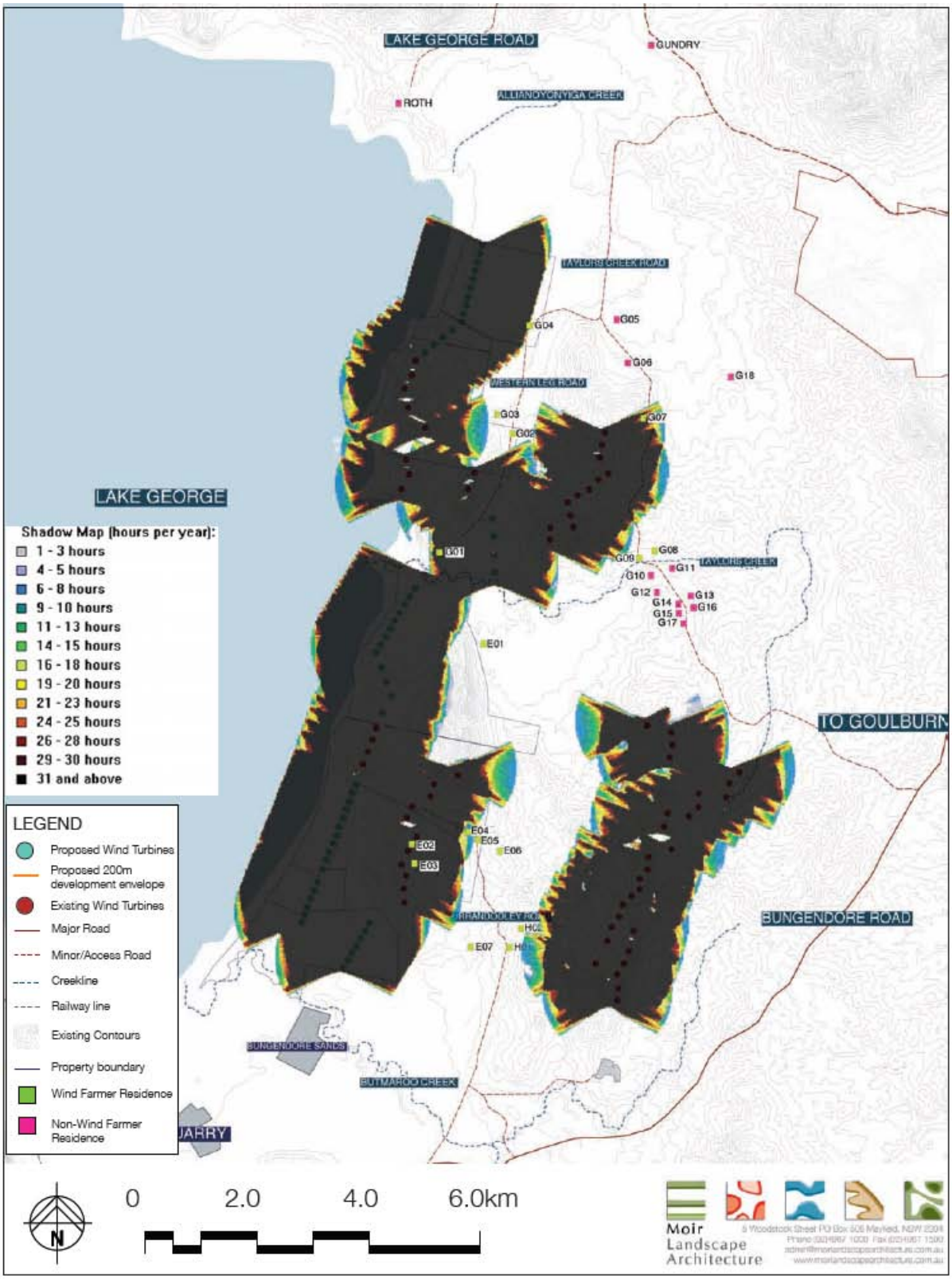

Figure 67: Shadow flicker diagram (Garrad Hassan)

That assessment found that seven homesteads are likely to be affected by shadow flicker. Of these seven homesteads, five are located within the shadow flicker zone currently established by CWFI. Two new properties will be affected by the extent of shadow flicker associated with the Project. These two properties likely to be affected by the shadow flicker are both wind farmers and are therefore classified as non-relevant receivers.

Table 156: Residences affected by shadow flicker.

RESIDENCE	HOURS AFFECTED PER YEAR	WIND FARM	WIND FARMER
E02- L Orizon A	31 and above	Capital I Wind Farm	YES
E03- L Orizon B	31 and above	Capital I Wind Farm	YES
E04- Ellenden A	11-13 hours	Capital I Wind Farm	YES
E05- Ellenden B	1-3 hours	Capital I Wind Farm	YES
G01- Panhandle	31 and above	Capital II Wind Farm	YES
G04- Lakoona	29-30 hours	Capital II Wind Farm	YES
G07- Euroka	24-25	Capital I Wind Farm	YES

No public roads or public places are likely to be significantly affected by shadow flicker.

Overall the shadow flicker effects caused by the Project are minimal. A number of residences are subject to shadow flicker impacts to varying or lesser degrees. However, due to the location of the wind turbines in relation to these residences, it is unlikely that shadow flicker will cause an issue.

7.3.4 BLADE GLINT

Blade glint involves the reflection of light from a wind turbine blade, and can be seen by an observer as a periodic flash of light coming from the wind turbine. Its occurrence depends on a combination of circumstances arising from the orientation of the nacelle, angle of the blade, and the angle of the sun. The reflectiveness of the surface of the blades is also a key factor when assessing the blade glint. Blade glint is not generally a problem for modern wind turbines, provided the blades are coated with a non-reflective paint. The turbine models selected for the Project will be coated with a non-reflective paint.

Figure 68: Blade glint is not significant on the blades of modern turbines due to the non-reflective paint that is used on the surface of the blades

7.4 CUMULATIVE VISUAL IMPACT

Cumulative landscape and visual effects result from additional changes to the landscape or visual amenity caused by the Project in conjunction with other developments. 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 cumulative effects of the Project need to consider the impact on the immediate and broader regional context it is part of and take into account the change of scale and the potential for the receiving landscape to accommodate the larger composite feature.

In addition to the existing development in the region including CWFI and the Woodlawn Bioreactor, Woodlawn Wind Farm is currently under construction and the Capital Solar Farm is proposed for construction in the future.

The main cumulative impact of the multiple wind farm developments in the area are likely to be related to the combined visual impact of the wind farms from vantage points where multiple wind farms are visible.

CWFII is directly adjacent to CWFI and the proposed layout has been designed to ensure it appears as a continuation of the existing wind farm as opposed to a separate entity. Being directly located on the slopes of the ridge, the most direct cumulative visual impact is likely to be seen from the west, along the western shores of Lake George, particularly along the Federal Highway.

WWF is located approximately 5kms to the north-east of the CWFI. From some directions the CWFI and WWF will appear as one single wind farm. The largest combined visual impact would be likely to be felt from residents and public areas located between CWFI and WWF, as they are likely to appear as two separate wind farms. Due to the location of the CWFII WTGs which are situated predominantly on the lower slopes to the east of the ridgelines associated with Grosses Hill and Hammonds Hill, the Visual Impact Assessment concluded that the contribution of the CWFII WTGs to the cumulative impact in the vicinity of the approved WWF would be negligible.

The proposed CWFII will connect to the existing 330kV transmission line which extends from the Capital substation. This minimise the required amount of additional infrastructure which in turn reduces the extent of cumulative visual impact.

7.5 MITIGATION MEASURES

The Capital II Wind Farm will be noticeable from many viewpoints within its visual catchment. The following mitigation measures attempt to lessen the visual impact of the proposed wind farm whilst enhancing the visual character of the surrounding environment.

WIND FARM DESIGN CONSIDERATIONS

The design of the 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 the siting principles, access, layout and other principles which directly impact on the appearance of the Project.

LANDSCAPING AND VISUAL SCREENING

Visual screen planting is a beneficial mitigation method used to assist in the reduction of the Projects visual impact. Dense wind break screen planting around homesteads and along property boundaries and roadsides forms part of the existing character of the region. Foreground visual planting is the most effective method in areas in high visual sensitivity, such as close to residences, due to the large scale of the wind turbines.

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 WTGs.

7.5.1 SHADOW FLICKER

Should shadow flicker become a problem, its effects can be reduced through a number of measures. These include the installation of screening structures or planting of trees to block shadows cast by the wind turbines, or the use of wind turbine control strategies.

Figure 69: The effects of shadow flicker can be reduced through screen planting surrounding affected receptors

7.5.2 BLADE GLINT

Blade glint is not likely to cause a problem for observers in the vicinity of the Project provided non-reflective coatings are used on the blades of the turbines.

7.6 CONCLUSION

The locations proposed for the proposed wind turbines are generally restricted to the cleared pastoral land east of Lake George. The wind turbines will not be as prominent as the existing wind turbines located on the higher ridges. Although the proposed wind turbines maybe taller (than those used in CWFI) they are generally located at lower altitudes (up to 270 metres below the ground level of existing wind turbines) resulting in reduced visibility, especially when viewed from the east.

The visual impact of ancillary works including roads, transformers, transmission lines etc. will be significantly less than the wind turbines. This is because of the lower level aspect and small size means they are generally not visible from public roads.

With respect to the visual impact of the proposed wind farm on the public domain, there are no individual viewing points from the public domain that would require any modification, let alone refusal of the proposal. The visual assessment acknowledged that the Project may result in some residual impacts to the landscape amenity, however the residual impacts are not considered to outweigh the Projects broader public benefit with respect to renewable energy generation.

The Project is a unique development for renewable energy which, due to the relatively large scale and new technology, is bound to be of interest to viewers. Simplicity in form through simplicity of line and repetitive form associated with groups of wind turbines can create a strong visual statement in the landscape.

8. NOISE AND VIBRATION ASSESSMENT

This Chapter summarises the findings of an assessment of the potential noise impact arising from the construction and operation of the proposed Capital II Wind Farm (CWFII). A full Noise Impact Assessment has been undertaken by Vipac Engineers and Scientists and is provided in **Appendix C**.

Table 16: Director-General's Requirements

DIRECTOR-GENERAL'S REQUIREMENTS	CHAPTER ADDRESSED
Noise Impacts – The EA must:-	
• Include a comprehensive noise assessment of all phases and components of the project taking into account cumulative impacts from surrounding approved or operational wind farms in the locality including: turbine operation, the operation of the electrical sub-station, corona and/or Aeolian noise from the transmission line, construction noise (focusing on high noise generating activities and any works proposed outside of standard construction hours), traffic noise during construction and operation, and vibration generating activities (including blasting) during construction and/or operation. The assessment must identify noise/vibration sensitive locations (including approved but not yet developed dwellings), baseline conditions based on monitoring results, the levels and character of noise (e.g. tonality, impulsiveness, low frequency etc.) generated by noise sources, noise/vibration criteria, modelling assumptions and worst case and representative noise/vibration impacts.	Chapter 8.1 & 8.2
• In relation to wind turbine operation, determine the noise impacts under operating metrological conditions (i.e. wind speeds from cut in to rated power), including impacts under meteorological conditions that exacerbate impacts (including varying atmospheric stability classes and the van den Berg effect for wind turbines). The probability of such occurrences must be quantified.	Chapter 8.2
• Include monitoring to ensure that there is adequate wind speed/profile data and ambient background noise data that is representative for all sensitive receptors.	Chapter 8.1
• Provide justification for the nominated average background noise level used in the assessment process, considering any significant difference between day time and night time background noise levels at background noise levels higher than 30 dB(A).	Appendix C

DIRECTOR-GENERAL'S REQUIREMENTS	CHAPTER ADDRESSED
• Identify any risks with respect to tonal, low frequency or infra-noise.	Appendix C
• If any noise agreements with residents are proposed for areas where noise criteria cannot be met, provide sufficient information to enable a clear understanding of what has been agreed and what criteria have been used to frame any such agreements.	Chapter 8.3
• Clearly outline the noise mitigation, monitoring and management measures that would be applied to the Project. This must include an assessment of the feasibility, effectiveness and reliability of proposed measures and any residual impacts after these measures have been incorporated.	Chapter 8.3
• Include a contingency strategy that provides for additional noise attenuation should higher noise levels than those predicted result following commissioning and/or noise agreements with land owners not eventuate.	Chapter 8.4

The ambient noise environment in rural areas may include noise from a variety of sources, including the wind, rain, animals, buildings and human activities. It can exhibit both diurnal and seasonal variability. A wind farm development can add to existing rural noise levels in the vicinity of the wind farm. Whether the additional noise is regarded as disturbing will depend on a range of factors including both subjective factors and measurable aspects such as how loud the sound is, how long it lasts, the tone of the sound and the time of day or night at which it occurs.

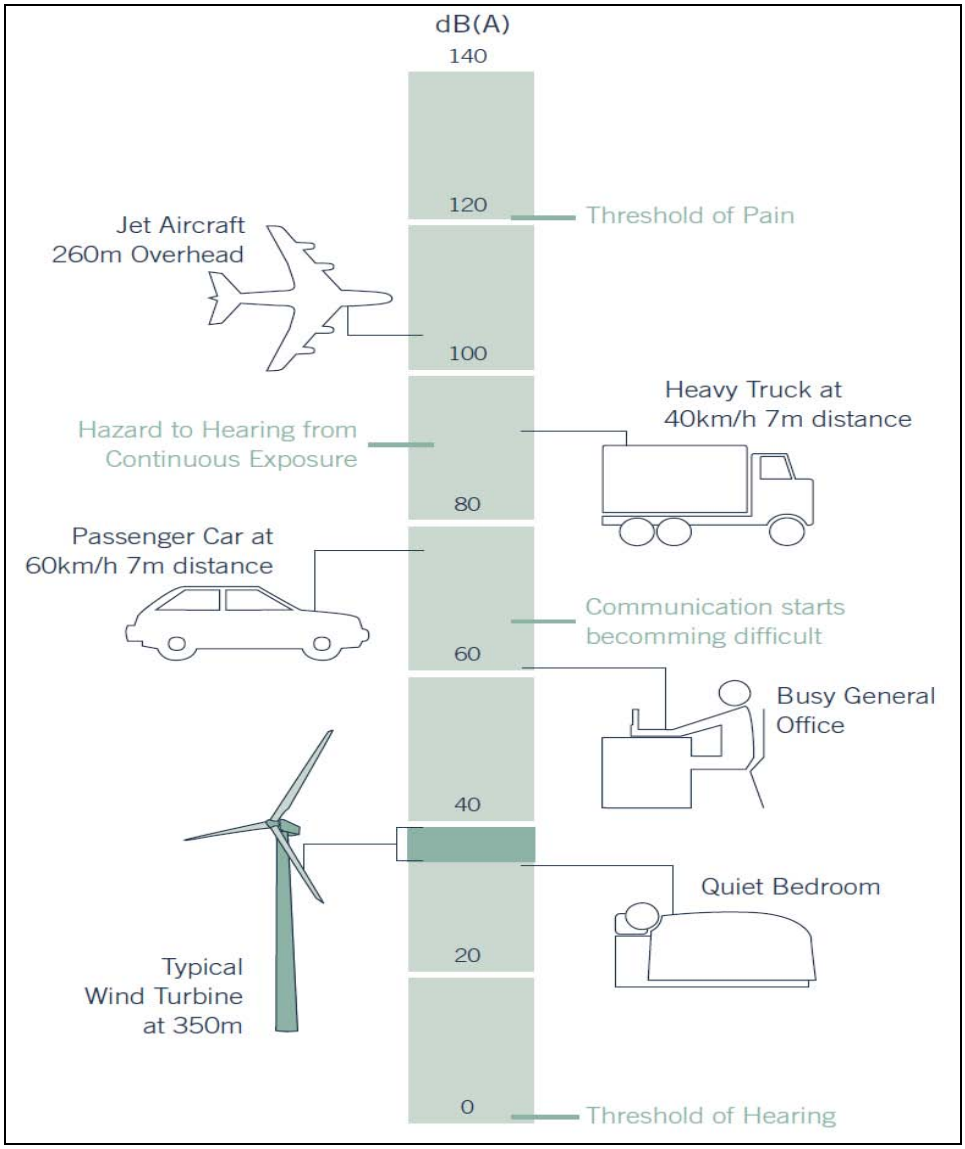

Figure 70: Wind Turbine relative noise levels (SEDA 2002)

8.1 OVERVIEW OF ASSESSMENT

The noise assessment was performed to determine the noise generated by a proposed wind farm with 53 to 57 wind turbines. The Project is associated with several noise sources including:-

- Wind turbine generators (WTG) – up to 55 wind turbines; and
- Site activities, operation staff movements on site and maintenance activities involving cranes, power tools and mobile plant to maintain access tracks as well as ongoing site restoration activities.

The total noise generated by an operational wind turbine is made up of several components, broadly grouped as mechanical and electrical noise, and aerodynamic noise. Noise is generated only when the turbine is operating. Mechanical noise is produced from the motor or gearbox. If the wind turbine is functioning correctly, the mechanical noise from a modern wind turbine should not be an issue. Aerodynamic noise is produced by wind passing over the blade of the wind turbine.

Construction noise sources include transport vehicles, excavators, cranes, concrete batching plant activities and earth moving activities. Other sources of noise may be from transformer related noise and maintenance activities.

The predicted noise levels were assessed against the South Australian Environment Protection Authority's (SA EPA) *Wind Farms – Environmental Noise Guidelines*. The SA EPA guidelines state that:-

> *"the predicted equivalent noise ($L_{Aeq\ 10mins}$), adjusted for tonality in accordance with these guidelines, should not exceed 35dB(A) or the background noise ($L_{A90\ 10mins}$) by more than 5 dB(A), whichever is the greater, at all relevant receivers for each integer wind speed from cut-in to rated power of the WTG."*

For non-relevant receivers (those associated with the wind farm), the World Health Organisation (WHO) criterion level for unreasonable interference or sleep disturbance is applicable.

8.1.1 NOISE SENSITIVE LOCATIONS

There are total of 29 residential premises (receivers) that are between 2kms and 5kms of the Project, four of which are classed as relevant receivers. The nearest associated dwelling (non-relevant) is approximately 960m away from the nearest CWFII wind turbine, and the nearest non-relevant receiver is approximately 1.2km away from the nearest CWFII wind turbine.

For residential sites which have WTGs on their property, the SA EPA criteria are not strictly applicable. These residences are classified as "wind farmers" or relevant receivers.

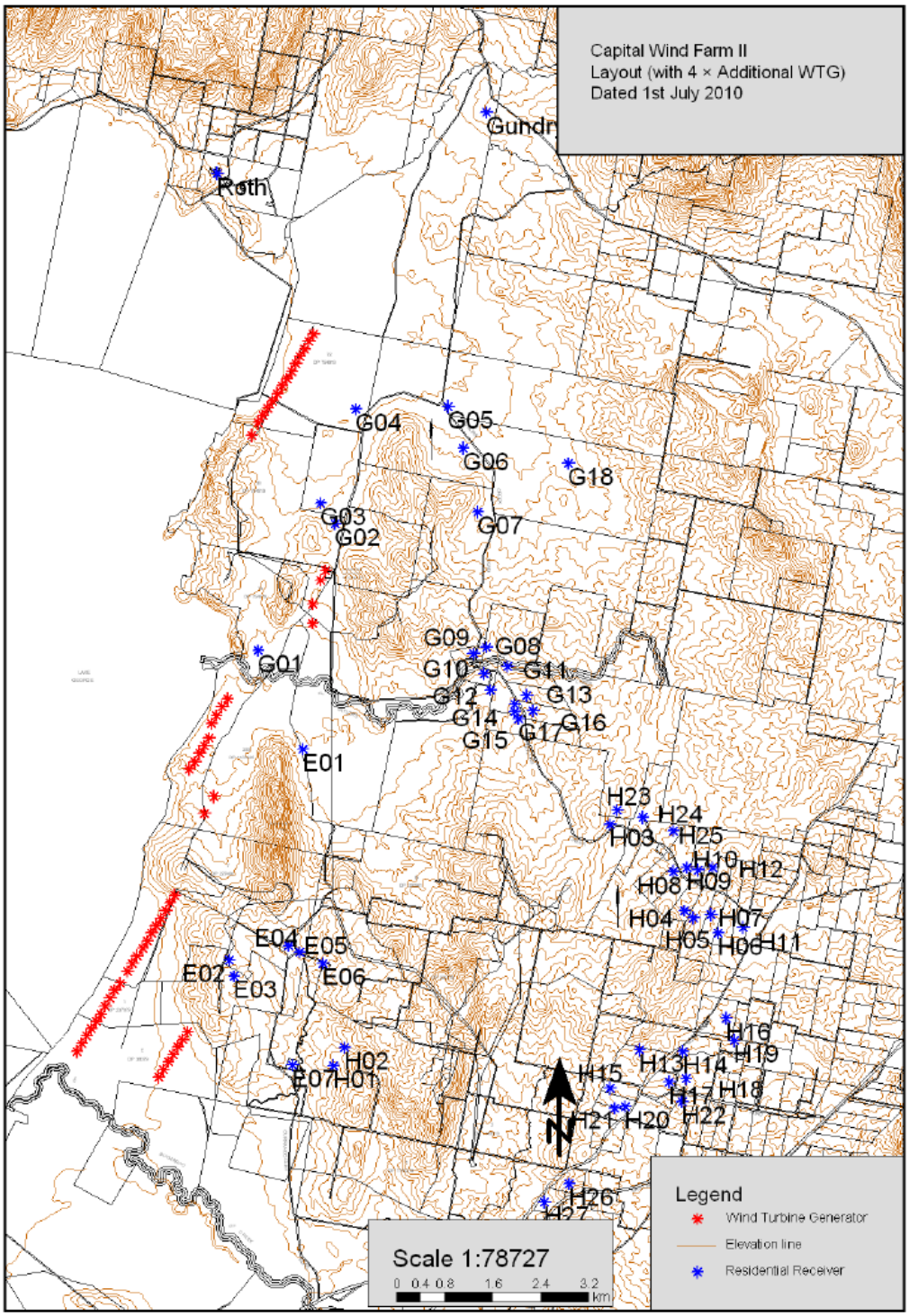

Figure 71: Proposed Capital II Wind Farm Layout (57 WTGs)

8.1.2 BASELINE CONDITIONS

Background noise is not constant, but varies with wind speed, weather and noise-producing activities. The component of background noise due to wind increases with increasing wind speed.

The background noise monitoring used for CWFII was sampled prior to the construction of CWFI, as any noise monitoring undertaken will now have influence from the adjacent CWFI. Therefore the background noise measurements and criteria selection as used in the Capital Wind Farm Noise Impact Assessment (prepared by Vipac Engineers and Scientists) has been used (**Appendix F** of **Appendix C**).

Figure 72: Typical sound level monitoring equipment

8.1.3 NOISE CRITERIA

The primary criteria to be used to determine the potential noise impact of the Project are provided in the SA EPA Noise Criteria. The guidelines have been outlined in Chapter 8.1 above.

The SA EPA Guideline criteria have been developed to minimise the impact on the amenity of relevant receivers, being those receivers not associated with the Project. It is recognised however that where a lease, financial or noise agreement exists, developers cannot absolve themselves of the responsibility of ensuring that an adverse effect on an areas amenity does not occur as a result of the operation of the Project.

Accordingly, the World Health Organisation (WHO) criteria for sleep disturbance states that sound levels should not exceed 45 $dBLA_{eq}$, so that people may sleep with bedroom windows open, unless otherwise agreed within the lease. Should the agreed noise levels exceed both the SA EPA Noise Criteria and the WHO criteria for sleep disturbance, a predetermined 'Expected Noise Impact' will be used to ensure the noise level does not have an adverse impact on the amenity of the receiver.

8.1.4 MODELLING ASSUMPTIONS

The noise model was run for the maximum power WTG setting, for neutral and wind-affected propagation conditions. The model was run for the highest impact scenario including the worst case wind conditions for the range of wind speeds from 4 to $10ms^{-1}$.

The noise model took into account the likely effects of atmospheric absorption, ground absorption/reflection, diffraction and attenuation by topographic features, screening effects of barriers and the propagation effect of wind speed and direction. Consideration of the occurrence and degree of atmospheric stability and its affect on noise propagation was also undertaken as part of the noise assessment.

8.1.5 WORST CASE NOISE IMPACTS

Two layouts were modelled, one consisting of 53 WTGs, and another with an additional 4 WTGs. For the purpose of assessing the noise impact associated with the Project (55 WTGs), the model for the 57 WTG layout was used to show the highest impact on nearby sensitive receivers. The noise modelling allowed for the variation in placement of WTGs up to 200 metres at each location, therefore the noise model was constructed with each WTG being moved 100 metres closer to the closest resident, to create the highest possible impact scenario for the proposed wind farm layout.

In addition to the allowance for an additional three turbines and location to the nearest sensitive receptor, the noise model considered the WTGs arrays with a hub height of 80 metres above ground level.

Modelling for an 80 metre hub height introduces a degree of conservatism given that the primary noise source is located 20 metres closer to the ground compared to a 100 metre hub height.

8.2 ASSESSMENT OF NOISE IMPACTS

The psycho-acoustic response or annoyance levels to a new noise source is subjective and will vary from person to person but is unlikely to be significant with wind farm noise and particularly so with increasing separation distance between the WTGs and the residences. Current wind turbine designs are not a significant source of low frequency noise or infrasound – even nearby (less than 500 metres), any infrasound is well below the threshold of human perception and would not cause health effects.

The predicted noise level generated from a wind farm with 57 WTG would achieve the appropriate criteria at all wind speeds at the most relevant receivers. **Table 6.5** of **Appendix C** summarises the predicted noise levels using the highest impact conditions.

8.2.1 CAPITAL I AND WOODLAWN WIND FARM

The Project is adjacent to both the Capital I Wind Farm (CWFI) and Woodlawn Wind Farm (WWF), and therefore cumulative noise impact of all three wind farms was investigated. It was found that at one relevant receiver (for CWFII project) the cumulative noise impact of CWFI and CWFII wind farms exceeded the noise criteria. However, it was found that the noise levels at this receiver was dominated by CWFI WTG noise and the overall impact at this receiver from CWFII is negligible.

The impact of the WWF is negligible at most receivers as this development is a large distance away from residences associated with CWFII.

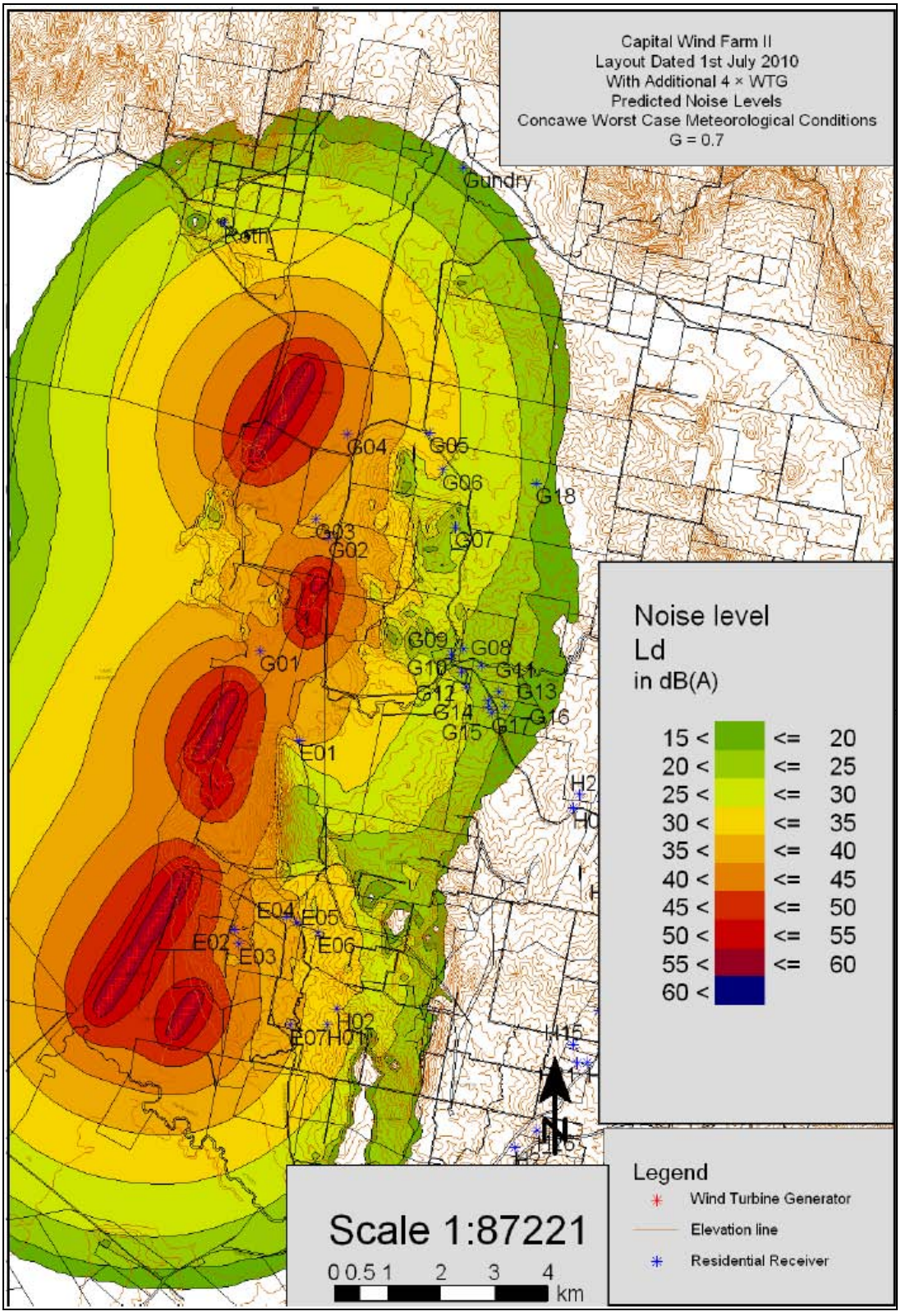

Figure 73: Capital II Wind Farm - Predicted Noise Levels of highest impact scenario (maximum power setting for 57 WTG layout)

8.2.2 CONSTRUCTION NOISE

Due to the distributed nature of the Project, construction noise impacts at wind turbine sites will progress across the Project site. Therefore, the extent of construction in any one area is likely to be less than 12 months and will be undertaken during standard construction hours (and the erection time for individual wind turbines is usually only a matter of days).

With all construction activities occurring on weekdays and only during normal working hours, the potential for sleep disturbance to occur is reduced. It is unlikely that the evening and night time amenity of residents in the vicinity of the construction activities will be affected by those activities.

It is anticipated that the existing roads will be utilised as far as possible, thereby reducing the need for additional access roads and reducing the impact of temporary road construction. The short-term increase in heavy vehicle movement may be noticeable.

As distances from the nearest turbine to each relevant receiver are mostly above 1,000 metres, the noise criteria for construction noise is likely to be achieved at most residences, with those at distances less than approximately 1,000 metres of the construction activities being exposed to higher short term noise levels.

The likely number of non-relevant residences that are affected by construction noise (non-relevant residences less than 1.5km) would be approximately 4. Non-relevant receivers G01 and G02 will experience construction noise of up to approximately 46dB(A) (1km away from construction activities), which meets the construction noise criteria of 46dB(A) outlined in Table 7-8 (**Appendix C)** for this residence. Construction noise levels for non-relevant receiver G04 will meet the selected criteria of 46dB(A), and the construction noise levels for non-relevant receiver E04 will be met (below 40dB(A)).

Additionally, there is to be some resource extraction activities at the gravel pit sites at the north west of the site. This site is approximately 1.6km away from the nearest residential receiver (relevant receiver G03). Measurements from previous projects have indicated that the approximate sound power levels from a gravel pit (mobile crusher and screen) of 114db(A). Therefore the predicted sound pressure levels at the nearest non-relevant receiver (1600m away) from the gravel pit operations are predicted to be approximately 39dB(A), and within the construction noise criteria.

However, as the construction of either the appropriate infrastructure or the turbines themselves are not confined to a single location for any significant length of time, the actual exposure of any given residence to any construction noise is only for a limited time period (possibly as short as a few weeks, depending on the construction activity).

Therefore, construction noise is not anticipated to cause significant detrimental effect to the amenity of the residences in the vicinity of the wind farm during construction.

In general, noise generated from the construction of the wind farm will be minor and temporary (up to a 12 month construction phase) and will have minimal impact, particularly given the rural landscape and few residences in the immediate vicinity of the WTG's locations.

Notwithstanding, a Noise Management Plan will be prepared as part of the Construction Environmental Management Plan and will be implemented for the construction phase of the Project. This will identify aspects such as operating hours and noise controls and provide a system for responses to any complaints raised by the community.

8.2.3 OPERATIONAL NOISE IMPACT

Noise associated with the CWFI has previously been assessed separately from the current CWFII assessment. Several receivers associated with the CWFI are non-relevant receivers for the proposed CWFII.

The noise impact on these receivers by the proposed CWFII is negligible as the noise levels at these receivers are dominated by CWFI. All noise at the relevant receiver locations for both CWFI and the proposed CWFII meets the stipulated noise criteria.

Table 17: 57 WTG Layout Predicted Noise Levels (L^{Aeq} dB(A)) for relevant sites at 8ms^{-1} wind speeds with the influence of CFWI

RELEVANT RECEIVER	WIND SPEED ms^{-1}						
	4	5	6	7	8	9	10
Criterion	**35**	**36**	**38**	**39**	**41**	**42**	**43**
Gundry	15.5	15.5	15.5	16.5	16.5	15.5	15.5
Roth	27	27	27	28.5	28.5	27	27
Bernallah (G5)	32.5	33.0	33.0	34.0	34.0	33.5	33.5
Widgemore (G6)	34.0	34.0	35.0	35.5	36.0	35.5	35.5
LaGranja (G10)	34.5	35.0	36.0	36.5	36.5	37.0	37.0
G11	33.0	33.5	35.0	35.0	35.5	35.5	35.5
Narine Green (G12)	32.5	33.5	34.5	35.0	35.5	35.5	35.5

G13	30.0	30.5	32.0	32.0	32.5	33.0	33.0
G14	30.5	31.0	32.5	32.5	33.0	33.5	33.5
G15	30.5	31.0	32.5	32.5	33.0	33.0	33.5
G16	29.5	30.0	31.5	31.5	32.0	32.0	32.0
G17	30.0	31.0	32.5	32.5	33.0	33.0	33.0
Torokina (G18)	27.5	28.0	29.0	29.5	30.0	29.5	29.5

Overhead transmission line noise (due to corona or Aeolian noise) is not significant or annoying at moderate distances (distances greater than 100m) from the likely location of the proposed overhead transmission lines and is therefore not likely to be an issue at the relevant receivers. It is not expected that the underground transmission lines will generate measurable noise levels.

The van den Bergh effects have not been accounted for, as for wind speed profiles given for the CWFI wind farm, there has been no evidence for stable van den Berg effects found.

8.2.4 SUBSTATION NOISE IMPACT

Transformer substations form an integral part of the construction of a wind farm. Due to the association with the adjacent CWFI and the WWF that is currently under construction, the Project does not involve the construction of a new substation (or additional transformers). Two existing transformers currently export the power generated from CWFI to the TransGrid network. A third transformer has been approved and is currently under construction as part of the WWF. As the capacity of the third transformer will not be reached by the WWF, the surplus capacity is capable of accommodating the power generated from the Project. This being the case, all noise generated by the substation has previously being assessed as part of the Project Applications for CWFI and WWF. It is therefore unlikely that the connection of the Project to the substation will increase the existing noise levels.

Notwithstanding, the sound levels at the nearest non-associated residences (about 1.4kms away – **Figure 74**) caused by the existing substation has shown to be negligible which is further confirmed by the lack of complaints received from the closest neighbours.

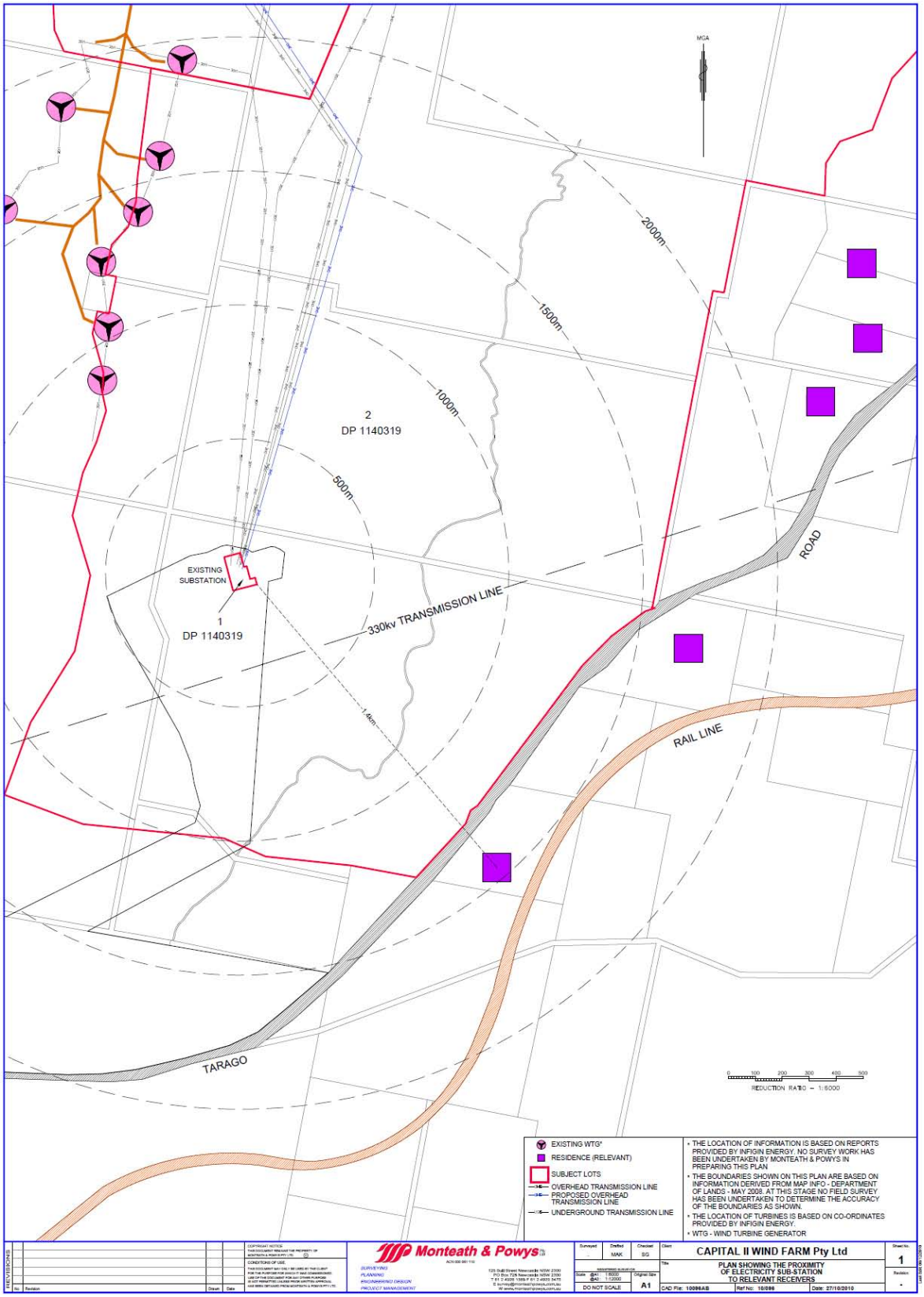

Figure 74: Distance from substation to nearest relevant (non-associated) receiver.

With the same atmospheric conditions used for the wind turbine calculations the sound levels at full power from the substation, would be less than 35dB(A). Due to the distance between the substation and receivers, the noise generated from the existing substation is not expected to be significant at the receiver locations.

8.2.5 VIBRATION IMPACT

CONSTRUCTION

Vibration levels generated from construction machinery is likely to be below the threshold of detection, and therefore negligible at all residences. Given the locations and distances to the residences there are not likely to be any vibration sensitive receivers. Blasting activities are not likely to occur during construction at this site and any piling activities that may cause noticeable short-term or distant low frequency noise events. However these occurrences are likely to be rare and only occur over a matter of seconds.

OPERATION

Due to the locations and distances of the residences relative to the proposed wind turbines there is not likely to be any detectable or perceptible impact due to vibration, infrasound or low frequency noise during operation of the Project.

8.3 MITIGATING MEASURES

The management of noise impacts will be undertaken using a similar management system established for the CEMP OEMP of the CWFI.

8.3.1 NOISE AGREEMENTS

Noise agreements have been registered between the Proponent and the owner of an affected residence that may experience wind farm noise levels above the relevant criteria. Generally these residences are wind farmers or associated with the CWFI (non-relevant receiver). The noise agreement (usually included in a contractual lease) has identified that nature of the noise impact likely to occur at the wind farmer residence and the owner's acceptance of the predetermined Expected Noise Impact.

8.3.2 CONSTRUCTION NOISE

In general, noise generated from the construction of the wind farm will be minor and temporary and will have minimal impact, particularly given the rural landscape and few residences in the immediate vicinity of the WTG's locations.

A Construction Noise Management Plan (CNMP) will be developed in conjunction with the Construction Environmental Management Plan (CEMP) such that operational controls may be implemented to minimise potential noise impacts during the construction stage.

The Interim Construction Noise Guideline (DECC, 2009) provides recommendations for the management of noise from construction works and examples of common mitigation techniques.

The Interim Construction Noise Guideline (DECC, 2009) identifies noise and vibration control practices that may be applied to minimise construction related impacts on the community. Examples of strategies and work practices that may be relevant management of potential vibration impacts include:

- Universal Work Practices:-
    - Ensure employees and contractors are appropriately trained in the use of equipment in ways to minimise generation of noise and vibration.
    - Ensure site managers regularly check the site and nearby residences for problems such that solutions can be quickly applied.
- Consultation and Notification:-
    - Provide information to neighbours before and during construction.
    - Maintain good communication between the community and project staff.
    - Provide a contact telephone number for community enquiries during the construction phase.
    - Have a documented complaints handling process, including a register of received complaints, actions and resolution.
- Plant and Equipment:-
    - Ensure the correct plant is used for the purpose.
    - Ensure equipment is maintained in good working order.

- Work Scheduling:-

    - Schedule potentially high impact activities during less sensitive periods and provide periods of respite. An example of such scheduling may be to undertake high impact activities only between 9:00am to 12:00pm and 2:00pm to 5:00pm.

- At Residences:-

    - Undertake building condition surveys at potentially impacted dwellings prior to commencement of vibration generating works to provide a reference against which impacts may be assessed.

8.3.3 OPERATIONAL NOISE

Receivers where a noise agreement has been made (non relevant receivers), the allowable noise levels are not to exceed the WHO Noise Guidelines for sleep disturbance levels of 45dB(A) unless otherwise agreed within a lease agreement.

Receivers that are in the vicinity of the Project site and not associated with the Project are identified as relevant receivers. The noise levels at these residences shall not exceed the SA EPA Noise Guidelines of 35dB(A). The Noise Impact Assessment prepared by Vipac Engineers and Scientists concluded that the noise criteria for all relevant receivers will be achieved therefore no mitigation measures are required.

8.4 CONTINGENCY STRATEGY

The cumulative impact of CWFI and CWFII meet the selected criteria where noise from the CWFII turbines is dominant. Accordingly, a contingency strategy is not necessary however, should levels higher than those predicted eventuate, then mitigation could be applied, some examples may be in the form of modifying sound power levels through wind sector management or the provision of acoustic barriers, including vegetation screens at the relevant receiver.

8.5 CONCLUSION

A Noise Impact Assessment was performed to determine the noise generated by a proposed wind farm with 57 wind turbines. The results of the noise modelling generated predicted noise levels that were assessment against the SA EPA “Environmental Noise Guidelines: Wind Farms”.

It was found that the cumulative impacts of CWFI and CWFII meet the selected criteria for the relevant receivers where the CWFII wind turbines are dominant. The residences classified as non-relevant receivers that are wind farmers or associated with the CWFI, have lease agreements in place with the Proponent that include a predetermined Expected Noise Impact.

During the construction period, noise from construction machinery may be discernible on occasions, but these will be short term impacts, during the day, and due to the distributed natural of the Project, noise impacts at wind turbine sites will progress across the Project site and therefore not be concentrated at a single location.

A Construction Environmental Management Plan will be implemented for the construction phase to mitigate and adverse noise impacts.

9. FLORA AND FAUNA

The Director-General's Requirements identified ecology as a key issue for the Environmental Assessment of the Project. The potential impacts to flora and fauna from the Project relate to the construction activites associated with clearing native vegetation and habitat disturbance and the operational impacts predominantly associated with birds and bats striking the rotating turbine blades.

This Chapter identifies the potential ecological impacts of the Project from construction and operation. The information presented in the Flora and Fauna Assessment is based on a review of available ecological data pertaining to the study area and field surveys. The data has been used to assess the significance of potential impacts from the proposal on listed species, ecological communities and populations of local, regional, state and national conservation significance, and their habitats, which are known or considered likely to occur within the study area. Mitigation measures to reduce these impacts are also discussed. The management measures are further detailed in the draft SOC contained in Chapter 17. **Table 18** below outlines the Director-General's Requirements and where they have been addressed in this report.

Table 18: Director-General's Requirements for Flora and Fauna

DIRECTOR-GENERAL'S REQUIREMENTS	CHAPTER ADDRESSED
Flora and Fauna – The EA must:-	
• Include an assessment of all project components on flora and fauna (both terrestrial and aquatic, as relevant) and their habitat consistent with the *Draft Guidelines for Threatened Species Assessment* (DECC, 2005)	Chapter 9.5
• Include details on the existing site conditions (including whether the vegetation comprises a highly modified or over-cleared landscape) and level of proposed disturbance (including quantifying the worst case extent of impact on the basis of vegetation type and total native vegetation disturbed).	Chapter 9.2
• Specifically consider impacts to threatened species and communities listed under both State and Commonwealth legislation that have the potential to occur on site including but not necessarily limited to: Box/Gum Grassy Woodland Communities, natural temperate grasslands, Tablelands Frost Hollow Grassy Woodlands, Silky Swainson-pea, Austral Toad Flax, Terengo Leek Orchid, Pink-tailed Worm-lizard, Grassland Earless Dragon, Striped Legless Lizard, Little Whip Snake, Woodland Bird Species, Superb Parrot, Squirrel Glider and the Golden Sun Moth.	Chapter 9.1, 9.3 and Chapter 9.5

DIRECTOR-GENERAL'S REQUIREMENTS	CHAPTER ADDRESSED
The EA must provide details of the survey methodology employed including survey effort and representativeness for species targeted.	
• Specifically address impacts to connectivity and biodiversity corridors and to riparian and/or instream habitat in the case of disturbance of waterways. In addition, impact of the project on birds and bats from blade strikes, low air pressure zones at the blade tips (barotrauma), and alteration to movement patterns resulting from the turbines must be assessed, including demonstration of how the project has been sited to avoid and/or minimise such impacts.	Chapter 9.5

9.1 ASSESSMENT METHODOLOGY

Kevin Miller and Associates prepared a Flora and Fauna Assessment for the Project in accordance with *Draft Guidelines for Threatened Species Assessment* (DEC and DPI, 2005) and *Principles for the Use of Biodiversity Offsets in NSW* (DECCW, 2008) and Greg Richards and Associates prepared an Assessment of the Bat Fauna at the CWFII site.

The study areas at CWFII were investigated during April and May 2010. The flora and fauna consultant was involved in the environmental assessment of the CWFI and has carried out various surveys since 2005. A detailed description of the methodology used to prepare the Flora and Fauna Assessment is contained within Chapter 3 of the Flora and Fauna Assessment Report within **Appendix D**.

A comprehensive flora survey was conducted to provide baseline floristic data and investigate the presence of threatened plant species, populations and/or endangered ecological communities in the study area. The distribution and extent of vegetation communities in the locality was initially identified from previous broad-scale vegetation maps. The existing vegetation maps of the site were ground-truthed and refined to an appropriate scale specific to the study site.

The assessment of impacts on terrestrial fauna utilised quantitative and qualitative data sourced from field surveys, and background reviews and knowledge of the fauna of the regional area. Data was collected on the type and distribution of fauna habitats and fauna species richness, distribution and abundance focusing on threatened species listed under the *TSC Act* and *EPBC Act*.

Fauna survey sites were selected to sample the range of habitat types identified on the site based on the initial stratification. The fauna survey was designed in general accordance with the *Draft Threatened Biodiversity Survey and Assessment Guidelines* which included diurnal and nocturnal census. Habitat assessment was also conducted to provide a landscape evaluation of the habitats in the study area and surrounding or proximal areas. Targeted surveys were also undertaken including call playback and trapping.

9.2 DESCRIPTION OF EXISTING ENVIRONMENT

The district to the east of Lake George has had a long history of sheep grazing, commencing well before 1850. The land is almost totally cleared of its original woodland cover and much has been pasture improved, seeded with pasture species and fertilised. Much of the lowland areas have recently been ploughed, see **Figure 75.** Remnant woodland is largely restricted to small areas on the higher ridges.

Figure 75: Typical landscape where CWF II is located. The low ridge in the foreground supports native pasture or occasionally native grassland amongst the rocky outcrop, while the low land flats in the distance are ploughed and cropped

9.2.1 EXISTING VEGETATION

By studying the remnant vegetation that exists in the study area and through observations made elsewhere on similar landscapes throughout the Southern Tablelands, it was found that three vegetation zones dominated in areas that have not experienced broad scale clearing or extensive disturbance.

i. Woodland of the higher and often rocky ridges and slopes;

ii. Woodland and open woodland on the gentle to level land of the valleys and lower slopes; and

iii. The largely treeless grassland of the lower slopes and broad flats adjacent to Lake George.

The remnants of the original broad vegetation pattern can be discerned by careful observation of the surrounding landscape.

Throughout the study area there would have been little if any woodland, and the site would have been mostly a Natural Temperate Grassland.

Patches of native grassland still exist on several of the gentle slopes in the area, but these have almost been obliterated on the flat land that has a potential high agricultural value. This land is now mostly ploughed and cropped. Adjacent to the flats there are open areas of native pasture. The remaining native plants are often associated with rocky outcrops, where grazing cannot eliminate them and cropping is unsuitable.

Overall, most of the study area is covered in exotic grassland and cropped land. The quality of the grassland depends upon the grazing and management history of individual paddocks. See **Figure 76**.

Figure 76: Differential management between individual paddocks, the grassland to the right is native grassland with few weeds, to the left is native pasture and exotic grassland

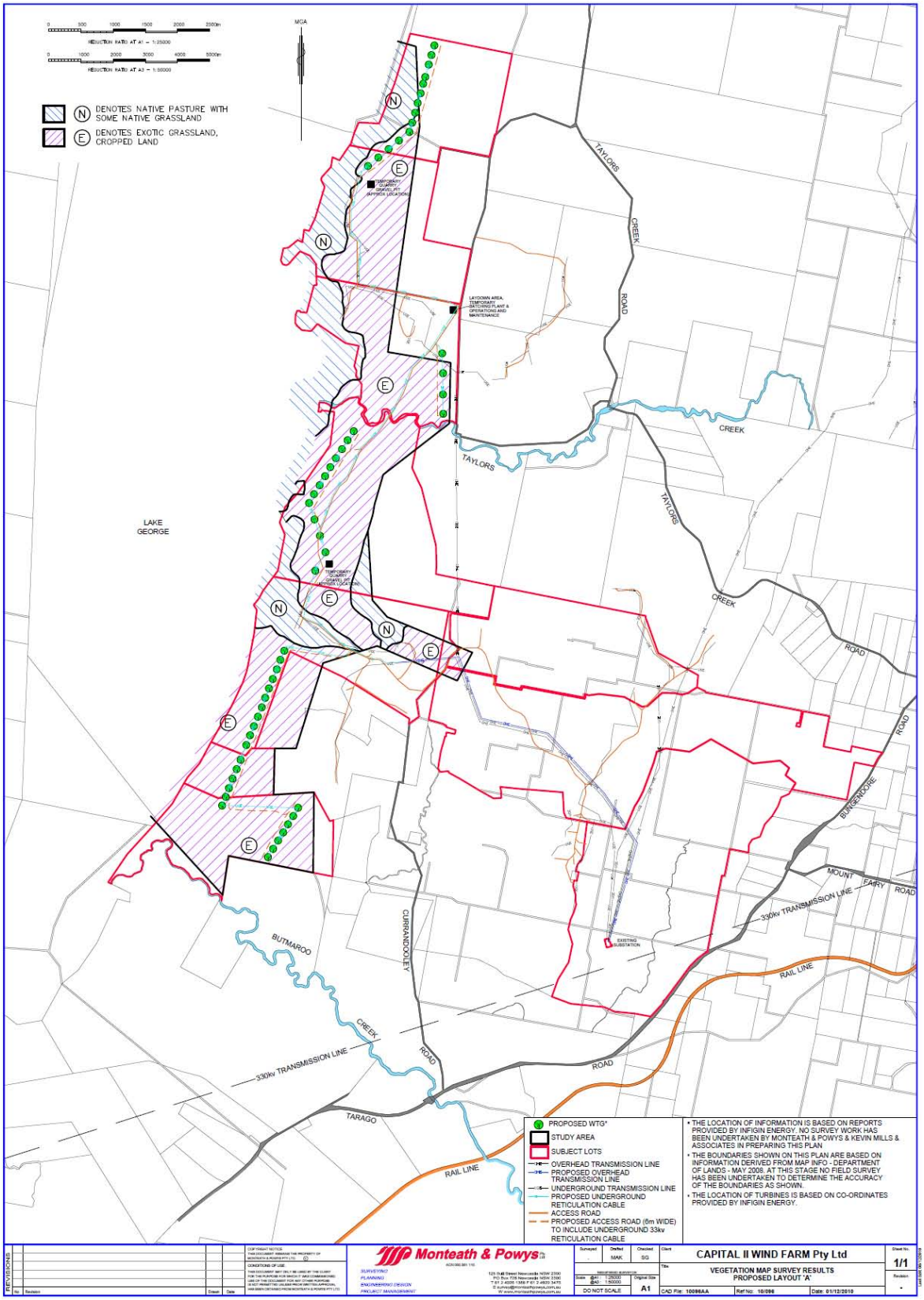

Figure 77: Vegetation survey - Layout 'A'

Figure 78: Vegetation survey aerial – Layout 'A'

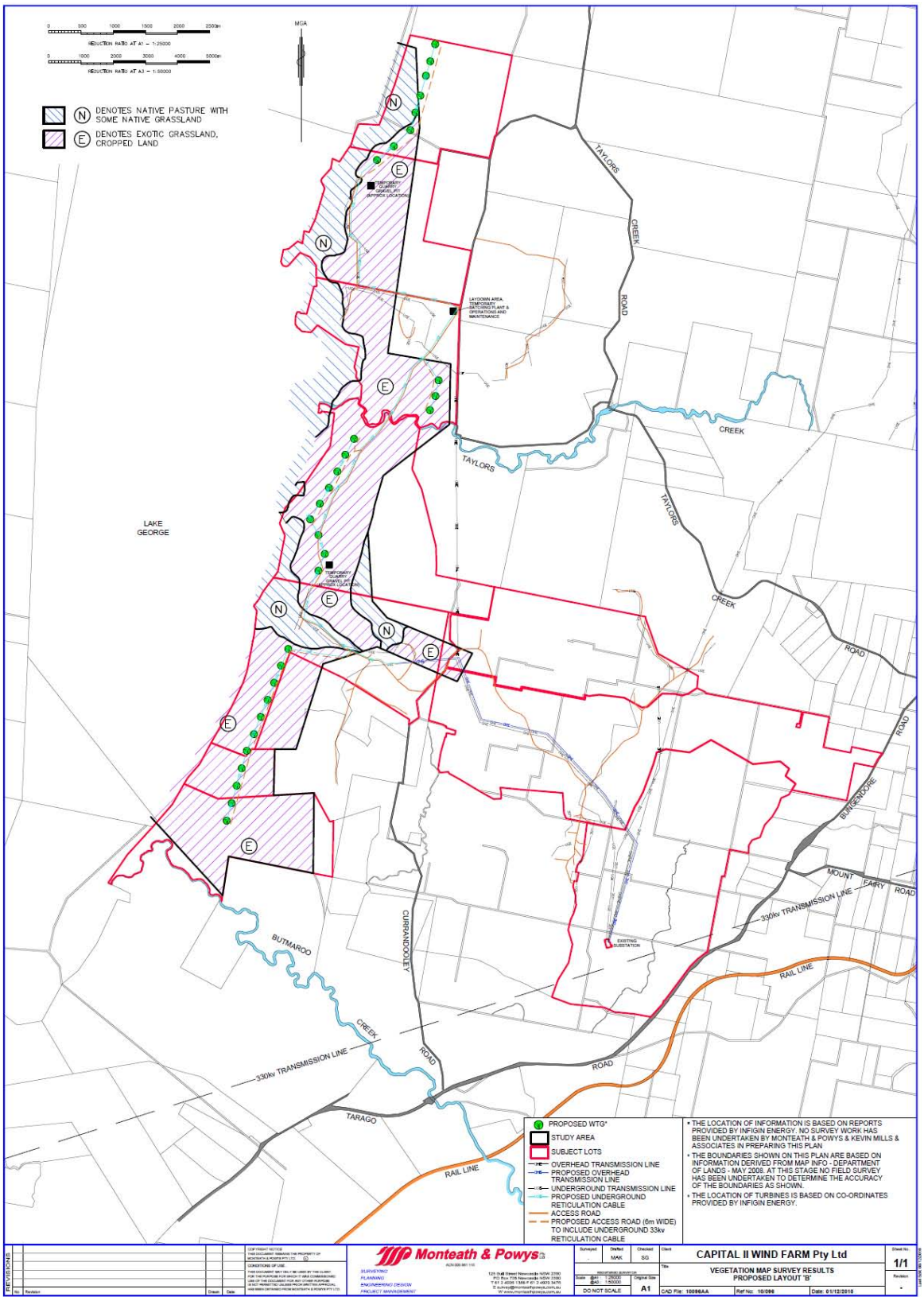

Figure 79: Vegetation Survey - Layout 'B'

Figure 80: Vegetation survey aerial – Layout 'B'

Several plots were sampled on sites that exhibited some native plant diversity. The '*floristic value score'* of each plot was calculated and it was found that the native grassland in the study area is of low quality (Table 2 **Appendix D**).

In all, 53 Indigenous and 37 introduced species were recorded throughout the study area. No rare or threatened plants were found and none are expected to occur there, as all of the Indigenous species recorded are common and widespread in the region.

9.2.2 EXISTING FAUNA

All species recorded in the study area are typical to the Southern Tablelands rural landscape. The lack of woodland in the study area has generally restricted the species recorded to those that inhabit treeless grasslands and farmlands.

Three species of listed threatened birds were recorded during the current survey, namely:-

- Diamond Firetail;
- Gang-gang Cockatoo; and
- Flame Robin.

The bird surveys also recorded the height of activity of the birds observed. The results show that all but a few birds are restricted in their activity to heights below 20 metres, being below the lowest tip of the blades on the WTGs.

There is no habitat for nocturnal mammals in the area and the one watercourse in the area, Taylors Creek is not affected in any way by the Project so there is unlikely to be any impact on frog species.

9.2.3 POTENTIAL IMPACTS

The Project is located almost entirely within cleared farmland and as such will have an extremely low impact on native vegetation. The majority of the turbine sites, access routes, and cable routes occur on cleared land with a long history of grazing with minimal potential to directly impact flora and fauna. A summary of the potential impacts on flora and fauna are identified in **Table 19.**

Table 19: Extent of Flora and Fauna impacts

ACTIVITY	POTENTIAL ENVIRONMENTAL IMPACTS
Clearing vegetation.	• Damage or disturbance to threatened species or populations. • Excessive impact on remnant woodland. • Clearing outside of designated areas. • Increased visibility of works due to excessive clearing of existing woodland.
Removal, stockpiling and respreading of soil.	• Introduction and spreading of weeds.
Removal and relocating of rocky reptile habitat.	• Reduced habitat for, and potential injury to, reptilian species and other fauna.
Access track positioning and construction.	• Disturbance to terrestrial threatened species and ecological communities outside of designated construction areas. • Disturbance to woodland vegetation where avoidance is impractical.
Vehicle washdown.	• Contamination of soil and water.
Site rehabilitation/revegetation.	• Spreading of weeds, damage to existing vegetation, inadequate vegetation cover and future erosion.

9.3 THREATENED SPECIES

Threatened species in New South Wales are listed on schedules under the NSW *Threatened Species Conservation Act 1995* (TSC Act). Nationally threatened species are listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The study area is almost entirely covered by ploughed paddocks and heavily grazed exotic grasslands, which rarely contain threatened plant species and rarely attract threatened fauna species.

Given the highly disturbed nature of the study area, only three threatened birds were recorded in the study area, namely the Flame Robin, Diamond Firetail and the Gang-gang Cockatoo however, these birds are only likely to be itinerant visitors in the study area. All three bird species are listed as 'vulnerable' under Schedule 2 of the TSC Act.

Previous assessments completed by Kevin Mills and Associates surveyed a much greater area than the study area the subject of the Flora and Fauna Assessment. Consequently, several additional threatened species were recorded on nearby properties. Although this Assessment did not survey a similar area, it is noted that the study area focused on a particular landscape that has been identified as a suitable location for the proposed WTGs. This particular landscape is only found on the lower slopes adjacent to Lake George. The previous surveys include land further to the west of Lake George along ridge lines and land that is covered with significantly more vegetation.

9.3.1 MIGRATORY FAUNA

Various internationally protected migratory species listed under the Japan - Australia Migratory Bird Agreement (JAMBA), the China - Australia Migratory Bird Agreement (CAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) have been recorded in the vicinity of Capital Wind Farm. These species include the Australian Wood Duck, Australian Shelduck, Pacific Black Duck, Nankeen Kestrel, Brown Falcon and Wedge-tailed Eagle. However, there is no important habitat in the study area for such species and the habitat on the area is not likely to support an ecologically important proportion of a population of such species.

9.3.2 ENDANGERED ECOLOGICAL COMMUNITIES

Due to the extensive disturbance to the original vegetation in the study area it is difficult to determine the distribution of plant communities that occurred there. The native grassland in this area is likely to be part of the community known as Natural Temperate Grassland (under the *TSC Act 1995*). However due to past clearing practices and ongoing grazing, it is impossible to determine with any certainty that the EEC remain.

Of the 55 proposed turbine locations (Layout A), two are on sites supporting native pasture to native grassland. Although native grasslands and native pasture are probably part of an EEC, it was concluded that there is no conclusive evidence that an EEC is present within the development site as it is impossible to determine the exact distribution of plant communities that occurred on the site.

It was found that the native grassland and native pastures are likely to be part of the Natural Temperate Grassland community, however the assessment concluded that the impact of the proposed wind farm in the study area is not likely to significantly affect any EEC's.

9.4 STATUTORY CONTROL

9.4.1 COMMONWEALTH ENVIRONMENTAL LEGISLATION

Environment Protection and Biodiversity Conservation Act 1999

The impact of a proposed action on matters of national environmental significance is assessed under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Matters of national environmental significance are:-

- World Heritage properties;
- National Heritage places;
- Wetlands of international importance (RAMSAR wetlands);
- Listed threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas;
- Great Barrier Reef Marine Park; and
- Nuclear actions (including uranium mining).

An 'action' is a project, a development, an undertaking, an activity or a series of activities, and an alteration of any of the above. An action can be on Commonwealth land, State land council land, private land, or water.

Presence of Matters of National Environmental Significance

The study area does not contain any threatened species or matters of national environmental significance, as assessed in the Flora and Fauna Assessment (**Appendix D)**. Migratory species may potentially migrate over and in the vicinity of the study area, however the vegetation survey did not locate any potential migratory bird habitat in the study area that could likely support an ecologically signification proportion of a population.

Although the Project may be considered an 'action', due to the lack of any critically endangered species or communities on the site, there should be no requirement to refer the matter for assessment as the Project is not likely to have a significant effect on any species or ecological communities listed under the *EPBC Act 1999* or their habitats.

9.4.2 STATE ENVIRONMENTAL LEGISLATION

Threatened Species Act 1995

Assessment of the species and communities in the vicinity of the Project concluded that the development of the wind farm is not likely to have a significant effect on any threatened species, populations or ecological communities listed under the *TSC Act 1995*, or their habitats. This is discussed further below in Chapter 9.5.

9.5 ASSESSMENT OF POTENTIAL IMPACTS

The construction of CWFII is unlikely to have significant impact on native flora and fauna. This is primarily due to the Project being contained entirely on highly modified land, mostly in paddocks covered in exotic pasture grasses, some of which are regularly ploughed and cropped. The original vegetation in the study area is so decimated that it is impossible to determine the distribution of plant communities that occurred there.

Notwithstanding the lack of threatened flora or fauna, the Project has been designed to avoid any areas of potential significance eliminating the need for any woodland or even individual native trees to be removed. The remaining areas of native grasslands and woodlands on the site will be retained.

9.5.1 IMPACTS TO THREATENED FLORA

The surveys of the study area did not find any threatened plant species and none are expected to occur. The highly disturbed nature of the site, a portion of which is regularly ploughed, and the exotic grassland covering the majority of site precludes the likelihood of threatened flora occurring in the study area. Accordingly it is likely that there will be no significant impact on any threatened flora.

9.5.2 IMPACTS TO THREATENED FAUNA

The only occurrence of threatened fauna in the study area is likely to be occasional visits by listed woodland birds.

Their occurrence in the study area is not unique, they range widely across the landscape and would not find high value habitat in the study area. Woodland is the most important habitat for these species. No woodland occurs on or near any of the proposed components of the Project.

9.5.3 IMPACTS TO RIPARIAN OR INSTREAM HABITAT

The two major water courses found within the Project site (Taylors Creek and Butmarroo Creek) will be retained in their protected and conserved in their current condition. Access across these watercourses will be provided from the existing access tracks constructed as part of CWFI. These existing tracks have been constructed to accommodate the type of vehicles expected to require access throughout the site.

Impacts to riparian vegetation on site will be restricted to a narrow crossing of Taylor's Creek for the access road only. This will occur across an existing track used for access over the creek and a culvert construction will be used.

The crossing point has been identified as a degraded portion of the creek in terms of the sparse presence and low condition of the riparian vegetation which is dominated by bracken fern. No significant impact on riparian vegetation as a result of the Project is therefore expected.

9.5.4 IMPACTS TO BIODIVERSITY CORRIDORS

The landscape surrounding the study is characterised by a mosaic of open agricultural land with patches of forest and woodland including riparian vegetation and residential allotments. The land is almost entirely used for agricultural pursuits. There is little opportunity to enhance habitat connectivity through the study area without extensive rehabilitation of significant tracts of land. However this would result in the loss of productive arable land. The Project is unlikely to have a significant impact to the habitat connectivity or wildlife habitat corridors given the lack of vegetation present to support a viable connection through the site.

9.5.5 BLADE STRIKE - AVIFAUNA

The Australian Wind Energy Association Report entitled '*Wind Farms and Birds – Interim Standards for Risk Assessment*' provides a framework for determining the levels of investigation of bird impacts at wind farm sites and a set of systematic and structured protocols for the different levels of investigation that guide the choice and application of bird collection data and analysis methods. The greatest impacts appear to occur near large wetlands and on important migration routes, where large flocks of birds congregate.

Several bird surveys in the area of the wind farm have taken place since 2005, and an understanding of the species present and the habits they are using has been established. The heights at which birds were flying were also recorded. The results indicate that the vast majority of birds fly below the lower tip of the blade.

After a review of the threatened bird species known and potentially present in the study area (**Appendix D**), the relevant species are either ground species or are unlikely to occur in the area because of a lack of suitable habitat, e.g. woodland. Given the ephemeral nature of Lake George, which is subject to long periods of dry weather, the overall risk to wetland bird species is likely to be very low.

This being the case, the overall potential risk to threatened bird species from blade-strike is very low to negligible, however it is acknowledged that some level or mortality is likely to be unavoidable.

9.5.6 BLADE STRIKE - BATS

A 2010 field study conducted by Greg Richards and Associates (**Appendix E**) showed that during 90 detector nights of sampling, which generated a total of 2,882 identified bat calls, only 10 bat species were present in the development site. Only one of the 10 species was listed in the NSW Threatened Species Conservation Act 1995, being the Eastern Bentwing Bat (EBB). Of the 2,882 identified bat calls, the EBB accounted for 0.4% or 12 confirmed calls. The remaining bat species are common throughout the region and are not considered in any threat category.

Nocturnal surveys were conducted throughout March and April 2010 and found that the average number of bat calls per night is similar to other areas on southern Australia where open pasture is relatively poor habitat for bats.

The EBB has become the focus species at wind farms in the Southern Tablelands, with a major concern being its migration from its breeding cave at Wee Jasper (where up to 30,000 EBB can be present) to the wintering caves in the Great Dividing Range or the South Coast of NSW. The closest potential wintering cave to the development site can be found at Mt Fairy, some 13kms to the east. **Figure 81** locates Wee Jasper and Mt Fairy and indicates the likely migration path passing through the Capital Wind Farm.

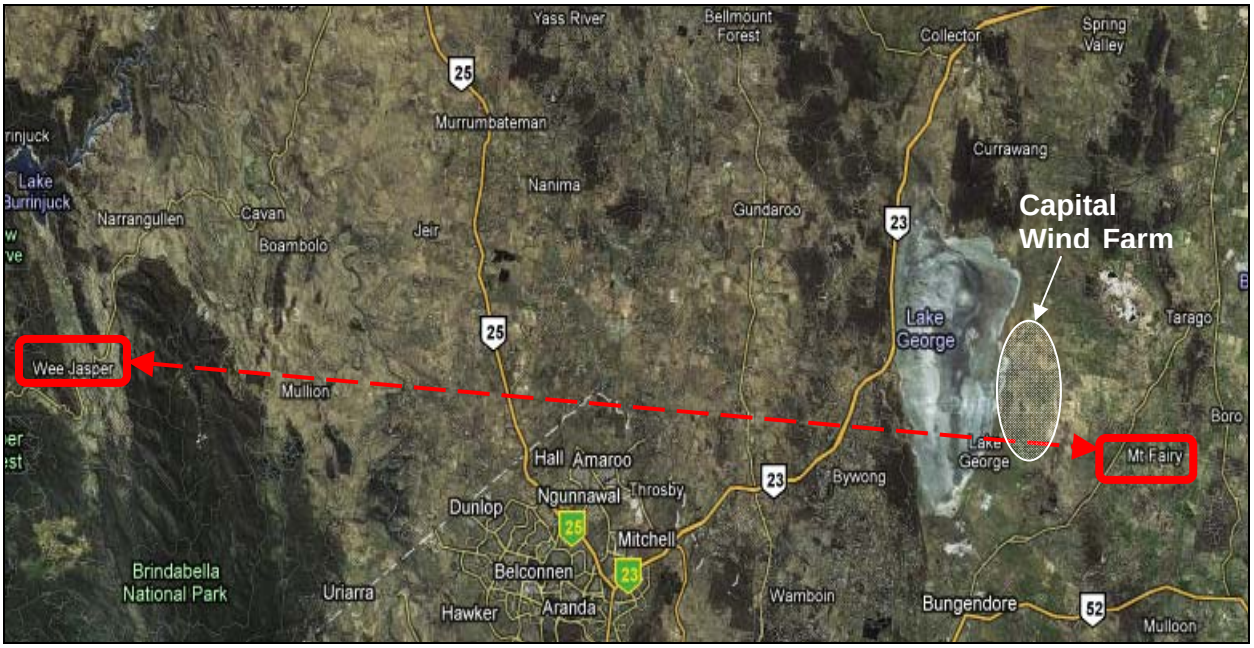

Figure 81: Eastern Bentwing Bat migration path from Wee Jasper breeding caves to Mt Fairy wintering caves (Google Maps 2010 and Greg Richards & Associates)

The development site provides a poor habitat and no roost sites, being relatively barren with a small tract of woodland found in the study area. This would explain why the bat community is depauperate in threatened species.

This being the case, it remains that the EBB may only migrate across part of the development site possibly twice per year with little reason to remain on the site for any length of time, should the EBB take a direct flight to the staging cave at Mt Fairy. Notwithstanding the Wee Jasper EBB population occupies numerous caves in winter, so not all of the breeding colony would pass through the wind farm. The survey during March and April was timed to coincide with the late summer dispersal period of the EBB. It was found that during the migration period, very few EBB passed through the wind farm site.

The likelihood of collision mortality is highly dependent on the siting of wind farms and the characteristics of the relevant bat species. Literature review, risk assessment and assessment of significance were undertaken to characterise the impacts to threatened species. Based on the results of the literature reviews and an understanding of bat behaviour, those species most likely to come into contact with turbine blades during operation include those that forage above the canopy, are migratory or have large foraging areas and may roost in trees across the development site.

Given the lack of foraging habitat preferred by the EBB, the potential for blade strike is reduced, however given the migratory behaviour of the species there is potential for strike during these activities.

It was concluded that the low level of EBB activity at CWFI, especially in the open habitats suggests that this species in unlikely to regularly use the CWFII project area.

An Adaptive Bird and Bat Management Plan will be implemented including the existing survey area (CWFI) be extended so that additional sites are monitored in the development site. Additional management measures that have been implemented in other wind farms include:-

- Minimising the availability of raptor perches;
- Swift carcass removal;
- Pest control; and
- Wind sector management including switching off turbines that have been identified to result in a higher rate of bat strike.

9.5.7 LOW AIR PRESSURE AT BLADE TIPS - BAROTRAUMA

Both bats and small birds can be affected by the rapid change in air-pressure near moving turbine blades. Although physical collision with the turbine blade does not occur, the fluctuation in air-pressure, or sudden decompression, can be fatal to some bird and bat species.

Ongoing monitoring conducted on the CWFI (as part of the Adaptive Bird and Bat Management Plan) site included the collection of bat carcasses. Many of the carcasses did not have visible injuries indicating that they have probably suffered from decompression – barotrauma.

Similar to blade strike, it is acknowledged that some level of mortality will occur due to the affect of barotraumas on some species of birds and bats. In this regard, the Adaptive Bird and Bat Management Plan will consider the potential risks of barotrauma and implement the recommended management measures such as those listed in Chapter 9.5.6.

Notwithstanding, as the monitoring component of the Adaptive Bird and Bat Management Plan has not been completed, an accurate and thorough scientific conclusion cannot be reached. Regardless of the status of the report (it is noted that the report methodology requires ongoing monitoring for approximately two years; equivalent to 2 breeding seasons), since operation of CWFI commenced, there has been no fatalities of any threatened species as a result of blade strike or barotraumas; which is notable because the monitoring period coincided with the emigration of the Eastern Bentwing Bats from Church Cave, Wee Jasper to wintering sites to the east of the site.

9.5.8 ALTERATION TO MOVEMENT PATTERNS

Some local and regional movement patterns have been recorded, particularly the migration path of the threatened Eastern Bentwing bat (EBB) from the breeding caves at Wee Jasper to the staging/wintering caves around the Mt Fairy area (**Figure 81**). Following an assessment of the bat fauna in the area (**Appendix D**), it was concluded that due to the lack of foraging habitat and vegetation on the site preferred by the EBB, it is unlikely that the EBB would regularly use the site, and therefore the movement patterns would be unlikely affected.

Notwithstanding the direct migration path is around 80kms, allowing for wind patterns and other meteorological influences, the migration path is not likely to be point-to-point. In this regard the same migration path is unlikely to be frequently used, and therefore the risk of significant alterations to the preferred movement pattern, or migration path is negligible.

9.5.9 BIODIVERSITY OFF-SETTING MEASURES

The components of the Project are located to avoid impacts on all important native habitats and will not diminish the biodiversity values in the area. The minimal effects of the development will be mitigated in those areas where there is some native habitat by minimising the footprint of the development and micro-siting components to avoid local habitat features. As there is no significant impact on native habitat or habitat likely to be important to threatened birds, there is no need for an off-set.

9.5.10 KOALA HABITAT

State Environmental Planning Policy No. 44 Koala Habitat Protection (SEPP 44) applies in this area, however no Schedule 2 Koala food trees were recorded in the study area. The area is therefore not considered to be “potential Koala habitat” and no further provision of the Policy apply.

9.5.11 IMPACT SIGNIFICANCE ASSESSMENT

An assessment of significance of impacts was conducted for known and potential subject species (i.e. listed threatened species) in accordance with the *Draft Guidelines for Threatened Species Assessment* (DECC and DPI 2005), and in the National context in accordance with the *Significant Impact Guidelines for Matters of National Environmental Significance* (DEWHA 2006) (refer **Appendix D** and **Appendix E** for details).

The assessment has concluded that the Project is unlikely to impose a significant impact on local populations of threatened species, endangered communities or their habitats as listed under the TSC Act and EPBC Act as it is not necessary to remove any threatened flora or disturb threatened fauna habitat. The project components and layout has been designed to avoid and minimise the likelihood of disturbance to threatened flora and fauna. The Project is entirely located on highly modified land, and there is no need to remove any native vegetation, woodlands as the Project development envelopes are devoid of vegetation with the exception of exotic pasture grasses.

9.5.12 EPBC ACT ASSESSMENT

Many internationally protected migratory species occur in the general area, as many common and widespread species are listed. Some of these species occur in the area from time to time. Construction of the Project is not likely to have a significant impact on any listed migratory species. There is no "important habitat" on the development sites for such species and the habitats are not likely to support an “ecologically important proportion” of a population of a migratory species.

Accordingly, CWFII is not likely to have a significant impact on any matters of national environmental significance listed under the *Environment Protection and Biodiversity Conservation Act 1999*. Referral to the Commonwealth Minister for the Environment for assessment is, therefore, unwarranted.

9.6 MITIGATION MEASURES

The Project will not involve the clearance of any native flora or disturbance to flora and fauna habitat within the subject site. The majority of the WTG sites, access routes and cable routes occur on cleared land with a long history of grazing, which minimise the potential for wind farm activities to impact native flora and fauna.

A series of mitigation measures are recommended that are designed to minimise the potential impacts as a result of this clearing and disturbance. The mitigation measures provided below include mitigation and management practices during the construction and operational phases of the Project.

9.6.1 MITIGATION MEASURES DURING CONSTRUCTION

Similar to the Flora and Fauna Management Sub-Plan prepared for CWFI as part of the CEMP, a revised Sub-Plan will be prepared prior to any works commencing. The following is a list of management measures implemented for the CWFI.

Pre-construction

- Staff inductions – flora and fauna management procedures;
- Field survey for roost sites – ecologist to inspect trees for potential bat roosting sites;
- Identification of vegetation to be cleared
- Seed collection – seeds of indigenous plants to be collected; and
- Access tracks and underground cabling – tracks to be minimised where possible.

During Construction

- Vegetation clearing – clearing and trimming of vegetation to be kept to a minimum;
- Soil management – erosion and sediment impacts on flora and fauna to be minimised;
- Construction vehicles – site construction vehicles to be restricted to designated tracks only; and
- Weed management – weeds must be separated from native vegetation disposed at an approved solid waste facility and earth moving vehicles to be washed down before entering and leaving a property.

Post Construction

- Revegetation and rehabilitation of disturbed areas – where practical, revegetation will occur in disturbed areas with indigenous species.

9.6.2 MITIGATING MEASURES DURING OPERATION

When identifying potential flora and fauna impacts during the operation phase, the potential for avifauna coming into contact with moving wind turbine blades must be considered. A Bird and Bat Adaptive Management Plan was implemented for the CWFI and will be adopted for the CWFII Project. The objective of this adaptive management program is to minimise bird and bat disturbance from the construction and operation of the Project, in particular reduce bird and bat turbine collision risk. This will be achieved by establishing monitoring and management procedures consistent with the methods outlined by the Australian Wind Energy Association (2005) and the status of risks to avifauna identified for the site.

9.6.3 MONITORING AND REPORTING

A program for monitoring and reporting on the effectiveness of the mitigation measures will be implemented and used to review the Adaptive Bird and Bat Management Plan were the measures found to be ineffective and able to be improved. An environmental officer will be appointed for the construction phase of the project, whose role it will be to implement the Sub-Plan and ensure the mitigating measures are adopted.

9.7 CONCLUSION

The assessments of significance have concluded that the Project is unlikely to impose a 'significant impact' on local populations of threatened species, endangered communities or their habitats as listed under the *TSC Act* and *EPBC Act*. The Project has been assessed under DECCW guidelines and it was found that the additional wind turbines and associated infrastructure at the Capital Wind Farm will not diminish the biodiversity values in the area. The land affected is almost entirely highly modified from its original character. At most, there are occasional visits by woodland birds, although there is no breeding or special habitat for such species on the Project site. Limited clearing could be required to install some turbines, however it was found that the impact on the woodland would be acceptable.

The proposal is not likely to reduce the long-term viability of a local population, as the species known to occur in the general area do not depend upon highly disturbed farmland for their survival.

In conclusion, the construction and operation of CWFII is not likely to accelerate the extinction of any species, population or ecological community or place any such species, population or community at risk of extinction as the development is located in paddocks that have been almost entirely cleared of their original natural vegetation and habitats.

The recommendations found in Part 7 of **Appendix D** will be adopted in a Flora and Fauna Management Sub-Plan and implemented so that the potential impacts of the Project can be appropriately managed so as to not result in significant residual impacts.

10. INDIGENOUS HERITAGE

The Director-General's Requirements identified heritage as an issue for the Environmental Assessment (EA). This Chapter describes the existing environment and identifies the potential heritage impacts of the Project. It also identifies mitigation measures that would be required to reduce these impacts. **Table 20** below outlines the Director-General's requirements and where they have been addressed in this report.

Table 20: Director-General's Requirements for Heritage

DIRECTOR-GENERAL'S REQUIREMENTS	CHAPTER ADDRESSED
The EA must include an assessment of the potential impact of the project components on indigenous heritage values (archaeological and cultural).	Chapter 10.7
The EA must demonstrate effective consultation with Indigenous stakeholders during the assessment and in developing mitigation options including the final recommended measures.	Chapter 10.5
The EA must be consistent with the *Guidelines for Aboriginal Cultural Impact Assessment and Community Consultation* DEC July 2005.	Chapter 10.6

This Chapter of the EA summaries the findings of the Aboriginal Archaeological and Cultural Heritage Assessment attached as **Appendix E**.

10.1 ASSESSMENT APPROACH

Austral Archaeology Pty Ltd completed an Aboriginal Archaeological and Cultural Heritage Assessment to identify the Aboriginal archaeological and cultural heritage values present on the Capital II Wind Farm (CWFII) site.

The main objectives of the heritage assessment were as follows:-

- Identify and consult with the appropriate Aboriginal stakeholders in regards to the project;

- Undertake a field assessment of the entire study area in the company of Aboriginal stakeholder representatives to identify Aboriginal archaeological and cultural sites and issues, areas of potential archaeological deposit, and/or archaeologically sensitive landscapes, within the study area; and
- Produce an assessment and professional recommendations based on the results of the field work and mapping to advise the Client on the Aboriginal archaeological and cultural values of the subject area.

As part of the assessment a series of recommendations for the management and mitigation of any potential impacts of the development have been prepared.

Note: A Potential Archaeological Deposit (PAD)

10.2 DESCRIPTION OF EXISTING ENVIRONMENT

The CWFII study area is located in the South Eastern region of NSW within the Pejar Local Aboriginal Land Council boundary.

Excavations have shown that there are at least 21,000 years of Aboriginal occupation in and around the Lake George area (Flood 1996:33). Despite colonisation by Europeans in recent centuries, Aboriginal people descended from the earliest inhabitants of this region still maintain their connection to their country and their customs (Brown *et. al.* 2007; Flood 1996:5).

The subject site is located within the Lake George Catchment area. The major drainage lines in the study area are Taylors Creek and Butmaroo Creek which drain into the basin of Lake George to the west. Wrights Creek joins Butmaroo Creek close to Lake George.

The drainage of the study area has been modified by the construction of bunds and dams along drainage channels limiting the amount of water flowing into the major creeks. The study area consists of shallow valleys between low crests with a large number of ephemeral streams and drainage lines located in the more elevated parts of the catchment and feeding into Taylors and Butmaroo Creek.

Investigations of the distribution of archaeological objects and places include an analysis on the natural resources available in a region to gain an understanding of the range of cultural remains that can be expected.

Water availability is a major influence on the intensity of Aboriginal occupation. Flaked stone artefacts are the predominant evidence of past Aboriginal activity and are often associated with permanent water sources.

Soil types are influential as accumulating sediments can cover cultural remains while areas of sediment removal through erosion can either uncover buried archaeological material or transport small items away from the original depositional context.

With the exception of the Woodlawn Mine, major ground disturbance within the study area is limited to drainage enhancement and water storage work in the form of creek alignment and construction of dams.

The historic removal of the native woodlands has also resulted in accelerated and increased erosion across the study area specifically along creek lines and valleys.

Regular ploughing will disturb the top layer of soil to the depth of the ploughshare (usually between 10-15cm), therefore potentially affecting site integrity. However, localised artefact movement is common and does not necessarily affect overall site context.

10.3 ABORIGINAL HERITAGE INFORMATION MANAGEMENT SYSTEM

A search of the NSW DECCW's Aboriginal Heritage Information Management System (AHIMS) was conducted covering an area of approximately 20km² surrounding the proposed study area. A total of 74 Aboriginal objects and places have been recorded within this area (**Table 21**).

Table 21: Summary of sites recorded within 20km^2 of the study area

FEATURE TYPE	TOTAL	%
Artefact	62	83.78
Potential Archaeological Deposit (PAD)	12	16.22
TOTAL	74	100

Of the 74 recorded sites within 20km² of the study area, only two sites fall within the current study areas (Site # 57-2-0007 & 57-5-0060). The site cards were recorded in 1968 and 1987 respectively.

NP&WS SITE # 57-2-0007

This site was recorded along the north bank of Taylors Creek by R. Lampert in 1968. The site dimensions were recorded as being 140 metres in length and 28 metres in width. Within this area no specific artefacts were recorded, but it was written down that cores and scrapers were located within the area.

Ground truthing of this location revealed an artefact scatter of 21 artefacts (CWF II-S-21) which were all recorded in detail. It is proposed that this recording be submitted to update the existing site card.

NP&WS SITE # 57-2-0060

This site was recorded along the relict shore line of Lake George by P. Packard in 1987. The site dimensions were recorded as being 1km in length and 80 metres wide and no specific artefact recordings were made. A brief mention of a small number of edge ground axes, hammer stones/anvils and quartz flakes were made with no specific locations or detailed recordings.

Ground truthing of this location revealed one artefact scatter (two artefacts) and one isolated find (CWF II-S-07 & CWF II-IF-06) which were all recorded in detail. No edge ground axes, hammer stones/anvils were located within this area.

Approximately 300 metres south of this area another scatter was located (CWF II-S-06) and a broken edge ground axe and quartz flake were identified. It is proposed that these recordings be submitted to update the existing site card.

No other previously recorded sites where located within the current study areas.

10.4 PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

A number of archaeological assessments have taken place in the Southern Tablelands region. Several of these have been undertaken in conjunction with other wind farm developments.

10.4.1 CAPITAL WIND FARM

Investigation of the Capital Wind Farm development area by Austral Archaeology in 2004 identified six areas of PAD and, in a small additional survey in 2005 two further sites were recorded to the south of Taylors Creek. Finds included an isolated flake of grey silcrete on top of a ridge of Hammonds Hill and an open artefact scatter and associated PAD eroding out of the western bank of Wrights Creek. Within an area of approximately 30 metres, the site consisted of a scatter of six artefacts within the eroded roadway. It was considered that there was moderate to high sub-surface potential for archaeological deposit.

Austral Archaeology also undertook a program of sub-surface investigation in 2007, for an area to the east of Lake George, directly to the south east of the study area.

Eighty three (83) excavation pits were investigated in six excavation areas within the footprints of four wind turbines, an electrical substation and four PADs. Investigation was located on varying topographical locations (i.e. on ridge crests, upper slopes and on areas associated with lower water sources) each differing in proximity to nearby Lake George.

A total of 348 artefacts were recovered, including 320 un-retouched flakes, small numbers of cores, flakes, hammer stones, and flaked pieces of quartz, quartzite, silcrete and chert. The majority (210) were retrieved from the closest wind turbine location to Lake George to be investigated. Of the six excavation areas investigated, five were determined to contain no more than the general background scatter of artefacts routinely located within this landscape. The sixth showed evidence of what appeared to be a knapping floor.

10.4.2 WOODLAWN WIND FARM

The Woodlawn Wind Farm development has also been subject to several phases of archaeological investigation.

Navin Officer Pty Ltd (1998) surveyed a small spur feature to the south of the Woodlawn Mines, and the area around Crisps Creek and the Mulwaree River. The spur feature lies within the northern section of the Woodlawn Wind Farm area. No archaeological material was located in that area and it was concluded that any sites would have been destroyed by severe ground disturbance. Three artefact scatters and an isolated find were located near Crisps Creek and the Mulwaree River in alluvial terrace deposits or on lower slopes.

Biosis (2005a) undertook a survey of the Woodlawn Wind Farm area, consisting of the proposed Wind Turbine Generator locations along the ridge line. A total of 21 Aboriginal archaeological sites were recorded which consisted of 10 isolated finds and 11 open artefact scatters. Of these, all except one were identified as being of low to moderate archaeological significance. The one artefact scatter considered as being of high archaeological significance was described as being a discrete occurrence of over 70 quartz artefacts eroding out of the section of the drainage line. The quartz appeared to show excellent flaking characteristics and that the majority of the artefacts found showed full flake characteristics, some with notable elongation. The site was considered to be an intact archaeological deposit due to the discrete occurrence of the flakes within 1.0 metre, and at the same depth in the deposit (Biosis 2005a: 37).

In 2009, Austral Archaeology undertook further survey of a transmission line that runs in a north easterly direction crossing Taylors Creek between Bungendore Road and Lake George.

As a result of the field assessment, two isolated finds, three open artefact scatters and seven areas of potential archaeological deposit were identified (Austral Archaeology 2010). Two of these PADs were in association with surface artefact material eroding out of sand deposits.

The remainder were determined based on landform characteristics alone. While the research potential of the majority of the pads was considered to be low to moderate, one PAD and the three surface artefact sites associated with it are considered of sufficient research potential to warrant further investigation. Artefacts included flakes, cores, hammer stones and ground edge hand axes consisting of quartz, quartzite, silcrete, chert and granite. All identified sites were considered as being of culturally significant to the Aboriginal stakeholders.

10.5 CONSULTATION

The stakeholder consultation process for this project was conducted in accordance with the DECCW (NSW) *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation 2005* (the Part 3A Guidelines). The Local Aboriginal Land Council (LALC) and registered stakeholders for this project were consulted with throughout the process. The study area falls within the boundary of the Pejar Local Aboriginal Land Council (PLALC). Gundungurra Tribal Council Aboriginal Corporation was identified as Native Title Holders for the area through a search of the National Native Title Tribunal (NNTT) data base.

Stakeholders were invited to register their interest by advertisements in the Koori Mail and Queanbeyan Age. In addition, contact was made with the Local Aboriginal Land Council and the Buru Ngunnawal Aboriginal Corporation in the form of letters of notification prior to newspaper advertisement.

As a result of the invitations and advertisements, the key stakeholder groups identified for this assessment are the Buru Ngunawal Aboriginal Corporation (BNAC) and the Pejar Local Aboriginal Land Council (PLALC).

Views of the local Aboriginal community groups regarding cultural constraints during the project were sought, Lake George is considered to be the home of the creator spirit for the Ngunnawal people and as such holds great meaning spiritually and tangibly as their ancestors would most definitely have occupied sites around the lake shore to be close to their creator spirit.

During the field assessment the representatives of the Aboriginal stakeholder organisations BNAC, PLALC and Douglas Connors, were asked to identify issues, items or areas of cultural significance and offer comment on cultural rather than archaeological grounds.

10.6 FIELD ASSESSMENT METHODOLOGY

The survey methodology was developed to meet the requirements of the *NSW National Parks & Wildlife Service Aboriginal Cultural Heritage Standards & Guidelines Kit* (NSW NPWS 1997).

The CWFII field assessment methodology aimed to accomplish the following:-

- To undertake a full pedestrian survey of the study area;
- To identify Aboriginal archaeological and cultural sites and issues;
- To identify areas of potential archaeological deposit, and/or archaeologically sensitive landscapes, within the area covered by the development envelope; and
- To consult with the Aboriginal stakeholders in the field in relation to the inherent cultural values of the subject property, and to discuss recommendations to avoid or minimise impact to Aboriginal heritage values of the subject area.

The CWFII study area was divided into three sections – North (Survey Area 1), Central (Survey Area 2) and South (Survey Area 3) – based on groupings of turbines. Survey units can similarly be split into three categories - Flats, Foothills and Ridgelines.

Each Survey Area was split into multiple transects, delineated by paddock boundaries and survey area boundaries. These transects were then walked by archaeologists and Aboriginal stakeholders. Attempts were made to survey the location of each indicative turbine location however landforms and exposures of interest that intersected the study area or were in the vicinity were also targeted.

10.7 FIELD ASSESSMENT RESULTS

Field work was undertaken over 12 days from 7 June to 11 June 2010, the following week on 15, 16 and 18 June 2010 and 5 July to 6 July 2010. 100% of the study area was surveyed and ground surface visibility was excellent. As a result of the survey 64 new sites were recorded in the study area.

The survey involved representatives from Pejar Local Aboriginal Land Council and Buru Ngunnawal Aboriginal Corporation and Stakeholder Douglas Connors representing himself.

Consent was sought from PLALC and BNAC site officers and Douglas Connors prior to making any modifications to the proposed survey methodology.