

# Cullerin Range Wind Farm

# Visual Impact Assessment

31 January 2006

Prepared for: **Taurus Energy Pty Ltd**



## Executive Summary

Scenic Landscape Architecture was commissioned by ngenvironmental to complete the visual assessment component of the Environmental Assessment Report for a wind farm at Cullerin Range. The proposed wind farm contains up to 15 wind turbines, each with three blades up to 46m long mounted on tubular steel towers up to 80m high. They will be located on a section of the Cullerin Range, midway between Gunning and Breadalbane.

The method used to determine the visual impacts has been adapted from the *Windfarms and Landscape Values*, a report commissioned by Australian Wind Energy Association and the National Trust (Planisphere 2005), and from the Bureau of Land Management in the United States, known as the BLM method.

The report identifies the scenic quality of the region, divided into landscape character types. It also identifies key viewpoints of surrounding residents, towns and roads to the wind farm and determines their visual sensitivity to the proposed wind farm, and the visibility of the wind farm from each view point. The report then assesses the contrast of the proposed wind farm to the existing landscape character of the region, and the visual impact on residents and users of the area.

Seven landscape character types were identified in the region, determined largely by the dominance of agriculture. Most of the region consists of a modified farming landscape, which is characterised by pastures with light scattered timber, located on surrounding rolling hills, typical of much of the farming land along the Great Dividing Range. The variation in vegetation coverage and topography are the key determinant of landscape type.

The report found that the contrast of the wind farm to the surrounding modified farming landscape was acceptable. Consequently the landscape of the area will be able to absorb the change in the landscape character resulting from the introduction of a wind farm. Wet Lagoon Nature Reserve is the only site of still water around the site, and is one of the few unique landscape features of the area. With few visitors, and views to 132kV and 330kV transmission lines, the Hume Highway and surrounding farming land, the landscape character of this area could accommodate the introduction of a wind farm.

The report determined locations with views to the wind farm within a 15 kilometres radius of the site. There are a number of large working properties and rural residential homes around the site who will be able to view the wind farm. There will be views of the wind farm from the towns of Collector, Breadalbane, Gunning and Parkesbourne.

Visual sensitivity of users was determined to assess the visual impact of the wind farm from various locations, and user groups in the area were identified to determine the visual sensitivity of users to the wind farm. The main users of the area are graziers/primary producers, rural residential land owners, towns' people and arterial road users. There is less frequent visitation of the area by rail users and recreational users. Each group varies in their sensitivity to the proposed wind farm based on a number of factors including their attachment and relationship to the landscape of the area.

This report considers that from most locations around the site, the wind farm will not represent a significant visual impact. However, there are a number of houses within ten kilometres from the proposed wind farm where the visual impact will be moderate to high, including on the plains to the east of the site, around Cullerin (to the north of the site) and some locations close to the site on the west of Cullerin Range. Generally, the visual impact is considered "high" where there are direct or partial views of the wind farm from a residence. There are some measures that can be taken to reduce the visual impact of the wind farm including using vegetation around houses to screen the view.

There will also be a cumulative impact from other wind farms that have been approved in the area. Most notably, the Gunning Wind Farm that has been approved is located ten kilometres north of the proposed wind farm site along the Cullerin Range. There will also be a visual impact from shadow flicker (generated by the moving turbine blades when the sun is low in the sky) and associated infrastructure (substation, control building, overhead transmission lines and access roads). Measures can be taken to minimise the visual impact of these factors.

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# 1 Introduction

## 1.1 General Description of the Development

Scenic Landscape Architecture was commissioned by ngenvironmental to complete the visual assessment component of the Environmental Assessment Report for a wind farm at Cullerin Range. This report provides an assessment of the visual impact of the proposed development and includes recommendations to minimise the visual impacts.

The proposed wind farm is located along Cullerin Range, midway between Gunning and Breadalbane. The Range extends for approximately 30 kilometres, running north-south, along the Great Diving Range. The section of the Range upon which the wind farm is proposed to be located, lies between the existing Hume Highway that runs to the south of the range and the former Hume Highway (now Cullerin Road) that runs to the north of the site. The wind turbines are to be located along a section of the Range for approximately 3.5 kilometres.

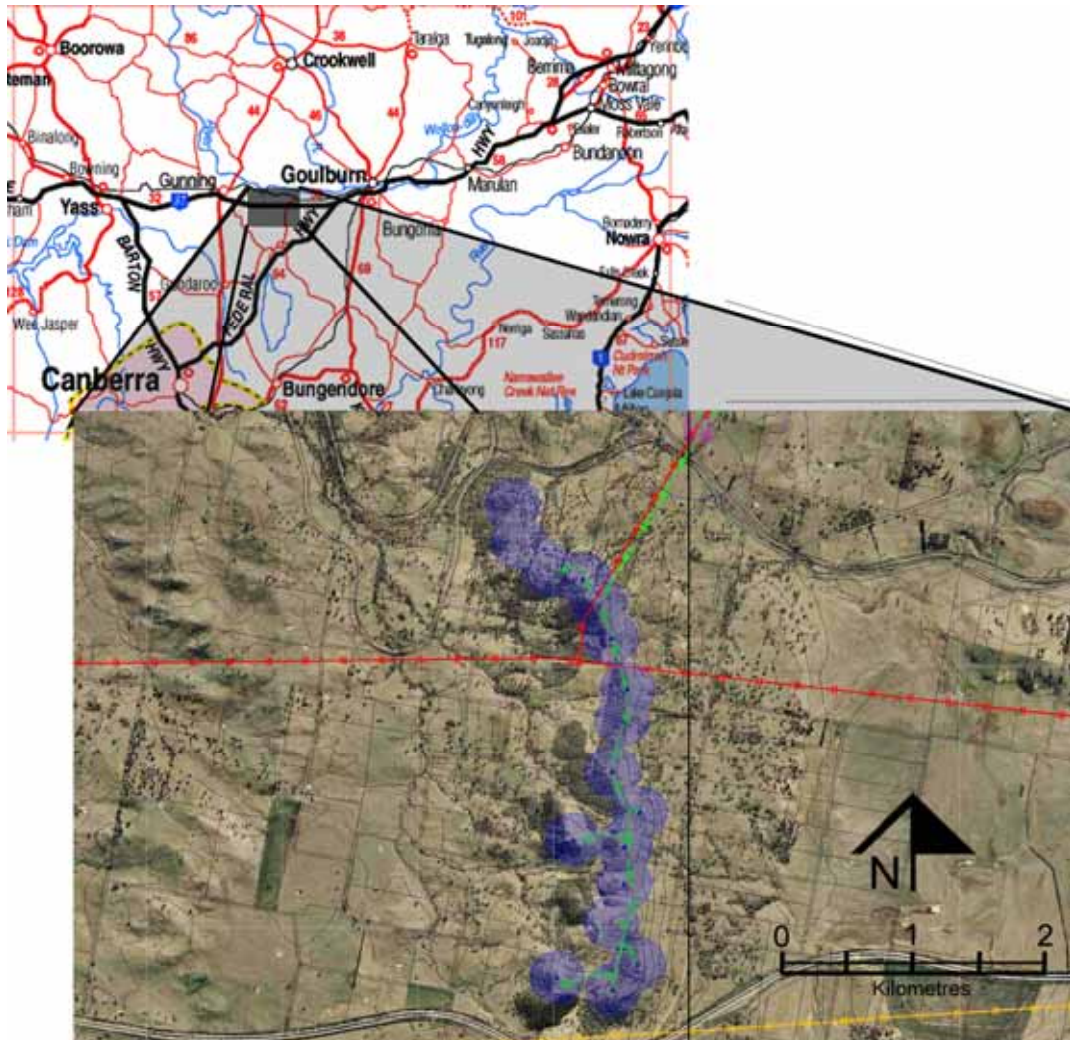


Figure 1 Cullerin Range - location of proposed wind farm

The proposed wind farm at Cullerin Range involves the construction, operation and ultimately decommissioning of:

- up to 15 wind turbines, each with three blades up to 46m long mounted on tubular steel towers up to 80m high;
- electrical connections between wind turbines using underground cables;
- a substation and transmission connection linking the wind turbines to the existing Country Energy 132kV transmission system that runs over the Cullerin Range;
- access roads around the site, and access for the installation and maintenance of wind turbines;
- an on-site control room; and
- equipment storage facilities.

The wind farm will have a maximum capacity of up to 30 Megawatts.

## 1.2 Methodology

The method used to determine the visual impacts has been adapted from the *Windfarms and Landscape Values*, a report commissioned by Australian Wind Energy Association and the National Trust (Planisphere 2005), and from the Bureau of Land Management in the United States, known as the BLM method. This method identifies methodologies for assessing and documenting landscape values, significance and sensitivities.

This visual assessment has been completed by the:

- review of existing literature;
- review of topographical maps and aerial photographs;
- review of Photomontage Visualisations;
- review of shadow flicker analysis;
- review of Zone of Visual Influence maps;
- visiting the site and adjacent areas; and
- using the community workshop to document the community's and stakeholder's values of the landscape setting in the local and regional area.

The visual assessment ultimately identifies the visual impact that the proposed wind farm will have on various viewpoints in the surrounding landscape. This is done by:

- categorising the landscape into character types and uses, and describing those types;
- identifying the landscape quality through the assessment of the scenic quality. The scenic quality of the site is described and measured as the visual appeal or value of the landscape as determined by scarcity or uniqueness of landscape, landscape type, natural features, vegetation and water within each landscape character site;
- identifying important views to the wind turbines and associated infrastructure from surrounding areas including roads, farms, neighbouring residences and towns;
- Identifying the type of user in the surrounding areas, duration of exposure and dominance of exposure. This component determines the visual sensitivity of views to the wind farm;
- identifying the distance from viewpoints to the site;
- identifying the degree of change introduced by the project and subsequent contrast to the existing landscape; and
- determining the ability of the landscape to absorb the proposed changes.

While the visual impact assessment process attempts to derive an objective measure of visual impact, there will always be a degree of personal subjectivity on the part of the viewer that determines whether the wind farms will be considered favourably or not.

Aspects such as the personal attachment to a particular element of the landscape, and the extent to which the viewer values the contribution of the proposal to essentially pollution free energy production cannot always be determined. This aspect has been partially addressed by considering the type of user and by making an assessment as to their sensitivity to the landscape around them. The community workshops and other discussions with local land holders also provided the basis for a qualitative and quantitative analysis of the perception of different viewers.

### **1.3 Structure of this Report**

This report is structured as follows:

- Section 2: Visual characteristics of the wind farm and the landscape;
- Section 3: Scenic quality of the region – divides the area into character types and areas;
- Section 4: Visual sensitivities and landscape values – outlines the outcomes from public consultation, uses the Zone of Visual Influence study to clarify the location of potential vantage points, identifies the types of uses and draws out the visual sensitivities from the major viewpoint locations around the site;
- Section 5: Visibility of the wind farm – establishes the visibility of the wind farm from locations around the site;
- Section 6: Visual assessment - discusses the visual impacts of the wind farm proposal from specific locations, cumulative visual impacts, shadow flicker and other visual effects of the wind farm proposal. Recommendations are made to minimise the visual impact of the proposal; and
- Section 5: Conclusion – summarises the results of the assessment.

### **1.4 Acknowledgements**

The assistance of Jerry De Gryse, from Inspiring Place Pty Ltd, for his input in reviewing an early draft of the report, offering suggestions for improvement and providing examples of his work is gratefully appreciated.

# 2 Visual Characteristic of Wind Farms and the Landscape

## 2.1 Visual Characteristics of a Wind Farm

Wind turbines can be perceived as either being majestic or dominating depending on where it is seen from and the viewers' perception (Planisphere 2004). They are often perceived as being interesting in their own right and have been likened to sculptured forms due to their sleek and simplistic appearance. Some people find them unattractive. Additionally, rather than being just static objects, the movement of the wind turbine blades can attract attention.

Within close proximity to wind farms, it is likely that the structures will be revered as being dominating. However, from mid-ground or distant view, the structures will be less dominating and may be perceived by people as being majestic due to their scale and simplistic form. Some people dislike their form or the change that they create to the existing landscape, while appreciate the distinctive visual quality they introduce to a landscape (Planisphere 2004).

The visibility of the turbines will vary throughout the day and season due to the level of the intensity of light. The turbines will be more visible in the early morning and evening when light shines directly upon the structure. Additionally, the backdrop to the structures can also affect the visual contrast. Where the structures are located against the sky, the structures, due to the off-white colour, blend into the horizon especially when there is haze or cloud. When the structures are viewed against land, the colour contrast increases the visual prominence of the structure (Planisphere 2004).

The visual impact is also determined by the orientation of the viewpoint to the wind towers, as the turbine blades will be more visible when viewed straight on. The orientation of the blades will be generally north-south taking advantage of the western prevailing winds. As such, the structures will be most prominent from a western or eastern viewpoint.

A wind farm will be far more visible when viewed from side on compared to when viewed from end on, where only a few turbines will be visible and the wind farm will appear considerably smaller.

The Australian Council of National Trust and the Australian Wind Energy Association embarked on a project to establish agreed landscape assessment procedures. Stage One of the project has been completed which looks at issues associated with visual characteristics of wind farms.

The visual characteristics of a wind farm include the physical form of a wind farm and its potential visual effects within a landscape and to surrounding users of the landscape, as outlined in Table 1 (Planisphere 2005). The table has been modified as necessary to be applicable to the Cullerin Range proposal.

**Table 1: Visual Characteristics and Effect of a Wind Farm**

Characteristics	Effect	Examples of responses
Scale of development – height and numbers of turbines	Change of landscape character Eye catching High visibility from short to long distances Contrast to the horizon and ridgelines	Majestic or dominant – depending on perceived perception of landscape and user
	Effects to cultural heritage values	Loss of cultural heritage
Form of development	Eye catching Change of landscape character	Majestic or dominant – depending on perceived perception of landscape and user
Movement of	Sun glint and shadow flicker	Distracting



Characteristics	Effect	Examples of responses
turbines	Eye catching	Relaxing or irritating
Colour of towers and blades	Level of contrast to surrounding landscape	Intrusive or integrated
Location and layout in landscape	Change of landscape character	Majestic or dominant – depending on perceived perception of landscape and user
	Change visual appeal of landscape	Loss, change or gain of visual features
	Layout of towers– cumulative effect of grouping etc	Dramatic, harmonious or dominant
Location of substations	Change in landscape character	Dominant or non intrusive
	Potential change in visual appeal	Loss or change
Location of power lines and easements	Change in landscape character – structures and clearing of trees	Dominant or non intrusive
	Potential change in visual appeal	Loss or change

Additionally Planisphere (2005) gave further conclusions as to the visual integrity of a wind farm, which includes the following:

- Positive visual impacts of a wind farm can include:
  - : form, line colour and movement of the turbines are interesting and pleasing;
  - : the clean, modern lines, form, height can be seen by some people as visually interesting and pleasing;
  - : “... just as individual turbines can become dominant elements by virtue of their height, collection of turbines are potentially impressive and highly visible because of a combination of height, repeating elements and the geographical area they cover” (Planisphere p.8 2005);
  - : “The cumulative impact of numerous functional turbines can have a particularly strong visual impression on a landscape” (Planisphere p 43 2005);
  - : the contrast to the surrounding natural environment can be seen as dominating or interesting ; and
  - : perception as to their function – providing environmentally sustainable power may mean that the wind turbines are more acceptable.
- Negative impacts of a wind farm can include:
  - : scale, form and colour can contrast to the surrounding landscape changing the landscape character, landscape value and cultural heritage;
  - : scale and height can be dominant in the landscape – exceed both the human scale and the scale of the surrounding landscape; and
  - : number of turbines will accentuate the impacts.

### 2.1.1 Distance of visual perception

The Planisphere Report (2005) claims that wind turbines can be seen up to 20km away in clear weather but are difficult to perceive. At 14km away, a single turbine is insignificant although a collection of turbines becomes more significant depending on the number of towers and the horizontal area they occupy.

The University of Newcastle (2002) also note that:

“The most explicit and structured recommendations on the specific issue of the potential visual impact of wind turbines in relation to distance appears to be the self-styled Sinclair-Thomas Matrix (Sinclair, 2001)... At that time,

Thomas concluded that “15 km is considered to be the appropriate radius distance for study” and according to Sinclair, this became recognised as the norm for ZVI [Zone of Visual Influence] in EIA (apparently irrespective of turbine size).”

On that basis this visual assessment focuses on views within 15 kilometres from the site. From this distance wind farms and especially individual turbines are difficult to perceive.

### **2.1.2 Public perception of wind farms**

When wind farms are proposed, there is usually some concern by the public over the likely visual impact. By their very nature wind farms are highly visible. Meridian Energy (May 2005) note:

“For a wind farm, potential visibility and related landscape effects are usually the key issues. Wind farms are generally highly visible activities given that turbines are usually sited on ridges and hilltops where the wind flow is greatest.”

But visual impact does not necessarily mean a negative impact as is largely assumed and often voiced by some in the local community. It is apparent that the beliefs of the individual are the major determinant of whether a wind farm will be viewed favourably or not. In the Environmental Impact Statement for the Crookwell wind farm, DIPNR (2004, p25) stated that:

“The key premise underlying the visual assessment is that visual impacts of the wind farm are largely determined by the perception of viewers to wind farms and wind energy per se.”

Warren et al, (2005) note that:

“... even if the facts are not in dispute, a perceptual gulf defined by individual’s values and beliefs separates those in favour and those against.”

Most people believe there is broader public benefit from the production of ‘green’ and sustainable energy. An understanding of the broader benefits of wind farms can result in people being more accepting of the structures and this type of development. However, there is usually opposition from some local residents to wind farms proposed in their locality.

Recent studies show that opposition to wind farms (especially to their visual impact) does not appear to be the majority view. Lothian (undated) notes that in the United Kingdom, most people regard them favourably, and that surveys indicate broad support for wind farms. Further:

“An Irish survey of 1200 people found that only 1 per cent of the general public is opposed to wind farms, that 84 per cent regard them as a good thing, and that most of those with direct experience of wind farms do not consider that they have had any adverse impact on the scenic beauty of the area ... “(Warren et al, 2005; SEI, 2003).

And that:

“Prior to construction, locals typically expect the landscape impacts to be negative, whereas, once in operation, many people regard them as an attractive addition (Warren et al, 2005).”

Therefore, the visual impact of wind farms is not necessarily negative. Wind turbines can sometimes add a positive visual quality to the landscape.

## **2.2 Public Views of the Landscape**

The perception of the wind farm often has much to do with how an individual views the landscape.

Section 3 of this report offers an independent view of scenic quality of the landscape based on United States Bureau of Land Management's visual resource management system. These observations on the landscape are utilised in the report, primarily to gain an understanding of the contrast that the wind farm will present to the existing landscape.

In Section 4.3 of this report, the users of the region are broadly listed and an assessment of their likely perspective on the surrounding landscape is provided. This should only be seen as a guide to the views of the users to the landscape. Planisphere (2005, p65) states:

“Many of the values identified as of importance through the stakeholder survey are not easy to measure or quantify. For example, it is easier to quantify the effects of a wind farm development on tangible values of native vegetation (if any), but far more difficult to quantify the effects on intangible values such as an individual's feelings about a place.”  
(Schwann, 2002)

This visual assessment has tried to incorporate the differences in attitude to the landscape into the assessment.

# 3 Scenic quality

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## 3.1 Introduction

This section describes the existing visual environment of the local and regional landscape, its landscape character, significance and determines the landscape character types. Landscape character types are used to determine the visual impact of the wind farm on the surrounding landscape.

Scenic quality is a way to describe and measure the visual appeal of the immediate landscape and the surrounding area. This is largely determined by reviewing seven key factors including:

- landform;
- vegetation;
- water;
- colour;
- adjacent scenery;
- scarcity; and
- cultural modifications.

### 3.1.1 Scenic quality ratings

Each landscape character type (outlined below) determined for the region is given a rating. The rating system is based on the United States Bureau of Land Management's visual resource management system, and it assumes that the areas with the most variety and most harmonious landscapes have high visual quality. It should also be noted that human built features do not always detract from the visual setting.

The rating system has three levels:

- Low scenic quality – fairly common scenic quality to the physiographic region;
- Moderate scenic quality – a combination of common or outstanding scenic quality to the physiographic region;
- High scenic quality – outstanding scenic quality to the physiographic region

## 3.2 Landscape Character

### 3.2.1 Regional landscape character

The region has low variety in character type due to the dominance of agriculture as the predominant land use. As a result most of the region consists of a modified farming landscape, characterized predominantly by pastures with light scattered timber, located on surrounding rolling hills, and sometimes in the paddocks. Paddocks are separated by fence lines and sometimes punctuated with young native plants planted in straight rows. Some areas have hedgerows of old large exotic trees, usually pines and homesteads surrounded by exotic trees.

The landscape is largely a cultural landscape due to the modifications that have been bought around by 180 years or so of rural practices. It is a landscape of rolling hills with scattered remnant trees and grazing herds. Where these areas have been overgrazed or over cleared, there are some signs of erosion, which has created scars through the landscape.

The dominance of grasslands and pasture in the landscape creates seasonal changes in the landscape. New growth in spring creates a healthy looking landscape, which reverts to yellows and browns through summer and autumn. Grasses recedes through winter.

The modified nature of the landscape is further emphasised by the abundance of visible built structures such as homesteads, farm buildings, fences and other infrastructure including highways, roads and transmission lines.

The area still retains a fair degree of uncleared (or regrown) timber north along the Cullerin Range. Mudoonen Range (and nature reserve) to the west and south, treed areas along the top of the Lake George Escarpment, well treed ranges to the east of the Federal Highway and treed ranges to the north of Goulburn create a healthier looking regional landscape.

The Hume Highway continues to go through the area but no longer follows the original route through Breadalbane and Gunning. The visual impact of the new highway is quite marked and although often screened by roadside vegetation, the highway introduces a strong built form to the region that contrasts to the rural feel of the area.

The regional landscape, with the exception of the large plains, is generally typical of the landscape of the southern tablelands, central west New South Wales and southern New South Wales in general.

### **3.2.2 Local landscape character**

The Cullerin Range sits at 853m above sea level and is one of the higher points along this section of the Great Dividing Range. Just to the north of the range is the highest point on the Sydney to Melbourne railway line, which winds its way through the surrounding hilly country. The plains to the east are at 700-720m ASL while the western side of the range drops away significantly. Gunning sits as low as 520m ASL and the rise to the Cullerin range is quite pronounced.

To the north Cullerin Range continues and is a mixture of well treed hills and cleared areas. The hills are relatively steep with some deep gullies. Erosion is evident where the land has been over-cleared.

To the west, the hills are quite abruptly rolling with quite heavy timber close to the Cullerin Range thinning out to scattered timber. In paddocks there are a few large old trees or dead skeletons of trees. Homesteads tend to be surrounded by exotic trees.

To the east the land is dominated by pastoral and farming activities. It consists of flat plains surrounded by low hills with sparse scattered native timber. Large exotic trees are common, usually located around homesteads. Built structures such as fences, roads, rail lines, electrical infrastructure telecommunication infrastructure and buildings are visible across the largely flat landscape.

To the east of Cullerin Range contains small hills and plains. The tree cover is sparse. The plains are generally dry but locals advise that Wet Lagoon Nature Reserve contains water when most other areas have dried out, providing wildlife habitat. The presence of the lagoons and large plains adds an interesting feature to the landscape. One local noted that the aesthetic of gentle rolling hills and flat plains was of great scenic importance to her.

### **3.2.3 Landscape character types**

The local and regional landscape consists of several landscape character types, largely defined by topography and vegetation density with the occasional distinctive landscape feature, including: hills, gullies, plains, escarpments, homesteads, exotic vegetation, and views to surrounding man made and natural features. The landscape character types described below are used to determine the landscape quality and therefore, the impact that a wind farm will have on surrounding landscape.

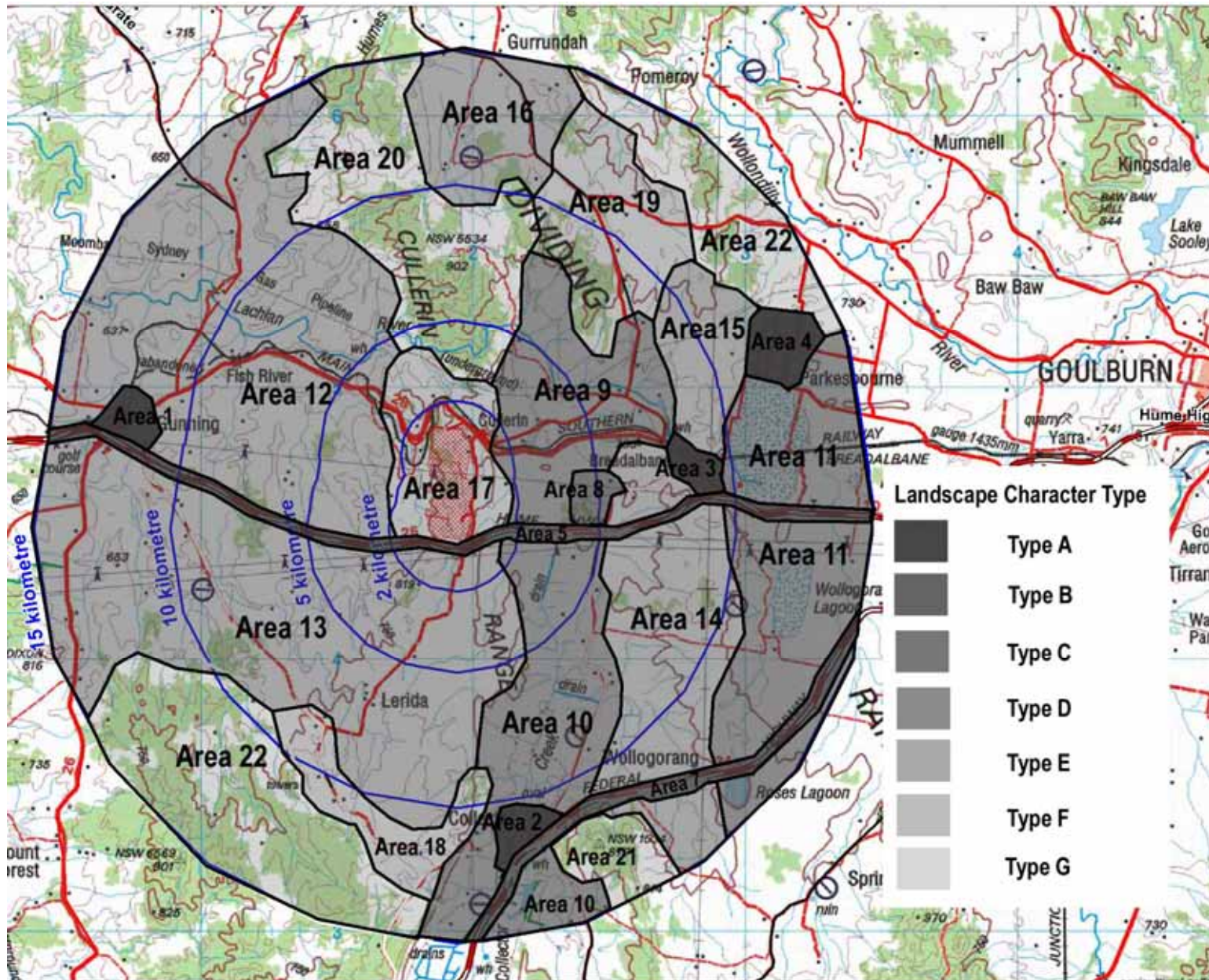


Figure 2 Landscape Character Types

There are seven landscape character types identified in a 15 kilometre radius around the area as follows:

- **Type A:** County towns and rural residential communities;
- **Type B:** Transport Corridors;
- **Type C:** Nature Reserves/Wetlands;
- **Type D:** Plains – mostly agricultural land;
- **Type E:** Rolling hills with sparse vegetation cover – generally agricultural land;
- **Type F:** Hills with light to moderate vegetation coverage – generally agricultural use or rural residential land use; and
- **Type G:** Ranges/hills with moderate to high vegetation coverage – including state forests or privately owned land, sometimes for agricultural use.

These character types are defined into areas as outlined in the table below, and shown in the map above. These areas are used consistently through the report.

**Table 2: Landscape Character Types (refer to the map above)**

Location	
<b>Type A</b>	<b>Country Towns and Rural Residential Communities</b>
<b>Area 1: Gunning</b>	<p><b>Description:</b> Gunning is located 12 kilometres to the west of the site. It is a pleasant country town with a population of around 500 people with some good examples of 19th century architecture. The landscape character of the town is dominated by large exotic trees that feature in the town, that provide an attractive contrast to the surrounding open landscape. Industrial elements within the town are clearly visible and contrast to the surrounding landscape. The townscape is typical of country towns in the region.</p> <p><b>Scenic Quality:</b> Low to moderate scenic quality.</p>
<b>Area 2: Collector</b>	<p><b>Description:</b> Collector lies 11 kilometres to the south of the site. Built on a high point within the surrounding plains, the town is an attractive rambling collection of houses in amongst a mixture of tall remnant native trees and exotic vegetation. The town has a rustic feel, and appears slightly run down, and not particularly vibrant. The presence of the adjacent Federal Highway visually contrasts to the townscape.</p> <p><b>Scenic Quality:</b> Low scenic quality.</p>
<b>Area 3: Breadalbane</b>	<p><b>Description:</b> Breadalbane is about 9 kilometres to the east of Cullerin Range. It is a small town located along the old Hume Highway and was historically, it was a stopping point for road and rail.</p> <p>The town is a sleepy scattering of houses and lines the railway and appears slightly run down. There are a considerable number of large exotic trees sometimes in rows. The presence of the railway introduces an industrial character.</p> <p><b>Scenic Quality:</b> Low scenic quality.</p>
<b>Area 4: Parkesbourne</b>	<p><b>Description:</b> Parkesbourne is a very attractive rural residential area. It is heavily treed in parts with native ground cover and understorey plants presenting a bush feel. Houses are scattered through the area located along sealed and gravel roads. The density of vegetation sometimes provides visual isolation for houses. There are some farming properties surrounding the area but activity appears to be less intensive judging by the extent of remnant vegetation.</p> <p><b>Scenic Quality:</b> Moderate scenic quality.</p>



**Photo 1: View of the site from Gunning**



**Photo 2: View of the site from Collector**



<b>Type B</b>		<b>Transport Corridors</b>	
<b>Area 5: Hume Highway</b>	<b>Description:</b> The Hume Highway passes east-west through the middle of the study area. From the west, the road rises from around Gunning over a series of hills towards the site and passes close to the south of the site. On the eastern side of the Cullerin Range, the Highway passes across the flat plains, separated by a series of small rolling hills that divide the large flat plains. The road provides a hard landscape, with a repetitive view. The presence of roadside vegetation further confines views along the road corridor. <b>Scenic Quality:</b> Low scenic quality.		
<b>Area 6: Sydney to Melbourne Railway</b>	<b>Description:</b> The railway line runs parallel to Cullerin road passing to the north of the site. <b>Scenic Quality:</b> The scenic quality will reflect the surrounding landscape and will vary depending on location. Generally there is low to moderate scenic quality.		
<b>Area 7: Federal Highway</b>	<b>Description:</b> The Federal Highway is the main transport link between Canberra and Sydney. It passes to the south east of the site. The strong built form of the environment dominates the view as the driver focuses down the road. Vegetation around the roadside exacerbates this view. The road provides a hard landscape, with a repetitive view. Advertising along roadside around Collector are another reminder of the built environment. <b>Scenic Quality:</b> Low scenic quality.		
<b>Type C</b>		<b>Nature Reserves/Wetlands</b>	
<b>Area 8: Wet Lagoon</b>	<b>Description:</b> The Wet Lagoon Nature Reserve is located approximately 5 kilometres to the east of the site. Aside from its function as a nature reserve it is distinctive as one of the few and the largest areas of permanent water in the district. The lagoon is surrounded by low hills with sparse scattered remnant timber. The lagoon provides an attractive contrast of deep green against the brown yellow of surrounding landscape and is a unique feature in the landscape. The Hume Highway and 132 KV transmission lines are also visible from the Lagoon. <b>Scenic Quality:</b> Moderate to high scenic quality.		
<b>Type D</b>		<b>Plains – mostly agricultural land</b>	
<b>Area 9: Mutmutbilli</b>	<b>Description:</b> This area is predominantly plains surrounded by low sparsely treed hills. The area extends from the Hume Highway for about 10 kilometres to the hills north of the area and is bisected by the road between Breadalbane to Gurrundah, Cullerin Road, and Old South Road. It is a modified rural environment. Native vegetation is sparse on the hills and mostly non-existent on the plains, giving a bare, modified appearance. Replanted native vegetation is in ordered rows and long fence lines divide the plains. The large old homesteads and large exotic vegetation gives an indication of the length of settlement and largely defines it as a cultural landscape, and adds to the overall appeal of the area. Clumps of large exotic trees surround homesteads and hedgerows of large pines divide paddocks. The tall poplars lining Cullerin Road provides a strong ordered feature to the environment and is a reminder to the extent of alteration to the landscape. The train tracks and wide Cullerin Road introduces a strong built form into the landscape. The plains are an interesting feature in the landscape. The views to the well vegetated Cullerin Range to the north west add some variety to the landscape generally. <b>Scenic Quality:</b> Low to moderate scenic quality.		



**Photo 3: View of the site from the Hume Highway, east of the site**



**Photo 4: View of the site from the Hume Highway, west of the site**



**Photo 5: View of the site from Wet Lagoon**



**Photo 6: View of the site from north of “Sweetwood Lea”**



**Photo 7: View of the site from the road between Collector and Breadalbane**



**Photo 8: View of the site from Cullerin Road 4 kms west of the site**

<p><b>Area 10: Collector Creek</b></p>	<p><b>Description:</b> This area includes the plains that extend from Cullerin Range south along Collector Creek, past Collector to Lake George. The low open plains are surrounded by low hills to the east and north with the Lake George escarpment rising above the area to the west.</p> <p>The landscape is a modified farming landscape, mostly cleared with only scattered patches of remnant trees. Dead eucalypts in large cleared paddocks, separated by straight fence lines further emphasises the extent of modification. Hedgerows of large pine trees generally indicate the presence of homesteads.</p> <p>To the north, the 330kV transmission lines and the highways add to the presence of human alteration and built form within the landscape. There is no landscape feature that makes the landscape particularly unique or significant.</p> <p><b>Scenic Quality:</b> Low to moderate scenic quality.</p>
<p><b>Area 11: Breadalbane Plains</b></p>	<p><b>Description:</b> The expanse of large flat open plains is interesting and the size of the expanse of flat ground does add a degree of uniqueness. There is generally scattered timber on the surrounding hills except for Parkesbourne which is well treed. It is a modified farming landscape, exemplified by views to the highway and railway line which bisect the area. The Federal Highway lies to the south, and 132kV and 330kV transmission lines cross the area.</p> <p><b>Scenic Quality:</b> Low to moderate scenic quality.</p>
<p><b><u>Type E</u>                      Rolling hills with sparse vegetation cover</b></p>	
<p><b>Area 12: West of Cullerin Range</b></p>	<p><b>Description:</b> This large area is typical of the regional landscape and is a highly modified agricultural landscape across rolling hills with sparse scattering of remnant vegetation, and little or no remnant understorey vegetation.</p> <p>The area is defined by the Hume Highway to the south and Cullerin Range to the east. It is bisected by the Cullerin Road and the road between Gunning and Crookwell. To the west of Gunning, the area contains a small section of the road to Dalton. It feels more remote along the road to Crookwell as there are few houses and little traffic. The roads and views to the Hume Highway add a built form to the landscape.</p> <p>The landscape is dominated by the open paddocks occasionally punctuated by the green of remnant trees, the large exotic trees surrounding homesteads and large exotic hedgerows. There are a number of dead large eucalypts in the paddocks. Quite prominent hills dot the landscape.</p> <p><b>Scenic Quality:</b> Low scenic quality.</p>
<p><b>Area 13: South of Gunning/ Lerida</b></p>	<p><b>Description:</b> This large area is very similar to Area 12. It is defined by the Hume Highway to the north, the Mundoonen Range to the south and the plains around the Collector Creek to the east.</p> <p>It is bisected by the road between Collector and Gunning and the road running south from Gunning to Gundaroo. It is a modified agricultural landscape consisting of rolling hills with sparse scattering of remnant vegetation, with little or no remnant understorey vegetation. The difference from Area 12 is that there are a number of rural residential holdings in the area, and occasional areas of reduced primary production have resulted in regrowth of native vegetation. There also tends to be slightly more timber lining the roads, particularly the road from Gunning to Collector.</p> <p>The area also contains the Lerida South Road that runs south from the site. This road runs through two large farming properties.</p> <p><b>Scenic Quality:</b> Low to moderate scenic quality.</p>
<p><b>Area 14: Wollogorang</b></p>	<p><b>Description:</b> This area includes the rolling hills that extend south from Breadalbane to the hills east of Collector. The area is bordered by the flat plains to the east and the Collector Creek to the west. The area is bisected by the Federal Highway to the south.</p> <p>The land is predominantly agricultural land with only scattered remnant vegetation. It is a modified farming landscape dominated by open pastoral paddocks. Homesteads are surrounded by large exotic vegetation.</p> <p><b>Scenic Quality:</b> Low scenic quality.</p>



**Photo 9: View of the site from Cullerin Road 8kms west of the site**



**Photo 10: View of the site from Cullerin Road near "Illawambra"**



**Photo 11: View from road between Collector and Gunning**

<b>Area 15: North of Breadalbane</b>	<p><b>Description:</b> This area is defined by the ridgeline that runs north from Breadalbane. It is bordered by the more hilly country to the north, the Breadalbane Plains to the east and the Mutmutbilli area to the west.</p> <p>The land is predominantly agricultural land with scattered remnant vegetation. It is a modified farming landscape that is dominated by open pastoral paddocks. It is typical of agricultural landscapes in the region.</p> <p><b>Scenic Quality:</b> Low scenic quality.</p>
<b>Area 16: Gurrundah</b>	<p><b>Description:</b> The land to the north around Gurrundah is generally agricultural land with rolling hills. The area is bounded by the Cullerin Range to the west and hilly country to the east. There remain some reasonable patches of native vegetation on the surrounding hills, which add to the scenic quality of the area.</p> <p><b>Scenic Quality:</b> Low to moderate scenic quality.</p>
<b>Type F</b>	<b>Hills with light to moderate vegetation coverage</b>
<b>Area 17: Cullerin</b>	<p><b>Description:</b> Area 17 is located around the site. It is typified by hilly country especially to the north and west of the site with some deep gullies.</p> <p>Cullerin Road passes just to the north of the site connecting Gunning and Breadalbane. The road weaves its way through the range and the surrounding hills and the site is generally in view, except when due north of the site when the hills next to the road tends to limit views. The road is lined by trees adding to the landscape character. The view north from the road is of the heavily treed Cullerin Range. Deep gullies and erosion is evident from the road where the land has been over-cleared.</p> <p>The Old Sydney Road passes to the south of Cullerin Road and the railway weaves its way under the road adding to the charm of the area. Attractive old railway bridges cross the track in three places.</p> <p>To the west of the site, the hills are rolling and heavily timbered close to Cullerin Range thinning out to the east. The land drops away significantly and there are some large old eucalypts lining some deep gullies. To the east of the range, the vegetation coverage tends to be sparser than the west.</p> <p>The changes in topography, higher level of vegetation than surrounding areas and the interest of the railway line create an interesting landscape.</p> <p><b>Scenic Quality:</b> Moderate scenic quality.</p>
<b>Area 18: Lerida south</b>	<p><b>Description:</b> This area is located around the eastern end of the road between Gunning and Collector on the foothills of the Muntoonen Range to the south. It also includes part of the Lake George escarpment that extends to the west of Collector. This area is slightly more treed than closer to Gunning and is quite attractive. Primarily agricultural land, there are a few rural residential properties in the area. There is a fair amount of vegetation lining the roads in patches.</p> <p><b>Scenic Quality:</b> Moderate scenic quality.</p>
<b>Area 19: North of Mutmutbilli</b>	<p><b>Description:</b> This area takes in country north of the plains around Breadalbane and east of the Cullerin Range. The area is bisected by the road that runs between Breadalbane and Gurrundah.</p> <p>The area is used for farming but is generally more treed than some other surrounding farming landscapes. There are more numerous patches of remnant vegetation, and vegetation lining the roads. There is also a pine plantation in the area, which is a contrast to the pastoral landscape character.</p> <p>The topography is visually interesting and the vegetation gives the area a more natural character.</p> <p><b>Scenic Quality:</b> Moderate scenic quality.</p>
<b>Type G</b>	<b>Ranges/hills with moderate to high vegetation coverage</b>
<b>Area 20: Cullerin Range North</b>	<p><b>Description:</b> This area takes in the northern extent of Cullerin Range and foothills. It is generally hilly country and densely treed, but with some sparser timber on the foothills where the land is grazed or cleared.</p> <p><b>Scenic Quality:</b> Moderate scenic quality.</p>
<b>Area 21: Collector Hill</b>	<p><b>Description:</b> This hill is located to the east of Collector. It is densely treed and part of the land is part of a private nature reserve.</p> <p><b>Scenic Quality:</b> Moderate scenic quality.</p>

<b>Area 22: Other Areas</b>	<p><b>Description:</b> The Muntoonen Range and the Ranges to the north east of the site (about 13-15 kilometres to the site) are generally hilly country and densely treed, with sparser timber on the foothills where the land has been grazed heavily or cleared.</p> <p><b>Scenic Quality:</b> Moderate scenic quality.</p>
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Note the scenic quality assigned to each area is broadly consistent with the Environmental Impact Statement (EIS) prepared for the Crookwell 2 Wind Farm. For that region, the EIS states that:

“the site and its surrounding visual catchment is a highly modified landscape. Since European settlement, the woodlands of the area have been cleared, with the landscape currently reflecting long term agricultural use.” (DIPNR 2004, p25).

### **3.3 National Scenic Significance**

There is significance in the history of the region in terms of the development of the grazing industry in Australia. Wool production has been the rural mainstay of the region since the 1820s which has been a major contributor to shaping the landscape character of the region.

There is some historical significance to the region. “Until 1820 Gunning was at the ‘Limit of Settlement’” (Gunning Shire Council, 2005), after which time the expedition of Hamilton Hume and William Hovell identified a route south to Port Phillip. The length of European settlement in this part of New South Wales is visible in many elements of the landscape such as native tree coverage, the size and extent of exotic vegetation, the age of homesteads and the architecture of regional towns.

This area is now the location of the major north-south transport corridor in Eastern Australia for both road and rail. Old Sydney Road is a historic reminder of the original route to Melbourne adding to the landscape character of the region.

# 4 Visual Sensitivities and Landscape Values

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## 4.1 Introduction

The purpose of this section is to determine the visual sensitivity from various locations around the site. To account for differences in personal perceptions of landscapes, this section of the report incorporates a generalised perspective of different users and their sensitivity to changes in the landscape. The visual sensitivity of the user has three components:

- Dominance of exposure to the wind farm;
- Duration of exposure to the wind farm; and
- Likely relationship of the user to the environment.

For example, a resident who looks across at the turbines every day will have a substantially different experience of a wind farm than a motorist passing the site while travelling to their destination elsewhere. Factors that will contribute to visual sensitivity include (Planisphere 2005):

- personal meaning attached to the landscape;
- personal feeling of inspiration and interpretation derived from the landscape;
- diversity, composition, and accessibility of the landscape;
- lack of change (timeless quality); and
- a sense of grandeur and integrity.

For the purpose of this report, three categories have been used to assist in the determination of the level of user sensitivity to the landscape (based on the BLM method). These three categories are allocated based on feedback from questionnaires, personal feedback from community information sessions and reasonable expectations of personal preferences based on experience:

- Low – views from low use sites where duration of view are short or not important or maybe partially obscured by landscape features;
- Moderate – duration of view is moderate, such as views from roads where many of the viewers are frequent and their visual sensitivity is constrained due to the orientation of the user; and
- High – duration of view is high from residential and recreational areas where the perceived degree of concern about scenic quality is evident and the project site is dominant in the visual catchment and views are highly regarded.

## 4.2 Public Perception and Consultation

In order to develop an understanding of the public perception of the Cullerin Range wind farm proposal, Taurus Energy conducted an initial community survey by mail. This was followed by a public meeting on 17 December 2005 at the Gunning Function Centre. Community members were asked their opinion of the proposal and what impact they believed the wind farm would have on them. The public was also provided the opportunity to fill out feedback forms where they could express their opinions openly. This form and its analysis and results are included in the Environmental Assessment Report prepared by nghenvironmental.

The consultation for the proposed Cullerin Range wind farm was useful in encapsulating the range of views of wind farms and, in particular highlighted the differences in sensitivity to the proposal from different groups of people.



There appeared to be considerable opposition for some members of the community to the wind farm which appears consistent with the findings of the Department of Infrastructure, Planning and Natural Resources in their consideration of the Crookwell 2 wind farm. DIPNR (2004, p27) note

“The Department acknowledges the very strong and often highly emotive views of the potentially affected residents. It is quite clear that many within the local community (whom have no financial benefit from the project) have very strong negative feelings about the wind farm. In many cases this is regardless of the actual proximity to the turbines. Overall, the proposal would result in visual changes to the locality and, thereby, associated perceived changes in the community’s amenity, regardless of the specific selection of turbine locations.”

Positive views have also been expressed in favour of the wind farms from a visual point of view. Planisphere (2005, p8) note that:

“In debates about the impact of wind farms on landscape values, there is a tendency for polarised views on the part of people with firm opinions ... But this polarisation is not necessarily an accurate reflection of the views of the wider community.”

This report has, wherever possible, incorporated the views of public relating to the visual impact. Views of the respondents relating to visual issues as included in written feedback forms are summarised as follows:

- 52% of respondents (22 of 42) stated that views and the cultural landscape was the most valued aspect of the area;
- 35% of respondents (7 of 20) stated visual related factors will have the biggest impact on them; and
- 26% of respondents (10 of 39) believed that visual impact was one of the factors that they disliked about wind farms.

It should be noted that these opinions were gathered from the Open House prior to final turbine layouts or photomontages being prepared. The public response to the wind farm is detailed further in Environmental Assessment Report prepared by nghenvironmental.

### **4.3 Types of users**

The perception of the visual impact will largely be a result of the perspective of the viewer. Landowners may view the landscape differently than people who make a choice of location largely based on visual amenity. People who have long connections to the region might have a closer connection to a landscape and be more opposed to visual changes in that landscape. Passing traffic will generally have a low sensitivity to the site as they have no stake in the view or little relationship to the surrounding landscape.

This assessment tries to incorporate the range of views of users. A broad categorisation of users within the local area is listed below; however, these user types can only be regarded as representative of a wide range of views and not inclusive of everyone’s perspective.

#### **Graziers/Primary Producers**

Many of the people living near Cullerin range are graziers and other property owners that generally work the land for a living. 41% of respondents to the questionnaire at the public consultation day (11 of 27) stated that their interest in the area was commercial.

Some of the property owners in and around the site have agreed to have turbines on their land and will receive financial benefit via lease arrangements. Other property owners that are not part of the project will be within close proximity to the turbines and may not receive any direct financial benefit from the development.

In reality, primary producers have a largely pragmatic approach to the landscape. It is primarily a source of production and income and its visual quality tends to be of

secondary consideration. Primary producers tend to equate a low value to the visual aspect of the landscape. However, this does not mean that all primary producers place a low value on the surrounding landscape. Indeed, much of the concern about change in landscape character expressed at the open day came from primary producers. Several people grew up in the area and had long connections to specific properties going back up to six generations. Some primary producers have a very strong interest in what was happening in their area and the consequences for landscape character. Where applicable, these views have been taken into consideration in the assessment.

Unscreened or unfiltered views from a house, regardless of the user type, tend to be valued highly and are appreciated more than other views. Other views from a working property are generally going to be valued lower as they tend to be of lower duration, and will generally be experienced while conducting other activities.

### **Rural Residential/Hobby Farmers Owners**

There are relatively few rural residential owners in the area. Only 4% of respondents to the questionnaire at the public consultation day (1 of 26) stated that their interest in the area was as hobby farmers. Another 6 respondents stated that they lived nearby.

Hobby farmers and rural residential owners tend to move to rural areas for the experience of living 'in the bush' or 'on the farm'. Visual perception and consistency is very important to people seeking a particular lifestyle. This type of user is choosing to live in a place where the environment, including the visual quality, is important.

As a result this type of landowner generally has a high sensitivity to their visual surroundings. Any significant change to those surroundings is likely to have a significant impact on them.

### **Towns People**

A number of people from Gunning attended the open day, demonstrating clear interest in what was happening in their region. Given their choice to live in town, it is assumed that town's people have a lower sensitivity to the surrounding landscape than say rural residential people. On balance, town's people are expected to equate a low to moderate value to the visual aspect of the landscape.

### **Arterial Road Users**

It is expected that most users of the roads, especially the Hume Highway will generally have a low sensitivity to the wind farm development as there is more detachment from the surrounding visual landscape. Generally, people are using the road to get to their destination, rather than for its scenic quality. In most cases, these people have a low sensitivity to the surrounding landscape.

### **Rail Users**

The main rail route between Melbourne and Sydney passes over the Cullerin Range and the proposed location of the wind farm is just to the south of the rail line. Rail travel is an ideal way to relax and view the surrounding landscape. Generally though, passengers will be largely detached from the landscape, and therefore, have a low to moderate sensitivity to the surrounding environment.

### **Recreational Users**

Locals at the public consultation day stated that there were a variety of recreational users that use the Old South Road and Cullerin Roads for bike riding, horse riding (the Bicentennial Trail), and train spotting. It was claimed that people came to the area for its scenic quality, and the heritage of the area. Taken on face value, it is reasonable to assume that recreational users place a moderate to high value on the landscape quality.

## 4.4 Major Viewpoints

### 4.4.1 Public consultation regarding views to the site

At the open day, the public were asked where the site could be viewed from. Participants noted that good views of the site are from the following locations. The areas under which these viewpoints are discussed in Section 4.4.2 of the report are also indicated.

- Parkesbourne - addressed as Area 4;
- Biala - located to the north west of the site and is addressed under Area 12;
- Old South Road, Breadalbane - included in the discussion of Area 9;
- Cullerin Range - included in discussion on Area 20;
- Wet Lagoon on Collector Road - addressed as Area 8;
- Old Hume Highway - addressed in discussion on Areas 9, 12 and 17;
- Gurrundah Road - addressed in discussion on Areas 9, 16 and 19;
- Crookwell Road - included in discussion on Area 12;
- Gundaroo Road - addressed in discussion on Areas 13;
- Grabben Gullen Road - addressed in discussion on Area 12;
- Bannister Lane - is located in Gurrundah and is addressed under Area 16;
- “Enniskillen” - located on Old South Road and addressed under Area 9;
- “Wadonga” - located on Cullerin Road and addressed in discussion on Area 12;
- “Big Hill” – it is understood that the owner is located along Collector Road and addressed in discussion on Area 14;
- “The Towers” - it is understood that the owner is located on Cullerin Road and addressed in discussion on Area 9,12 and 17; and
- The escarpment near Collector - addressed in discussion on Area 18.

### Zone of Visual Influence (ZVI) Analysis

A ZVI study was undertaken by Garrad Hassan Pty Ltd of the proposed Cullerin wind farm (see Figure 3 below), and was based on turbine layout Option B (refer to Section 6.2.3 for layout options). The ZVI study identifies, within a 15 kilometres radius around the site, where the turbines can be viewed from and how many turbines can be viewed from any given location.

Layout B was selected for preparation of the ZVI as this layout has the greatest zone of influence, as this layout has the largest number of turbines or the largest size and spread across the site.

The ZVI is based on land relief (i.e. contours) and turbine location only, and does not take into account vegetation which can screen views of the wind farm from specific viewpoints. For that reason, it is a conservative estimate; many of the locations identified will not be able to see the wind farm because of local tree cover. Nor does it give additional weighting to key viewpoints such as from individual houses that is undertaken through this visual assessment. However, the ZVI is useful in verifying and confirming information obtained during site visits.

The analysis shows that the wind farm will be visible from the plains to the east and south east, the hills to the north east, and around the site. The rolling hills to the west of the site show the bands of areas from which the wind farm will be visible. There will be partial views of the wind farms from the residential centres of Collector, Gunning, Breadalbane and Parkesbourne. There is only limited to no views of the wind farm from

the hilly country of the Cullerin Range to the north, the land to the north east (10 to 15 kilometres from the site) and the Munday Range to the south west of the wind farm.

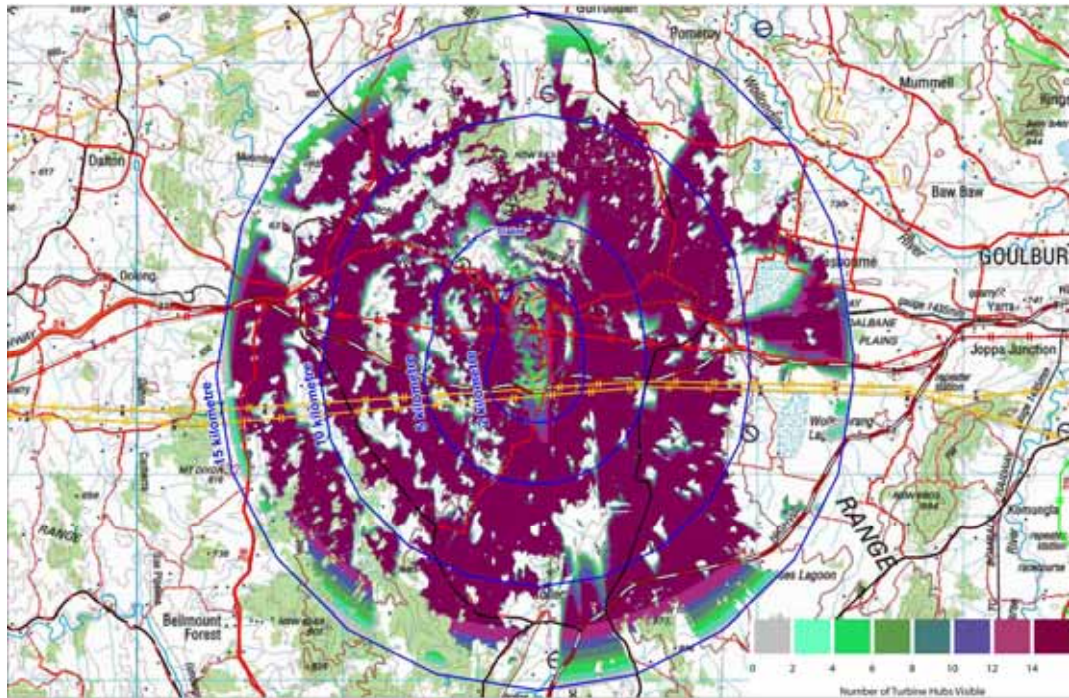


Figure 3 Zone of Visual Influence analysis

From the plains to the east of the ridgeline that runs to the north and south of Breadalbane, there are only limited views to the wind farm.

#### 4.4.2 Visual sensitivity of major viewpoints

This section determines the visual sensitivity of the user to the wind farm from each location taking into account the visual catchment, duration and dominance of exposure, and how the user values the landscape. At this stage it does not take into account the distance from the site or the surrounding scenic quality of the landscape as this is discussed in Section 5.

The distinction between landscape value and visual sensitivity should be noted. Landscape value relates to how a group of users are likely to view a landscape in general. Visual sensitivity relates to a specific measure of the relationship of a group of users to the landscape at a specific location, and incorporates “landscape value” as one of several factors.

**Table 3: Visual sensitivity of major viewpoints**

Main viewpoints	Landuse, user & duration	Visual Sensitivity
<p><b>Type A</b>                      <b>County towns and rural residential communities</b></p>		
<p><b>Area 1: Gunning</b></p>	<p><b>Landuse:</b> Land use is primarily residential in Gunning. A small rural residential population around Gunning might use the school and other facilities in the town. Some residents commute to work in Canberra.</p> <p><b>Type of user and frequency:</b> Town residents primarily – some traffic from surrounding properties and land holdings. There is some visitation by highway traffic.</p> <p><b>Visual catchment:</b> Gunning is quite low in the landscape and surrounded by hills. The main views are predominantly contained within Gunning itself. The attractive green of large exotic trees tend to draw the eye rather than to view the surrounding landscape. Several of the higher vantage points from Gunning, particularly along the western edge of the town, have more outward looking views and the Cullerin Range is a significant view point from some locations in Gunning. The hill on entry to Gunning from Gundaroo (near the DO Duck Inn) has exposure to the site, although filtered by trees.</p> <p>There are unlikely to be any views of the wind farm from the flat area of the main road of Gunning.</p> <p><b>Duration of exposure (to the development):</b> Duration of exposure will vary depending on the specific views to and users of the site. Those residents looking directly at the site will have long duration. Movement through the town by traffic will only have periodic and infrequent exposure.</p> <p><b>Dominance of exposure:</b> The site sits high above Gunning which will increase the dominance of exposure to some degree. However, there are very few sites in and around Gunning that will see the entire wind farm. The dominance of exposure is quite low for most, high for those with direct views. Due to its relatively low location in the landscape, most views are into the town with few panoramic views out.</p> <p><b>Landscape value:</b> There are no panoramic views out from Gunning. Gunning residents are considered to have a low to moderate value of the landscape.</p> <p><b>Refer to Photo 12 in Attachment A</b></p>	<p>Low to moderate visual sensitivity</p>
<p><b>Area 2: Collector</b></p>	<p><b>Landuse:</b> Collector is primarily residential and recently there have been a number of subdivisions in the town.</p> <p><b>Type of user and frequency:</b> Users are mainly town's people. The cafe and pub attract other visitors infrequently to the town.</p> <p><b>Visual catchment:</b> Key views are generally contained within Collector due to its hilly nature and extend of vegetation and by the surrounding hills and escarpment. The northern edge of Collector has views to Cullerin Range. For example the site can be seen from outside the Collector pub, but it is low in the landscape across the flat plains. A subdivision near "Coralto" to the south is likely to be able to see the top of the turbines through some screening vegetation. A subdivision to the north of the town does not have views to the site due to screening by vegetation.</p> <p><b>Duration of exposure (to the development):</b> Duration of exposure will vary depending on location. The few properties that look onto the site will have a long exposure.</p> <p><b>Dominance of exposure:</b> The wind farm will sit low in the landscape and houses or properties that face north towards the site will not have dominant views. Many will be screened by the central hill in Collector or by vegetation. Therefore, the dominance of the exposure is low.</p> <p><b>Landscape value:</b> The highway passing to the east of the town is an ever present factor in Collector. While the surrounding landscape is attractive there are no panoramic views. In summary, Collector residents are considered to have a low to moderate value of the landscape.</p>	<p>Low to moderate visual sensitivity</p>

Main viewpoints	Landuse, user & duration	Visual Sensitivity
<p><b>Area 3: Breadalbane</b></p>	<p><b>Landuse:</b> This town is predominantly residential land use.</p> <p><b>Type of user and frequency:</b> Town dwellers. Without a significant shopping capacity, other visitation is infrequent. Located off the Hume Highway, the town has very little through traffic.</p> <p><b>Visual catchment:</b> Sitting on the southern edge of Breadalbane Plain, the town is tucked into the hills. The main view shed is north across the plains and the views of the site from the main road and surrounding properties are limited. Higher vantage points, the western edge of the town and view points slightly north of the railway such as “Carinya” have views of the site over the small hills to the west of the town. Properties such as “Rosythe” which are on an eastern facing slope are unlikely to see the wind farm. There wind farm will be apparent for west bound traffic from within the town. There is a church on west edge of Breadalbane with views to Cullerin Range through trees.</p> <p><b>Duration of exposure (to the development):</b> Any property with views to the wind farm will have a long duration of exposure. Exposure will vary considerably depending on placement of vegetation, topography and view sheds. Duration of exposure from the road is intermittent.</p> <p><b>Dominance of exposure:</b> Dominance of exposure varies from most locations the hill between the site and Breadalbane will screen the lower parts of the towers. Most houses in Breadalbane do not look directly on the site. Houses on higher vantage points and just to the north of Breadalbane around the railway tracks have more open views to the site.</p> <p><b>Landscape value:</b> Breadalbane residents are considered to have a low to moderate value of the landscape.</p>	<p>Moderate visual sensitivity</p>
<p><b>Area 4: Parkesbourne</b></p>	<p><b>Landuse:</b> Land use is residential, rural residential and some primary production.</p> <p><b>Type of user and frequency:</b> User types include residents, surrounding rural landholders and those commuting for work. Frequency varies depending on localised views of the site. Visitation by others will be infrequent.</p> <p><b>Visual catchment:</b> The heavily vegetated nature of Parkesbourne contains the views with the trees becoming the dominant visual feature. The site is partially screened by a hill to the north of Breadalbane, but houses high on the southern side of the ridge and to the western edges of Parkesbourne have views to Cullerin Range filtered through vegetation. For example, houses such as “Birdwood”, “Cloverley”, “Roseneath” and “Hill View” are likely to have views to the site. Cullerin Range is screened from “Hill Top” by a shed and vegetation, however has but views to the Range will be afforded from around the home.</p> <p>There are no views towards Cullerin Range from the northern slopes of Parkesbourne.</p> <p><b>Duration of exposure (to the development):</b> Duration varies - homes with direct views will have a long duration of exposure, others will have only intermittent exposure. There is limited exposure from roads through Parkesbourne.</p> <p><b>Dominance of exposure:</b> Parkesbourne is well treed which helps to reduce the exposure from several vantage points. At times is it difficult (from roads through Parkesbourne) to get a clear view of the site. In general dominance of exposure is low to moderate.</p> <p><b>Landscape value:</b> It is assumed that most residents will choose to live at Parkesbourne for the landscape, as a lifestyle choice. Residents’ value of the landscape varies from moderate to high.</p>	<p>Moderate visual sensitivity</p>

<b>Type B</b>		<b>Transport Corridors</b>
<b>Area 5: Hume Highway</b>	<p><b>Landuse:</b> Main transport and travel route between Sydney and Melbourne. [Note: Surrounding properties are included elsewhere.]</p> <p><b>Type of user and frequency:</b> Primarily used by passing traffic and some local traffic. Large numbers of people will view the site from close range.</p> <p><b>Visual catchment:</b> The site is in view for most of the 15km stretch of road each side of the site. For east bound motorists, the site comes into view from round a bend near the junction with Federal Highway and heads directly to the site. The ridgeline south of Breadalbane screens the site from view for 2 -3 kilometres. After the hills south of Breadalbane (about 9 kilometres from the site) the view to the site is generally open, across the plains, until another set of hills partially screens Cullerin Range. Within 5 kms from the site, the site is clearly visible. The road passes just to the south of the site within five hundred metres of the turbines. From the west, the road passes over a series of hills and valleys. From low in the landscape, Cullerin Range is temporarily out of view, before appearing again as the hills are ascended.</p> <p>The main visual catchment is orientated along the road itself. Roadside vegetation varies in density and occasionally screens views out. Views out from the highway are generally of the highly modified farming landscape.</p> <p><b>Duration of exposure (to the development):</b> Duration is intermittent to the site due to the undulation of the road and roadside vegetation. The speed of traffic along the highway means that views will ultimately be transient.</p> <p><b>Dominance of exposure:</b> Roadside vegetation and hills partially screens views to Cullerin Range. From close to the site, the exposure will be dominant as the turbines will be high above the road.</p> <p><b>Landscape value:</b> Travellers are likely to place a low to moderate value on the surrounding landscape as they are likely to have little investment and attachment in local landscape. Local traffic is likely to place a moderate value on the landscape.</p>	Low to moderate visual sensitivity
<b>Area 6: Sydney to Melbourne Railway</b>	<p><b>Landuse:</b> Transport corridor</p> <p><b>Type of user and frequency:</b> Daily passengers and freight trains.</p> <p><b>Visual catchment:</b> Unlike the Hume Highway, the views from trains are open to the landscape. The site will be visible from the railway line for an extended period especially approaching Cullerin Range from the east. From the west, views of the site will be limited due to the windiness of the route and the local topography.</p> <p><b>Duration of exposure (to the development):</b> View duration is relatively short, especially in the context of an extended journey.</p> <p><b>Dominance of exposure:</b> The line passes close to the wind farm and so the dominance of exposure is high.</p> <p><b>Landscape value:</b> Passengers are likely to place a moderate value on the surrounding landscape as experiencing the passing landscape is an important part of a rail journey.</p>	Moderate visual sensitivity
<b>Area 7: Federal Highway</b>	<p><b>Landuse:</b> Main transport and travel route between Sydney and Canberra.</p> <p><b>Type of user and frequency:</b> Predominantly passing traffic and some local traffic.</p> <p><b>Visual catchment:</b> The Federal Highway passes to the south east of the site. The main visual catchment is orientated along the road itself. Views out are usually of farming landscapes, although sometimes tree lined hills give a more bush feel.</p> <p><b>Duration of exposure (to the development):</b> The site is in view for only short periods of time as it is screened from view for most of the journey by hills and roadside vegetation. The tops of the turbines will be visible for a stretch of about 5 kilometres along the road, dependent on roadside vegetation.</p> <p><b>Dominance of exposure:</b> Low dominance. The views are usually at 90 degrees to the road and sometimes partially screened by hills.</p> <p><b>Landscape value:</b> Travellers are likely to place a low value on the surrounding landscape as they are likely to have little investment or attachment in local landscape. Local traffic is expected to place a moderate value on the landscape.</p>	Low visual sensitivity

<b>Type C</b>		<b>Nature Reserves/Wetlands</b>	
<b>Area 8: Wet Lagoon</b>	<p><b>Landuse:</b> Wet Lagoon Nature Reserve is set aside for conservation purposes.</p> <p><b>Type of user and frequency:</b> Infrequent visitation by recreational users and passing traffic. It is an area primarily not used by people, but may have some infrequent visitation by groups such as bird watchers.</p> <p><b>Visual catchment:</b> The lagoon is viewed primarily from the road between Gunning and Breadalbane that passes to the east of the lagoon. Views from the road across the lagoon have direct views to Cullerin Range. "Dairy Flat", a property located on a south facing slope near Wet Lagoon is partially screened from the site by hills to the west but the wind farm will be in view from the house.</p> <p><b>Duration of exposure (to the development):</b> Duration of exposure will vary. From a moving car, the duration will be transient. Any recreational users such as bird watchers will experience a reasonably long duration of exposure.</p> <p>From "Dairy Flat" the exposure to the site will be considerable.</p> <p><b>Dominance of exposure:</b> Dominance of exposure is high as the main view point from the road across the lagoon includes Cullerin Range. From "Dairy Flat" the turbines will sit quite high above the house and the exposure will be of high dominance.</p> <p><b>Landscape value:</b> Residents are expected to place a moderate to high value on the landscape. Motorists are expected to place a moderate value on the landscape. Although the lagoon does not appear to have high visitation the users are likely to place a high value on the landscape.</p>		Moderate to high visual sensitivity
<b>Type D</b>		<b>Plains</b>	
<b>Area 9: Mutmutbilli</b>	<p><b>Landuse:</b> There are a small number of large working properties and a smaller number of residential properties in this area.</p> <p><b>Type of user and frequency:</b> User type is mostly local primary producer landholders. There is a low frequency of visitation by passing traffic and recreation users.</p> <p><b>Visual catchment:</b> The site is clearly visible from most locations across the flat plains. To the north of Old South Road, "Mutmutbilli" is looking end on to the site and is partially screened by vegetation. "Illawambra" is on this road within 2 kilometres of the site but the views to the site are screened by heavy vegetation around the property.</p> <p>"Enniskillen" has some views to the site. The views are partially screened by hills to the rear of the house but the turbines will be visible due to their height. "Sweetwater Lea" is facing south with clear views of site, while the view from "Strathmoi" is restricted by vegetation around the house. There is a church and cemetery at the junction of Old South road and the road to "Mutmutbilli" that has filtered views to the site.</p> <p>"Raeburn" has views to the site from the rear of the house, particularly the second storey. "Raeburn" (north) is located on the road to Gurrundah and sits up high on a hill and has clear and direct views to the site. "Wyaroo" and another house are located on the northern extent of the plains, and may get partial views of the site from the house.</p> <p>On Cullerin Road, "Waiontha" is surrounded by trees and unlikely to get clear views from the house.</p> <p><b>Duration of exposure (to the development):</b> Varies depending on location. From houses without screening, duration will be long. Duration from working properties is infrequent. From the road, duration of exposure is transient. It is likely that people attending church will mingle before and after church, or in the cemetery and have reasonably extended views of the site.</p> <p><b>Dominance of exposure:</b> As the plains are generally flat, the mid-ground views are not evident and the eye tends to search for a substantial view point. In this way the key views become the surrounding hills. Therefore, for those with views to the south and west, the wind farm site is quite dominant. Views from the roads have a high dominance of exposure</p> <p><b>Landscape value:</b> Discussions with residents at the open day revealed a high regard for the landscape in which they lived. Landholders in this area place to moderate to high value on the landscape. Recreational users place a moderate to high value on the landscape.</p>		Moderate to high visual sensitivity



<p><b>Area 10: Collector Creek</b></p>	<p><b>Landuse:</b> This is primarily an area used for primary production and there are some large farming properties in the area.</p> <p><b>Type of user and frequency:</b> Primary producers. Infrequent passing traffic on the roads.</p> <p><b>Visual catchment:</b> North of Collector, the views from this area to the site are generally open across flat land. There are some small hills through the area that sometimes screen views to the site from the road or houses.</p> <p>There are two properties within 5 kilometres of the site, “Greendale” and “Bohara”. “Greendale” has clear views to the site but has existing 330 kV powerlines running between the site and the house. “Bohara” has a slight hill and vegetation between the house and site, which will filter views from the rear of the house.</p> <p>“Maryfield” has views to the site from the rear of the house. “Werriwa”, “Moonyah” and “Milbang Park” may have partial or filtered views from around 9 kilometres from the site. “Milbang” is screened from the site by a hill and a house nearby is screened by trees.</p> <p>South of Collector, the view to the site is generally screened by the hills around Collector. “Windermere” and “Sunnyside” will not have views of the site. “Winderdeen” will have distant views to the site.</p> <p><b>Duration of exposure (to the development):</b> Varies depending on location. From houses without screening, duration will be long. Duration from working properties is infrequent. From the road, duration of exposure is quite extensive.</p> <p><b>Dominance of exposure:</b> Houses close to the site with views will experience a high dominance of exposure. “Greendale” looks to the site will see the whole breadth of the site. Other houses have a lower dominance of exposure.</p> <p><b>Landscape value:</b> Discussions with some residents at the open day revealed a high regard for the landscape in which they lived. This is balanced by other land holders who have a more pragmatic connection with the land primarily through production. On balance, landholders in this area place to moderate to high value on the landscape.</p>	<p>Moderate to high visual sensitivity</p>
<p><b>Area 11: Breadalbane Plains</b></p>	<p><b>Landuse:</b> Primary production.</p> <p><b>Type of user and frequency:</b> Primary producers are the main users in the area. Infrequent passing traffic on the roads.</p> <p><b>Visual catchment:</b> The key view from Breadalbane Plains tends to be the surrounding hills as the mid ground views are generally obscured. To the north, the well vegetated hills around Parkesbourne are the key feature. The views of the site will be across a low ridgeline that runs to the north and south of Breadalbane. This will partially screen the wind farm, so that views will generally be of the top section of the turbines.</p> <p>There are a number of properties north of the Hume Highway including “Wandara”, and “Carinya”. These are likely to have partial views of the site, but will vary depending on localised topography and vegetation. Others such as “Trig Hill” and “Willow Vale” are located on the eastern facing slopes and will not have views to Cullerin Range. Some properties low in the landscape such as “Little Wollogorang” will not see the turbines.</p> <p><b>Duration of exposure (to the development):</b> Varies depending on location. Duration from working properties is infrequent.</p> <p><b>Dominance of exposure:</b> The views will not be dominant as most views will be partially screened by hills.</p> <p><b>Landscape value:</b> It is assumed that owners of large primary production properties, in general, place a low value on the landscape, however from views from houses have a high value.</p>	<p>Low visual sensitivity</p>

<b>Type E</b>	<b>Rolling hills with sparse vegetation cover</b>	
<b>Area 12: West of Cullerin Range</b>	<p><b>Landuse:</b> Primary production - there is limited passing traffic along roads in the area.</p> <p><b>Type of user and frequency:</b> Most of the properties in this region are large farming properties. There is limited passing traffic along the roads.</p> <p><b>Visual catchment:</b> From around Cullerin Road, the Cullerin Range is visible from some of the properties along the road. "Ponderosa", "Wodonga", "Lochleigh" and "Risborough Stud" have views to Cullerin Range. "Mount Pleasant", "Signal Hill" and "Collingwood" are likely to have limited views through vegetation to the site from the houses.</p> <p>The Hume and Hovell Memorial is located along this stretch of Cullerin Road, but the site is screened by trees from the memorial. From the road, the site is clearly in view for the majority of the journey between Gunning and the site.</p> <p>There are two properties down Warnsley Road to the South. "Frankfield" is on an east facing slope and will have views of the turbines, partially blocked by a hill, and surrounding vegetation. Another property (name unknown) along Warnsley Road is surrounded by trees and screened by hills and is unlikely to see the site. "Hanging Rock" just outside of Gunning may have clear views to the site from 9 kilometres (vegetation around home unknown). All of these properties can see the site clearly from certain locations on their properties.</p> <p>Along the road between Gunning and Crookwell, the topography is hilly and views from the road and houses depend on the localised topography, and are infrequent. Generally the land gains altitude and the views more across to the site rather than up at the site. There are a number of properties along this road, which have filtered views of the site including "Rutherford" and "Allamby". Properties likely to be screened from the site include: "Birroon", "Tolldale" and "Koolang". Along the Biala Road, "Mount View" will have clear views to the site but "Merrill", "Rockfield", and "Alton Hill" and "Altjira" are likely to be screened.</p> <p>To the west of Gunning there are views from the houses on the road to Dalton including "Goondalee" and "Lleyton" although the main view shed is more to the north rather than to the site. A property on Hume Street also has views to the site.</p> <p><b>Duration of exposure (to the development):</b> From houses without screening, duration will be long. Duration from working properties is infrequent.</p> <p><b>Dominance of exposure:</b> For houses around Cullerin Road and closer to the site, the dominance of exposure is high for those with views, particularly as the site is considerably higher than the surrounding land, giving the turbines greater height. From locations further to the north, the dominance reduces as the altitude of viewing points rise and the view is along the wind farm, and few turbines will be seen.</p> <p><b>Landscape value:</b> It is assumed that owners of large farming properties, in general, place a low value on the landscape, however from views from houses have a high value.</p>	<p>Moderate to high visual sensitivity for properties along Cullerin Road with clear views to the site</p> <p>Moderate visual sensitivity for properties along the road to Dalton</p> <p>Low to visual sensitivity for the rest of the area</p>

<p><b>Area 13: South of Gunning/ Lerida</b></p>	<p><b>Landuse:</b> Primarily used for primary production but there are a number of rural residential properties along the road from Gunning to Gundaroo and the road from Gunning to Collector.</p> <p><b>Type of user and frequency:</b> Primary producers and some rural residential/hobby farmers. The road between Gunning and Gundaroo is the main road to Canberra.</p> <p><b>Visual catchment:</b> Along the road between Gunning and Collector, there are a number of properties that will be able to view the site or at least see the turbines. Properties that will view the site include "Linton", "Allendale" and a house at the end of Bradbury Lane. Mostly views from houses will be partially screened by vegetation, including "Yarrowarra", "Glencoe" and "Woolloowarre". Other properties are screened by hills such as "Sunnyside", "The Meadows", "Meullers", "Saentis Park" and "Warrawood".</p> <p>Of the two properties along Lerida South Road, "Lerida" does not have views of Cullerin Range and "Wood Park" has only partial views with other views screened by vegetation.</p> <p>Along the road from Gundaroo the view to the site opens up from around Mount Dixon about 9 kilometres from the site, interrupted periodically by localised hills. The view is open across the valley for some sections of road. "Taloubi" and "Woodbain" for example will have views to the site and two other properties have partial views of the site. "Gumboyah", adjacent to the Hume Highway has open views to site.</p> <p><b>Duration of exposure (to the development):</b> Varies depending on location. From houses without screening, duration will be long. Driving along the road the duration of exposure is only occasional and intermittent as the direction of the roads generally runs parallel to the site and the site is intermittently screened. Vegetation and small hills. Duration from working properties is infrequent.</p> <p><b>Dominance of exposure:</b> Dominance of exposure will vary. Along the road to Collector, dominance will not be high, as views are generally filtered by vegetation. From the road to Gundaroo, the houses tend to be a little more elevated than those around the road to Collector and therefore the view is more open.</p> <p><b>Landscape value:</b> It is assumed that these properties are a mixture of working and rural residential properties. Therefore, the residents are likely to place a moderate value on the landscape.</p>	<p>Moderate visual sensitivity</p>
<p><b>Area 14: Wollogorang</b></p>	<p><b>Landuse:</b> The area primarily contains large working properties, used for primary production.</p> <p><b>Type of user and frequency:</b> Primary producers. Limited passing traffic.</p> <p><b>Visual catchment:</b> There are few houses in this area. "Greendale" (north) sits on the road between Breadalbane and Collector. It is located on the east side of a hill and surrounded by trees. Their views will be mostly screened. There is at least one working property on the foothills of Collector Hill to the south with views to the site. There is a property on the eastern face of Breadalbane Hill which is unlikely to have views to the site from the house.</p> <p><b>Duration of exposure (to the development):</b> From the house with views, the duration of exposure will be significant. Duration from working properties is infrequent.</p> <p><b>Dominance of exposure:</b> For the house with views, the dominance will be moderate, as the view is end on and the wind farm will be a relatively small feature in a broad view shed. Dominance of exposure will be low for other properties.</p> <p><b>Landscape value:</b> It is assumed that owners of large primary production properties, in general, place a low value on the landscape, however from views from houses have a high value.</p>	<p>Moderate visual sensitivity</p>
<p><b>Area 15: North of Breadalbane</b></p>	<p><b>Landuse:</b> Primary production.</p> <p><b>Type of user and frequency:</b> Primary producers.</p> <p><b>Visual catchment:</b> There are two houses in the area, "Yurrunga" and "Allenby", both of which are located adjacent to Parkesbourne. Both properties have line of site to the wind farm from the houses but vegetation around the houses which partially screens the view.</p> <p><b>Duration of exposure (to the development):</b> From the houses where there are views, duration will be significant.</p> <p><b>Dominance of exposure:</b> Existing vegetation screening reduces the dominance of exposure to a moderate level.</p> <p><b>Landscape value:</b> It is assumed that owners of large primary production properties, in general, place a low value on the landscape, however from views from houses have a high value.</p>	<p>Low to moderate visual sensitivity</p>

<p><b>Area 16: Gurrundah</b></p>	<p><b>Landuse:</b> Mainly primary production.</p> <p><b>Type of user and frequency:</b> Primary producers</p> <p><b>Visual catchment:</b> There are only very limited views from this location, but there may be some houses on higher points in the landscape such as “Woodlands” in Gurrundah that may be able to view some of the turbines from around 15 kilometres. One respondent to the survey noted that the site could be viewed from Bannister Lane in Gurrundah, which is about 16 kms from the site.</p> <p><b>Duration of exposure (to the development):</b> From the houses where there are views, duration will be significant.</p> <p><b>Dominance of exposure:</b> Low dominance of exposure as views to the site will be limited by vegetation, topography and will be end on to the site.</p> <p><b>Landscape value:</b> It is assumed that owners of large primary production properties, in general, place a low value on the landscape, however from views from houses have a high value.</p>	<p>Low visual sensitivity</p>
<p><b>Type F Hills with light to moderate vegetation coverage</b></p>		
<p><b>Area 17: Cullerin</b></p>	<p><b>Landuse:</b> Primary production, with a small number of rural residential properties.</p> <p><b>Type of user and frequency:</b> Primary producers and rural residential. Residents claim that different interest groups use the roads in the area for activities such as cycling, horse riding and train spotting. These activities will be infrequent.</p> <p><b>Visual catchment:</b> From Cullerin Road to the west of the range, “Mt Rushmore” is screened partially behind hills. “Fairview” off Old Sydney Road is north facing away from the site but will have clear views and is within 2 kilometres of the site. There are two properties near the railway bridge to the north of the range that are within 2 kilometres of the site. One of these houses is screened from the site by a conifer hedgerow and does not have clear views. The other house is partially screened by vegetation and has views to the site from the rear of the house.</p> <p>“Wandella”, at the junction of North Lerida Road is within 1 kilometre of the site faces north east away from site. Light vegetation at the back of the house partially screens views but the site will be in clear view to the rear of the house. “Faybri”, is a small house for sale on the north side of the road with clear views to the site.</p> <p>Lerida North Road runs along the east of the site. Along this road “Springvale” is located at the base of Cullerin Range and will get clear views of the site from the rear of the house.</p> <p>Further to the east of the site, “Lerida Outstation” looks side on to the site and views that are partially obstructed by a hill and vegetation at the rear of the house.</p> <p><b>Duration of exposure (to the development):</b> Varies depending on location. From houses without screening, duration is long. Duration from working properties is infrequent.</p> <p><b>Dominance of exposure:</b> “Wandella”, “Faybri”, “Springvale” and “Fairview” have a high dominance of exposure. Other properties experience a lower dominance of exposure. The site is visible from most points along the roads in the area.</p> <p><b>Landscape value:</b> It is assumed that these properties are a mixture of working and rural residential properties. On balance, the residents are likely to place a moderate to high value on the landscape. Recreational uses place a moderate to high value on the landscape.</p>	<p>High visual sensitivity</p>
<p><b>Area 18: Lerida south</b></p>	<p><b>Landuse:</b> Primary production with a small number of rural residential properties.</p> <p><b>Type of user and frequency:</b> Primary producers and rural residential.</p> <p><b>Visual catchment:</b> There are limited views of the site due to surrounding vegetation. There are a number of houses (about 5) along the road which only have filtered or partial views of the site due to vegetation around the houses including “Oakdale” and “Little Lerida”. Two properties (including “Tikalara”) that will have views to the site. There are views of the site travelling to Collector down the escarpment but there are no known houses on the escarpment with views to the site. Houses at the base of the escarpment will be screened by vegetation and the escarpment.</p> <p><b>Duration of exposure (to the development):</b> Varies depending on location. From houses, duration will be moderate. Duration from working properties is infrequent. From the road views will be infrequent.</p> <p><b>Dominance of exposure:</b> The 2 houses with clear views experience a reasonably dominant exposure. Other views are low in dominance.</p> <p><b>Landscape value:</b> It is assumed that these properties are a mixture of working and rural residential properties. Therefore, the residents are likely to place a moderate value to high on the landscape.</p>	<p>Moderate to high visual sensitivity</p>

<b>Area 19: North of Mutmutbilli</b>	<p><b>Landuse:</b> Primary production with a small number of rural residential properties.</p> <p><b>Type of user and frequency:</b> Primary producers and rural residential.</p> <p><b>Visual catchment:</b> There are only limited views to the site due to topography and vegetation. "Marsland South" is the only house with clear views to the site.</p> <p><b>Duration of exposure (to the development):</b> Duration of exposure for "Marsland South" will be long. Duration of exposure to the site along the roads is very low.</p> <p><b>Dominance of exposure:</b> The view to the site is from a higher altitude than the plains so the view is more looking across to the site reducing the dominance of exposure. Views are from the north east so the full breadth of the site will not be in view.</p> <p><b>Landscape value:</b> It is assumed that owners of primary production properties, in general, will place a low value on the landscape, however from views from houses have a high value.</p>	Moderate visual sensitivity
<b><u>Type G</u> Ranges/hills with moderate to high vegetation coverage</b>		
<b>Area 20: Cullerin Range North</b>	<p><b>Landuse:</b> Primary production.</p> <p><b>Type of user and frequency:</b> Primary producers.</p> <p><b>Visual catchment:</b> There are two houses along the range. The ZVI analysis (see Section 5.2) suggests that these properties will not have views of the turbines.</p> <p><b>Duration of exposure (to the development):</b> If facing the site from the houses, duration of exposure will be extensive.</p> <p><b>Duration of exposure (to the development):</b> Low</p> <p><b>Dominance of exposure:</b> Low</p> <p><b>Landscape value:</b> N/A</p>	Low visual sensitivity
<b>Area 21: Collector Hill</b>	<p><b>Landuse:</b> Rural residential properties.</p> <p><b>Type of user and frequency:</b> Rural residential and hobby farmers.</p> <p><b>Visual catchment:</b> Views extend to the north towards the site and most are screened by vegetation.</p> <p><b>Duration of exposure (to the development):</b> Duration of exposure for those with views is limited by vegetation.</p> <p><b>Dominance of exposure:</b> Generally low dominance of exposure due to vegetation.</p> <p><b>Landscape value:</b> It is assumed that these properties are rural residential properties. Therefore, the residents are likely to place a high value on the landscape.</p>	Low to moderate visual sensitivity
<b>Area 22: Other Areas</b>	<p><b>Landuse:</b> Primary producers</p> <p><b>Type of user and frequency:</b> Primary producers – infrequent views.</p> <p><b>Visual catchment:</b> There are no known houses with views to the site.</p> <p><b>Duration of exposure (to the development):</b> Low</p> <p><b>Dominance of exposure:</b> Low</p> <p><b>Landscape value:</b> It is assumed that owners of primary production properties, in general, will place a low value on the landscape, however from views from houses have a high value.</p>	Low visual sensitivity

### Distant Views (greater than 15 kms)

It should be noted that there may be a number of locations from greater than 15 kilometres that have views to the site. This includes properties along the Muddoonen Range to the south and west, east of the Federal Highway and to the higher vantage points to the north and north west. Due to the distance (more than 15 kilometres away) and with reference to earlier comments on difficulty of perception the visual sensitivity of the users was assessed to be low / insignificant.

# 5 Visibility of the Wind Farm

This section establishes the visibility of the wind farm from various distances.

There are no set guidelines on visibility or dominance of wind farm turbines from certain distances. De Gryse (2000) uses the table below to express the general concept that at greater distances variations in the landscape become less obvious based on the proportion of the vertical field they take up:

**Table 4: Significance of Wind Turbine as a Vertical Element**

(adapted from De Gryse 2000)

Distance at which the turbine becomes:	Height of Wind Turbine (eg 120m)
Insignificant vertical element (less than 0.5% of the vertical line of sight)	>13.75 km
Visible but not dominating vertical element (less than 0.5% - 2.5% of the vertical line of sight)	2.7 km – 13.75 km
Dominant vertical element in the viewed landscape (greater than 2.5% of the vertical line of sight)	<2.7 km

The study that this table was used related to a wind farm on coastal lowlands on the north east coast of Tasmania. Its applicability to in-land sites where the wind farm is located on a ridgeline is not clear. However, the principle is conservatively adapted for this visual assessment.

For this visual assessment, four distance zones are used to categorise visibility, as follows:

- Foreground views: High visibility - within 5km of the wind farm;
- Mid-ground views: Moderate visibility - 5km to 10km of the wind farm;
- Background views: Low visibility - 10km to 15 kms of the wind farm; and
- Distant views: Low visibility - greater than 15km from the wind farm.

The distance from the site assists in determining the dominance of the wind turbines and therefore their visual impact from various distances. The distance each area is from the site is shown in Table 4 below:

**Table 5: Distance Zones**

Location	Distance from Site	Visibility
<b>Type A</b>		
Area 1: Gunning	12 – 13 kms	Low visibility
Area 2: Collector	10 – 11 kms	Low visibility
Area 3: Breadalbane	8 – 9 kms	Moderate visibility
Area 4: Parkesbourne	11 – 12 kms	Low visibility
<b>Type B</b>		
Area 5: Hume Highway	1 – 15 kms	Low to high visibility
Area 6: Sydney to Melbourne Railway	1 – 15 kms	Low to high visibility
Area 7: Federal Highway	11 – 15 kms	Low visibility
<b>Type C</b>		
Area 8: Wet Lagoon	4-6 kms	Moderate to high visibility

<b><u>Type D</u></b>		
Area 9: Mutmutbilli	2 – 12 kms	Low to high visibility
Area 10: Collector Creek	3 – 15 kms	Low to high visibility
Area 11: Breadalbane Plains	10 – 15 kms	Low visibility
<b><u>Type E</u></b>		
Area 12: West of Cullerin range	3 – 15 kms	Low to high visibility
Area 13: South of Gunning/ Lerida	1 – 15 kms	Low to high visibility
Area 14: Wollogorang	6-15 kms	Low to moderate visibility
Area 15: North of Breadalbane	8 – 12 kms	Low to moderate visibility
Area 16: Gurrundah	10 – 15 kms	Low visibility
<b><u>Type F</u></b>		
Area 17: Cullerin	1 – 5 kms	High visibility
Area 18: Lerida south	8 – 15 kms	Low to moderate visibility
Area 19: North of Mutmutbilli	6 – 13 kms	Low to moderate visibility
<b><u>Type G</u></b>		
Area 20: Cullerin Range North	2 – 15 kms	Low to high visibility
Area 21: Collector Hill	12 – 15 kms	Low visibility
Area 22: Other Areas	10 – 15 kms	Low visibility

# 6 Visual assessment

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## 6.1 Introduction

The visual assessment involves an evaluation of two aspects of the visual impact of the wind farm:

- The contrast that the wind farm will create in the landscape; and
- The visual impact on the user in the landscape.

The contrast to the existing landscape relates to the impact that the wind farm will have on the different landscape character types, and an assessment is made as to whether the contrast of the wind farm to the landscape is acceptable or not.

The second aspect of the visual impact is to consider the impact on the user and the view that they will have to the wind farm. This aspect includes consideration of:

- visual sensitivity of the user to changes in the landscape; and
- the distance that the viewer is from the wind farm.

For example, the wind farm will have a lower visual impact from a road to passing traffic than from a home where the wind farm can be viewed from the lounge room. The scenic quality of the landscape is a consideration in determining the visual impact on the user. That is, the visual impact of a wind farm across a pristine landscape is greater than the visual impact of a wind farm in an industrial landscape. The visual impact on the viewer considers three levels of impact:

- High – proposal is dominant within the landscape and generally not overlooked by the observer;
- Moderate – moderately dominant and is noticed; and
- Low – can be seen but does not attract attention.

The visual impact assessment on the user does not conclude whether the visual impact is acceptable or not to the user, just makes an independent assessment as to the extent of visual impact of the wind farm on the user.

The visual impact of the proposal will firstly be reviewed by considering the general impacts of the whole development. A more detailed assessment is then made from each of the main viewpoints.

## 6.2 Visual Impacts of the Wind Farm

### 6.2.1 Scenic interest of a wind farm

By their very nature, wind farms are highly visible and in some circumstances, they create an unacceptable visual impact. However, the positive aspects of wind farms and wind turbines should not be ignored. De Gryse (2000) notes that:

“The overall assessment of visual impact must consider the positive contribution that the scenic interest of wind farms generally has on the landscape ... While scenic interest does not necessarily mitigate these impacts, it does, nonetheless, ameliorate them, by adding positively to the landscape setting thus contributing to the acceptability of the impact.”

The positive visual aspects of wind farms need to be kept in mind when their visual impact and the contrast they present to the surrounding landscape is being assessed.



## 6.2.2 Contrast to the cultural & natural environment

The wind turbines introduce a very contemporary visual form to the area. Their tall sleek form provides a new element to the largely cultural landscape that has a strong historical essence. Their height and scale also contrasts to elements within the landscape, and their visual appearance can add an element of high visual contrast to the existing environment.

The landscape is highly modified, one that has been moulded by years of farming. There are several visible signs of modification from houses, fences, power lines and roads. From the perspective that this landscape has evolved through production activities, energy production could be considered consistent with the existing land use. Indeed, energy production and primary production have co-existed in several other locations. Meridian Energy (May 2005) note:

“Harvesting the power of the wind can be seen as an appropriately rural activity.”

Heinemann (2006) note that “windmills have been a common feature of Australia’s rural built environment for more than 100 years ... Until electricity and gas grids spread throughout non-urban Australia, small wind generators were used to provide energy on individual farms”, albeit the scale of the structures is on a significantly smaller scale.

There are also more modern elements in the landscape that are broadly consistent in scale to the wind farm turbines. The telecommunications tower on Cullerin Range stands not far below the height of the hub of the turbines and the large 132 kV and 330kV powerlines that run adjacent to the Hume Highway are a prominent built feature in the landscape. Other vertical elements include telegraph poles, signage, and transmission towers, although at a different scale. The visual quality of a wind farm is arguably higher than many of the existing man made elements already in the landscape.

The close proximity of the Hume Highway that runs to the south of the site adds a prominent built form to the area. The highway also introduces a transport/ industrial edge to the landscape character. It is on the Hume Highway that the vast majority of people will view the wind farms, albeit for a relatively short time frame compared to local residents.

While the wind farm will provide a contrast to this landscape, it is a change that the landscape should be able to absorb.

**Conclusion:** Low to moderate visual impact

## 6.2.3 Size of the wind farm and turbine size

Compared to the recently approved wind farms and proposed wind farms in New South Wales (see Table 6 in Section 6.4), the Taurus Energy proposal is a small wind farm (maximum of 15 turbines). In relation to the numbers of towers, Planisphere (2005, p80) note that:

“... collections of turbines can be highly visible because of the combination of their height, repeating elements and the geographical area they cover.”

A study of inland wind farms in South Australia found that “the presence of the smaller number of turbines enhanced landscape quality” (Lothian, undated), over a larger number of turbines. Warren et al, (2005) note that:

“It is clear ... that the public has a clear preference for smaller wind farms.”

A smaller number of towers in this proposal will reduce the visual impact of the wind farm by reducing the overall area of the proposal. Potentially there are fewer vantage points to the site. There is also a reduction in the visual impact by viewing fewer turbines.

The proposal may include the use of comparatively large towers (up to 80m tall), with blades up to 46m long for a total height of 126 metres. Planisphere (2005, p80) note that:

“The height of individual turbines can make them visible for long distances, and they can be prominent features on the horizon when viewed with the

sea or sky as a backdrop. The turbines can also stand in dramatic contrast with the height of features of the surrounding landscape.”

The possible use of large towers will mean that they will be more easily seen from a distance and increases the visual impact of an individual tower from any given distance.

### 6.2.4 Siting of turbines

The siting of turbines in some installations can have bearing on the visual impact on certain specific locations around the wind farm. In the case of the Cullerin Range proposal, two options for turbine siting have been put forward and are shown below. The photomontages comparisons in Section 8.1 show the visual differences between the two layouts.

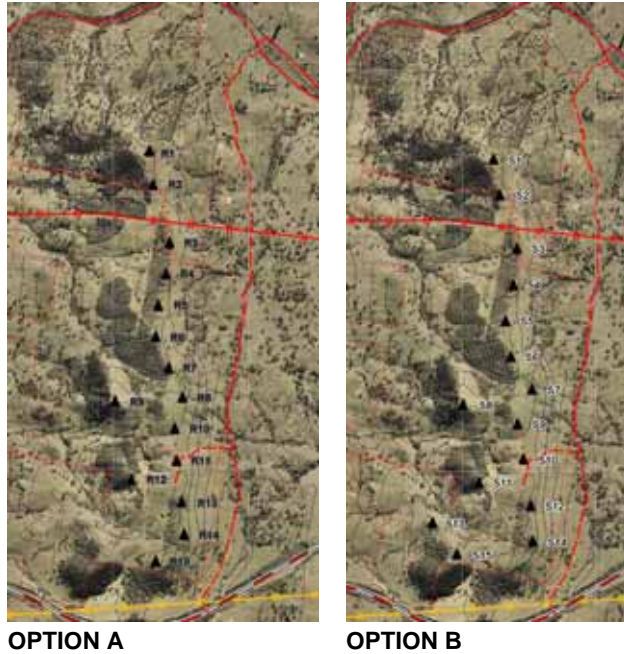


Figure 4 Turbine layout options

The nature of the Cullerin site and various viewpoints to the site means that turbine placement will only make a marginal difference to the visual impact of the wind farm. Under Option B, the turbines on the southern edge of the site are likely to be more visible from the highway when travelling from the west, but the differences in impact on residences around the site will be insignificant.

The turbines used under Option A are likely to be slightly smaller (around 6 to 10 metres) than those used under Option B. At this scale, the difference would not be easily perceived by the average viewer. Consequently, although the turbines used for Option B may create a larger visual impact, it is unlikely that this difference will be significant.

## 6.3 Visual Impact from Specific Locations

Localised topography and vegetation and the perspective of the viewer all contribute to the visual impact of the wind farm from various locations. The visual impact of the wind farm from key locations is outlined below.

### Type A - Country Towns and Rural Residential Communities

#### Area 1: Gunning

The views to the wind farm from Gunning are limited to some of the higher areas, particularly on the western edge of the town. The visibility of the towers from 12 kilometres is likely to be low. Additionally, residents of Gunning are likely to have a low to moderate visual sensitivity to the wind farm.

The wind farm will introduce a modern element that will provide some contrast to the old town feel. However, there are views of several modern built forms in and around Gunning, such as the Hume Highway and electrical infrastructure that lessens that contrast. Further, the wind farm is sufficiently out of view that the landscape character of the town will not be impacted significantly by the wind farm.

As such, the contrast of the wind farm to the existing landscape character of Gunning is acceptable, and the change could be accommodated without significantly impacting on the landscape character of the town.

**Conclusion:** Low visual impact

See Photomontage (Photo 12) in Section 8

### **Area 2: Collector**

The landscape around Collector is not particularly sensitive to change. The views of the Federal Highway that runs beside Collector emphasises the modern built form in and around the town. The introduction of wind farm will introduce a vertical built element to the landscape but this change to the landscape will only create a low and acceptable contrast to the existing landscape character of the town.

The views of the landscape around Collector take in a modified farming landscape and the surrounding treed hills. The wind farm will be viewed from Collector across the low plains and small hills that lie to the north of the town. There will be only limited views of the wind farm from the town from 10 kilometres. Views will be along the wind farm so few turbines will be visible. On balance, the wind farms will have a low visibility. It is expected that the residents of Collector will have a low to moderate visual sensitivity to the wind farm, and so any views to the wind farm will not generally have a high impact on the viewer.

**Conclusion:** Low visual impact

See Photomontage (Photo 13) in Section 8

### **Area 3: Breadalbane**

The landscape character of Breadalbane has a utilitarian edge, with the railway line, wide former highway passing through the town and the surrounding farming landscape. As a result, the contrast between the wind farm and the existing landscape is acceptable, and the change could be accommodated without unduly impacting on the landscape character of Breadalbane.

Breadalbane is located within 8 to 9 kilometres from the wind farm. From that distance, the wind farm will have moderate visibility above the hills to the east of the town. The predominantly westerly winds will result in the blades being oriented to be in full view from Breadalbane for much of the time. From some vantage points within the town all turbines will be visible, but most locations will only see the tops of some of the turbines. It is expected that the residents of Breadalbane will have a moderate visual sensitivity to the wind farm.

There are some houses from where the wind farm will be observed on a daily basis, but for other residents, it will be seen periodically.

**Conclusion:** Moderate visual impact

#### **Area 4: Parkesbourne**

The landscape character of Parkesbourne has a bush feel, with homes scattered throughout and the introduction of a wind farm will present a contrast to that landscape character. This is ameliorated as the views to the wind farms are across a modified farming landscape, and views of other built forms such as the Hume Highway and railway line are also evident. The change to the landscape of a wind farm would be acceptable.

Parkesbourne is located 11 to 12 kilometres from the site and from that vantage point, the visibility of the wind farm will be low. The views from Parkesbourne are limited by the vegetation but a number of houses will have views of the wind farm. In general, it is assumed that the residents of Parkesbourne will have a moderate visual sensitivity to the wind farm as they are predominantly rural residential properties. On balance, the visual impact of the wind farm will be low due to the limited views of the wind farm from some distance.

**Conclusion:** Low visual impact

### **Type B - Transport Corridors**

#### **Area 5: Hume Highway**

The Hume Highway presents a dominant transport related built form to the area. For the majority of the length of highway, the surrounding landscape consists of large farms, well cleared, generally with only scattering of remnant trees. As such, the views of the traveller will either directed along the road corridor or across a modified rural environment. Therefore the contrast between the built form of the highway and the wind farms is small, and the landscape could absorb the change.

The close proximity of the towers (as the Hume Highway passes approximately 500m to the south of the site) makes the wind farm highly visible from the Highway and will have a high visual dominance when viewed from below. From other locations along the Hume Highway, the views to the towers will vary depending on distance to the towers, roadside vegetation and localised topography. The predominantly westerly winds will result in the blades being in full view from along the road for a large portion of time, making them highly visible.

For users of the Highway, the wind farm will present an interesting feature to view while travelling along the road to a destination elsewhere. The speed of traffic along the highway means that the wind farm will be viewed from close distance for only a short time, which also reduces the visual impact. For most, they will have detachment from its presence and detachment from the surrounding landscape. It is assumed that travellers will have a low to moderate visual sensitivity to the wind farm. The visual impact of the wind farm from the Hume Highway will be low to moderate.

**Conclusion:** Low to moderate visual impact

See Photomontage (Photo 14) in Section 8

#### **Area 6: Sydney to Melbourne Railway**

The landscape character that the railway line passes through varies from low to moderate in scenic quality. Most of the landscape is a modified farming landscape, scattered with modern built elements such as powerlines, transmission towers and signage. As a result, the wind farm will provide an acceptable contrast to this landscape, but it is a change that the landscape should be able to absorb.

Views from the railway line are clear across the Breadalbane Plains, and intermittent from the west. The rail line passes about 1 kilometre to the north of the proposed turbine sites. Passengers on a train, enjoying the landscape views are expected to have a moderate visual sensitivity to the wind farms, but ultimately, passengers are unlikely to have any connection with the surrounding landscape. For users of the Highway, the wind farm will present an interesting feature to view while travelling to a destination elsewhere.

**Conclusion:** Low to moderate visual impact

See Photomontage (Photo 15) in Section 8

### **Area 7: Federal Highway**

The Federal Highway is located 11 to 15 kilometres from the site, and the wind farm will have low visibility from that distance. Similar to the Hume Highway, the Federal Highway presents a dominant two lane transport related built form to the area. For the majority of the length of highway, the surrounding landscape consists of large farms, cleared with scattered remnant trees, so the views of the traveller will either be of the road or a highly modified rural environment. There are also several other modern built elements in the landscape such as powerlines, transmission towers and signage. As a result, the wind farm will provide a low contrast to this landscape, and a change that the landscape should be able to absorb.

For users of the Highway, the wind farm might present an interesting feature to view while travelling along the road to a destination elsewhere. For the majority of motorists, they will have detachment from its presence and detachment from the surrounding landscape, and therefore have a low visual sensitivity to the wind farm. Add the speed of traffic along the highway, and the fact that views of the wind farm are at 90 degrees to the Highway, reduces the time and visibility of the wind farm.

**Conclusion:** Low visual impact

## **Type C - Nature Reserves/Wetlands**

### **Area 8: Wet Lagoon**

The uniqueness of the lagoon in a largely dry landscape, and the clear presence of bird life around the lagoon, results in a moderate to high scenic quality to the landscape. The scenic quality is lessened by the modified farming landscape surrounding the lagoon, and the close proximity of the Hume Highway and 132 kV transmission lines. There will be a contrast between the wind farm and the wet lagoon, but the wind farm will not unduly compromise the landscape character of the area due to the surrounding rural landscape typical of most of the area and built elements in the landscape.

From the road adjacent to Wet Lagoon (the point that most will see the wetland) the wind farm is approximately 6 kilometres away and with a moderate visibility. The visibility of the wind farm from "Dairy Flat" is high and the wind farm will be partially visible from the house. Residents will have a moderate to high sensitivity to the wind farm. Relatively few people will visit the wetland. Those that do visit the area are likely to have a moderate to high sensitivity to the landscape.

**Conclusion:** Moderate to high visual impact

See Photomontage (Photo 16) in Section 8

## **Type D - Plains**

### **Area 9: Mutmutbilli**

The landscape character of the area is a modified farming landscape which has seen much change since European settlement. The age of some of the built elements contributes to the cultural landscape.

Most of the views take in built elements such as views across the area includes modern built elements such as 132kV transmission lines, roads, train tracks, exotic vegetation. The introduction of a wind farm to a modified environment will present a contrast to the landscape, but this change could be accommodated without significantly impacting on the landscape character.

The views of the site are across the plains, varying from 2 to 12 kilometres. From the plains, the eye tends to take in the surrounding hills, and therefore the wind farm will have a moderate to high visibility being located on a prominent ridgeline. The views to the wind farm will vary from nearly side-on where all of the wind farm will be visible to along the wind farm, where fewer turbines will be visible.

It is expected that residents within this area will have a moderate to high visual sensitivity to the wind farm. There are a number of houses with clear views to the site such as "Sweetwater Lea" from 6 kilometres, while other houses are partially screened by trees such as "Waiontha". The clear views to the wind farm from some houses means that the visual impact will be high. The wind farms are also highly visible from the roads through the area.

**Conclusion:** Moderate to high visual impact

See Photomontage (Photo 17) in Section 8

### **Area 10: Collector Creek**

The landscape character of this area is a modified farming landscape. Some views to the wind farm from this area also include the Hume Highway and 132kV transmission lines, which add a built industrial form to the view already. There are sufficient modifications of the landscape and inclusions of modern elements to the landscape that the contrast of the wind farms to the existing landscape character could be absorbed by the landscape.

This area varies from 3 to 15 kilometres from the site. From the closest homes around 5 kilometres from the site, the wind farm will have a high visibility. Of note is "Bohara", "Maryfield" and "Greendale" who will have either open or filtered views to the wind farm from 5 to 6 kilometres from the houses. They are located south east of the range where views will include the majority of the wind turbines.

From the furthest locations in the area, the visibility of the wind farm will be low due to distance from the wind farm. There are a number of properties in the area who will not be able to see the wind farm, or have only very limited views. The wind farm will be clearly visible from several locations along the road between Collector and Breadalbane, particularly when travelling north.

Due mainly to the visual impact on those houses close to the wind farm, the wind farm will have a moderate to high visual impact on this area. From other locations the wind farm will have a low to moderate visual impact.

**Conclusion:** Moderate to high visual impact for the houses close to the site with views to the wind farm. Low to moderate visual impact from other locations.

See Photomontage (Photo 18) in Section 8

### **Area 11: Breadalbane Plains**

While the plains are quite interesting and unique in their size, the landscape is a modified farming landscape, typical of the region. The presence of the highways and rail lines add another built element to the visual character of the area. As a result, the contrast of the wind farm to the surrounding landscape is acceptable.

Located 10 to 15 kilometres from the site, the wind farm will have a low visibility. There will be only limited locations with views of the wind farms above the lines of hills in the area. The residences in this area are expected to have a low sensitivity to the wind farms largely due to the limited views of the wind farm.

**Conclusion:** Low visual impact

## **Type E - Rolling hills with sparse vegetation cover**

### **Area 12: West of Cullerin Range**

The landscape in this area is a modified farming landscape, largely cleared and with a clear production focus. From some locations, the Hume Highway is visible introducing a strong built element in the landscape. The width of the Cullerin Road is also a strong built element in the landscape.

The wind farm will introduce a modern vertical element to the landscape and will create a contrast to the existing landscape, but this change could be accommodated without significantly impacting on the landscape character.

Views from this large area vary from 3 to 15 kilometres, and the wind farm will vary from low to high visibility. The predominantly westerly winds will result in the blades being in full view from along the road for a large portion of time, making them highly visible. The views from directly west of the site will take in all of the turbines, while further north, views will be more along the wind farm and the wind farm will be narrower in the view.

Some houses closest to the site along Cullerin Road, such as "Ponderosa", have clear views to the site (refer to visual sensitivity analysis in Section 4) and from some of these locations the wind farm will be highly visible. The visual sensitivity of residents from this location and with views to the site is moderate to high. Consequently, the visual impact of the wind farm for properties within 5 kilometres with views of the site will be moderate to high.

Further to the east and north, as the visibility of the wind farm decreases, reducing the visual impact also. East of Gunning, there are houses with views to the site but the visibility of the wind farm is low being 14 to 15 kilometres from the site. The visual sensitivity of residents from this location is low to moderate. The resulting visual impact is low to moderate.

To the north, there are few houses that will view the site and those that do, are located approximately 15 kilometres or more from the site. The visual sensitivity of residents from this location is low to moderate, and the visual impact of the wind farms will be low from that distance.

**Conclusion:** Moderate to high visual impact for residences with views to the site within 5 kilometres. Low to moderate visual impact for other areas

See Photomontages (Photo 19 and 20) in Section 8

### **Area 13: South of Gunning/ Lerida**

Most of this area is a modified farming landscape, mostly cleared with scattered remnant vegetation. There are still large working properties in the area including "Lerida" close to the site and a number of rural residential properties. On the whole the scenic quality is low to moderate and is not particularly sensitive to change. Several locations in the area also take in views of the Hume Highway and power infrastructure. As such the introduction of a wind farm to the landscape could be absorbed by the landscape.

The area is located between 1 and 15 kilometres from the site, representing a low to high visibility for the wind farm. There are no houses with clear views to the wind farm within 5 kilometres. There are some houses along the road between Gunning and Collector with partially screened views. The views from the road are intermittent and the wind farm will be difficult to perceive from a vehicle moving travelling at an angle to the wind farm.

There are a number of houses along the road between Gunning and Gundaroo with clear views to the site. The residents in this area are expected to have a moderate visual sensitivity to the wind farm. The view towards the site across the sweeping rural landscape, also takes in the Highway and 132kV and 330kV powerlines that run between the road and the site. These views are from around 13 to 15 kilometres and from that distance, the site has low visibility. The views from the road are quite open but the wind farm will be difficult to perceive from a fast vehicle moving travelling at a 90 degree angle to the wind farm.

On balance, the visual impact from this area is low to moderate.

**Conclusion:** Low to moderate visual impact

### **Area 14: Wollogorang**

The landscape character of the area is typical of much of the surrounding farming landscape. As a modified farming landscape the landscape is mostly cleared with only scattered remnant vegetation. There are still large working properties in the area including "Greendale". Many of the views in the area take in the built elements such as the Hume Highway, Federal Highway and power infrastructure. As a highly modified environment, the contrast of the wind farm to the landscape is low to moderate, and could be accommodated without significantly impacting on the landscape character.

The views to the wind farm from the area vary from 6 kilometres to 15 kilometres. There is one known house with direct views to the site from around 11 kilometres, from where the visibility and dominance of the wind farm will be low. Other known views from houses to the site are screened by vegetation such as "Greendale". The road from Breadalbane heads directly towards the site for short time from where the site will be highly visible.

The residents in this area are expected to have a moderate visual sensitivity to the wind farm. On balance, the visual impact from this area is moderate.

**Conclusion:** Low to moderate visual impact

#### **Area 15: North of Breadalbane**

The landscape character in the area is a modified farming landscape. Although located adjacent to the more attractive scenery of Parkesbourne, the view from the two properties, "Yurrunga" and "Allenby", to the site is across heavily cleared farming land. The views to the south from this location also include built infrastructure such as power lines, the Hume Highway and the railway line. As such, the wind farms will be a reasonable contrast to the landscape character and could be absorbed by the landscape.

There are two properties, "Yurrunga" and "Allenby", located 10 kilometres from the site, with partially screened views to the site. From that distance, the visibility of the wind farm is low. These residents are expected to have a low to moderate visual sensitivity to the wind farm.

**Conclusion:** Low to moderate visual impact

#### **Area 16: Gurrundah**

The landscape character further north around Gurrundah is moderately attractive, as the views take in some of the more heavily wooded surrounding hills. The area remains, however, a farming landscape typical of the region. The introduction of a wind farm to a modified environment will present a contrast to the landscape, but this change could be accommodated without unduly impacting on the landscape character. The distance of the wind farm to the area also reduces the impact on the landscape.

The distance from the site of this area is 10 to 15 kilometres, and from that distance the site will have low visibility. While there are few houses that could see the site, but the wind farm will be difficult to perceive. Views from the road are rare and the site will be difficult to perceive from a moving vehicle. It is expected that the residents in the area will have a low sensitivity to the wind farm due to the limited views to the site.

On balance, the visual impact of the wind farm will be low.

**Conclusion:** Low visual impact.

### **Type F - Hills with light to moderate vegetation coverage**

#### **Area 17: Cullerin**

The landscape character of the area differs slightly from surrounding landscape as it has more variation in topography and more vegetation than many of the other areas. The area also has the historical interest of Old Sydney Road and a series of attractive rail bridges.

The area is modified farming landscape and is only moderately sensitive to changes in the landscape. The introduction of the wind farm will be a contrast to the existing environment. This change could be accommodated without significantly impacting on the landscape character due to the obvious modifications to the landscape, and views to modern built elements such as the Hume Highway, Cullerin Road, the railway and 132 kV transmission lines from some view points.

The wind farm will be very close to the surrounding residences and be highly visible. There are several residences such as "Wandella", "Faybri", "Springvale" and "Fairview" that have direct views to the site from their houses, although "Wandella", "Faybri" are looking along the wind farm and will not see the whole breadth of the wind farm. Some



turbines at the southern end of the site will be hidden from view. Residents in the area are expected to have a high visual sensitivity to the wind farm.

The wind farm will also be highly visible from some locations along the Cullerin and Lerida North Roads. On balance, the visual impact from this area will be moderate to high.

**Conclusion:** Moderate to high visual impact

See Photomontage (Photo 21) in Section 8

#### **Area 18: Lerida south**

This area has more a 'bush' visual character than many of the other areas around the site. Whilst it remains in parts a modified farming landscape, there is reasonable vegetation coverage across much of the area, and signs of regrowth on previously cleared land.

The area was used for primary production and there are clear signs of a modified environment. However, it is reasonably sensitive to change and the introduction of a wind farm will be a contrast to the landscape character, but this change could be accommodated without significantly impacting on the landscape character (as the landscape is modified and landscape character not at all unique in the broader region). Limited views of the wind farm also reduce the impact on landscape character.

The views from this area to the site vary from 8 to 15 kilometres. Most houses in the area are along the road between Collector and Gunning which is 9 to 12 kilometres from the site. From that distance, the site will have low to moderate visibility. Most views from houses are screened by vegetation. Residents are expected to have a moderate to high visual sensitivity to the wind farms.

There are occasional views through trees from the road but the wind farm will be difficult to perceive from a vehicle moving travelling at a 90 degree angle to the wind farm. On balance, the visual impact of the wind farm in this area is moderate.

**Conclusion:** Low to moderate visual impact

See Photomontage (Photo 22) in Section 8

#### **Area 19: North of the Mutmutbilli**

This area has considerably more remnant and road side vegetation than much of the region, and therefore the landscape character has more of a bush feel. Despite this, the land remains a predominantly a farming landscape. The introduction of a wind farm will be present an acceptable contrast to the landscape character.

There are only limited views of the site from this area. One property "Marsland South" has views from 10 kilometres but will see only a small number of turbines. From that distance the wind farm will be low to moderately visible. The visual sensitivity of residents in this location is considered to be moderate. No other properties in this area that have views of the wind farm are known.

There are occasional views through trees from the road but the wind farm will be difficult to perceive from a vehicle moving travelling at a 90 degree angle to the wind farm. In summary, the visual impact of a wind farm in this area is low to moderate.

**Conclusion:** Low to moderate visual impact

### **Type G - Ranges/hills with moderate to high vegetation coverage**

#### **Area 20: Cullerin Range North**

This area has a moderate scenic quality. The views along the range and across the rural landscape to the south can be panoramic, but much of the view takes in a modified farming landscape. The treed areas of the range provide some contrast in view.

This landscape is reasonably sensitive to change, but the surrounding landscape of modified farming areas means that the introduction of a built element of a wind farm will

be an acceptable contrast to the landscape. There are no houses in this area with clear views to the site.

**Conclusion:** Low to moderate visual impact

### **Area 21: Collector Hill**

There are no houses in this area with clear views to the site. The landscape character is of a well treed hill or ridgeline. The introduction of a wind farm approximately 12 to 15 kilometres from the hill will not significantly impact on the landscape character of the area.

**Conclusion:** Low visual impact

### **Area 22: Other Areas**

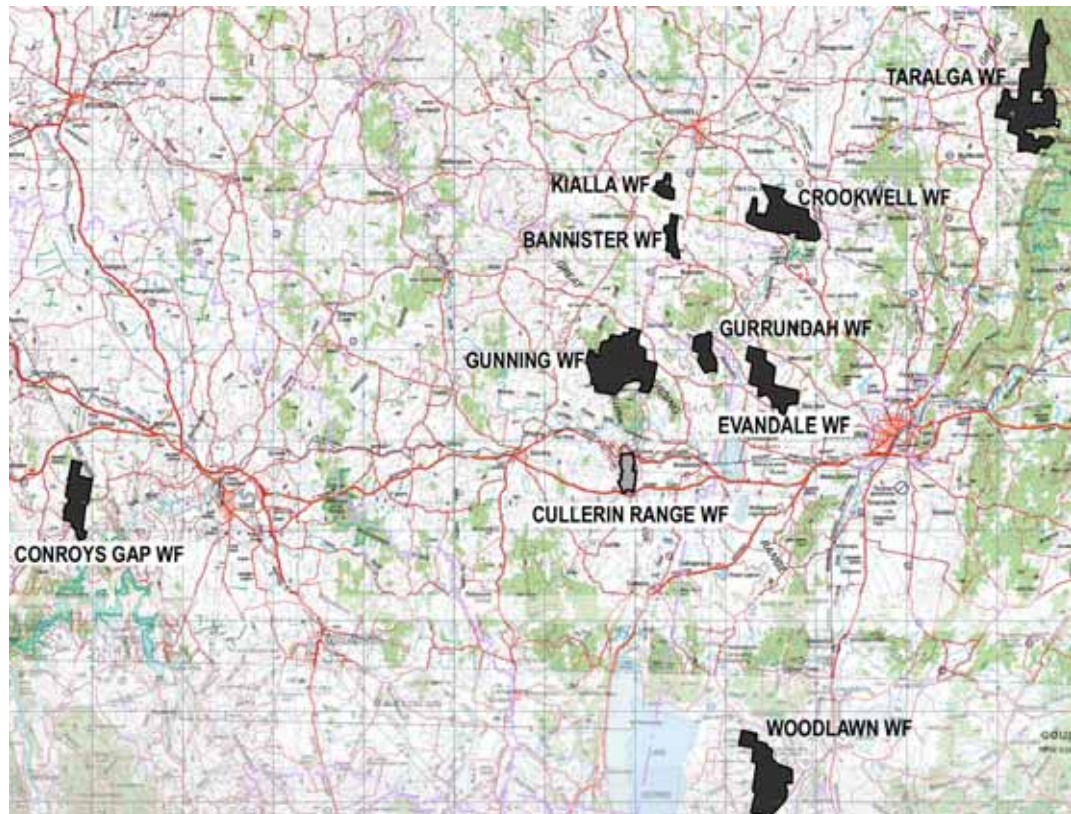
There are no known residences in this area with views to the site. A wind farm located 10 to 15 kilometres from the site will not significantly impact on the landscape character of the area.

**Conclusion:** Low visual impact

## **6.4 Cumulative Visual Impacts**

Cumulative visual impacts are assessed by reviewing the visual integrity and form of other built structures within the visual catchment of the proposed wind farm. Those structures with similar scale and dominance are identified as having a level of visual impact that together with the proposed wind farm will have a cumulative visual impact.

The development of wind farms in inland NSW has been predominantly along the Great Dividing Range. It is the Range that receives consistently higher winds and has the existing electrical infrastructure in place to allow economically viable development of wind farms in the area. Nearby wind farms are likely to provide the most significant additional visual impact.



**Figure 5** Location map of proposed and approved wind farms in NSW

The nearest wind farm to Cullerin Range is Crookwell, which is about 30 kilometres away. There may be some specific locations, for example around Mount Wayo to the North or around Parkesbourne that may be able to view both sites from a distance.

There is likely to be a growing number of wind farms in the area, with testing towers in several locations further north along the Cullerin Range. The known proposed wind farms in the area at the time of writing are as follows.

**Table 6: Proposed and approved wind farms in Goulburn, Crookwell and Yass areas of New South Wales**

Proponent	Location in NSW	No. of Turbines	New Power Lines to Connect to Grid
Delta Electricity (Operational)	Crookwell 1 Wind Farm, near Crookwell	8	Substation on site
Delta Electricity (DA Approved)	Gunning Wind Farm, near Gunning	32	14km, 132kV, aerial
WindEnergy JV (DA Approved)	Woodlawn Wind Farm, near Tarago	25	Not specified
Gamesa Energia (DA Approved)	Crookwell 2 Wind Farm, near Crookwell	50	Not specified
RES Southern Cross (DA Approved)	Taralga Wind Farm, near Taralga	50	Not specified, >30km high voltage
Taurus Energy (under development)	Evandale Wind Farm, near Goulburn	Up to 15	<10km aerial
Taurus Energy (under development)	Cullerin Range Wind Farm, near Gunning	Up to 15	Substation on site
Taurus Energy (under development)	Conroy's Gap Wind Farm, near Yass	Up to 15	<4km aerial
ACTEW Corporation (under development)	Spring Range Wind Farm, near Murrumbateman	Unknown	unknown
EHN (Oceania) (under development)	Molonglo Range Wind Farm, near Queanbeyan	Up to 60	3-10km, aerial
Marubeni Corporation (under investigation)	Kialla WF	These three sites have been under investigation since 2000, however no known activity is underway by Marubeni to currently develop these sites	
Marubeni Corporation (under investigation)	Bannister WF		
Marubeni Corporation (under investigation)	Gurrundah WF		

Of these, the Gunning Wind Farm, Crookwell 2, Woodlawn and Taralga wind farms have been approved. The Gunning Wind Farm is to be located on the Walwa property about 10 kilometres to the north of the Cullerin Range Wind Farm. There are a number of locations that will be able to view both wind farms from within 15 kilometres, including Breadalbane, higher spots in Cullerin Road, Gunning, some locations on Cullerin Road, north of Gunning along the road to Crookwell, and from the road between Breadalbane and Gurrundah.

The Crookwell 2 wind farm is approximately 40 kilometres from Cullerin and there should be no significant cumulative impact from this wind farm. Similarly, the Woodlawn wind farm is located 30 kilometres from the Cullerin site and there is a dividing range of hills between the Cullerin and Woodlawn sites, which will reduce the possibility of views to both sites. It is unlikely that there will be a cumulative visual impact of the Cullerin Range wind farm associated with the Woodlawn Wind Farm.

Of the unapproved wind farms, some residents around Breadalbane and Parkesbourne may see the Cullerin Range, Gurrundah and Evandale sites. The higher areas of Goulburn may also see the Evandale, Gurrundah and Cullerin wind farms.

However, having more wind farms in the area, they may become more acceptable, and in common feature in the landscape. In that sense it is likely that any given wind farm will

be less of a contrast to the environment, as people become less sensitive to their presence in the landscape.

There is considerable existing electrical infrastructure in the area, including the 332 kV transmission lines just to the south of Cullerin range. There is an additional power lines that runs over the site itself. The electrical infrastructure present in the region is not of the size and scale that will contribute significantly to the cumulative visual impact for the site.

The Hume Highway also presents a built form of similar scale as the wind farm. However, the Highway is a horizontal element, which will not create an additional cumulative visual impact.

## 6.5 Shadow Flicker

Shadow flicker is the pulsating shadow created by the turning blades. De Gryse notes that “shadow flickering associated with the rotation of the rotor blades has the potential to alter the viewed landscape, and to detract from the experience of people ...”. Shadow modelling for the Musselroe Wind Farm in Tasmania found that “most shadow impact is associated with 3-4 times the height of the object. While shadows may extend further than this, they become insignificant in their visual intrusion because of the reduced intensity of the shadow at such distances” (De Gryse 2000).

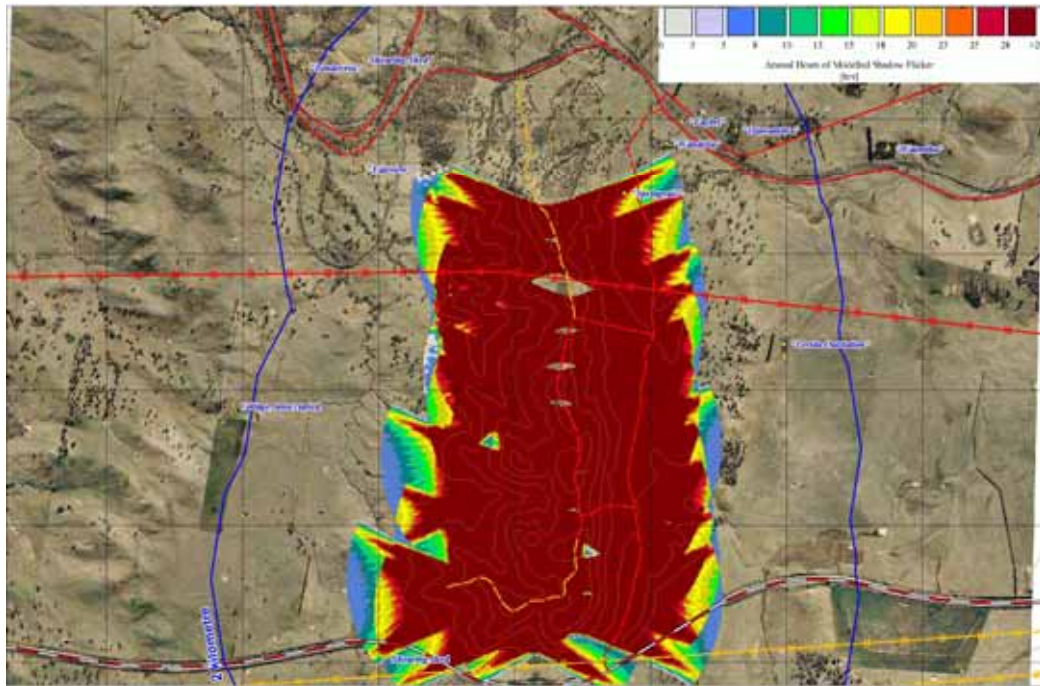


Figure 6 Shadow flicker analysis

The shadow flicker analysis for Cullerin Range Wind Farm was undertaken based on Layout Option B, which is likely to be the worst case scenario. The study found that there is one house “Springvale” impacted by shadow flicker. Shadow flicker is considered significant within 1 kilometre of a turbine. It is understood that Taurus Energy has committed to switching offending turbines off for the duration of shadow impacts on residences.

The Hume Highway is also impacted by shadow flicker. The effect on shadow on traffic has been evaluated in the Traffic Impact Study specialist report.

### 6.5.1 Glint

The movement of the blades can catch the light and produce glint as seen from surrounding areas. This blade glint is spasmodic, highly dependent on the angle of sun, angle and orientation of the blade, and the location of the viewer and is therefore not able

to be quantitatively assessed. The proposed paint to be used on the blades and tower of the turbines is expected to reduce blade glint. If blade glint is an issue for residents around the wind farm, it is understood that Taurus will discuss the installation of mitigation measures such as screening with affected residents.

## **6.6 Other Visual Impacts**

De Gryse (2000) notes:

“Infrastructure such as transmission lines can represent a significant alteration to the landscape character, particularly in bushland areas where the removal of vegetation and disturbance of soils can impose an artificial and permanent linear disturbance in the landscape and/or where they cross or are visible on the skyline.”

Consideration needs to be given to the potential visual impacts of associated infrastructure associated with the wind farm, other than the turbines, including electrical transmission lines, substation and control facilities and access road.

### **6.6.1 Electrical transmission lines**

The wind farm will use existing transmission lines that are located on and run over the top of the Cullerin Range. There should be little if any additional visual impact of electrical transmission lines as a result.

### **6.6.2 Substation and the control and facilities building**

There are two options for locating the substation. Taurus's preferred location for the substation is on top of Cullerin Range. There is potential that the substation will be visible from the surrounding landscape, and have a visual impact.

To ameliorate the views of the substation, it is suggested that the substation be located on the western side of the range to minimise the view from the east. The west side of the slope is more heavily treed and has more topographical variation, so that it could be more easily located to minimise visual impact.

Planted vegetation could be used to screen the substation which, if on the western side of the range could blend in with the existing vegetation cover. The substation could be coloured to reduce its visual impact.

The second option is to locate the substation along Cullerin Road as a joint facility with the proposed Gunning Wind Farm. From a visual perspective, this option is less preferable, as the substation will be viewed from close range from the Cullerin Road and there will be associated visual impact from the poles and power lines required to connect the turbines to the substation.

If this option was pursued, mitigation measures could be adopted such as planted vegetation and substation colour to reduce its visual impact.

### **6.6.3 Access road**

There is currently a road going up the east side of the Cullerin Range used to access the telecommunications tower on the range. It is understood that this road is too steep to be used to transport the turbines to the top of the hill.

Consequently, Taurus Energy proposes to use a short section (approximately 600 metres) of the eastern end of Old Sydney Road, and build a new access road to the south off Old Sydney Road to ascend the northern end of the Range.

From a visual perspective this proposal is acceptable. The tree cover in that area is quite heavy and views from the Cullerin Road are obscured. There are also no houses that will look directly onto the newly constructed access track.

Access to the base of the Old Sydney Road is proposed along Lerida North Road is possible, this will avoid heavy traffic going through Breadalbane or any other town, and minimise the visual impact of construction.

## **6.7 Recommendations**

### **Vegetation**

It is recommended that Taurus Energy:

- Avoid locating turbines in areas of native vegetation, and minimise the removal of native vegetation for turbine bases and access roads.

Localised landscape treatment can assist greatly in reducing the visual impact of the wind farms from specific view points, particularly around houses. Placing vegetation carefully can allow key views out from a home while screening other less desirable views. For example, some homes along Cullerin Range Road could retain the key view shed to the south but screen views to the wind farm. In most cases visual screens could become effective within 3 to 5 years.

It is recommended that Taurus Energy:

- Make provision for landscaping material to landholders to screen views of the wind farm from houses or outdoor entertaining areas around the site.

### **Tower colour**

The turbine towers will be predominantly viewed from below as the ridge is significantly higher than the surrounding land. This means that it is relatively easy to select colours that reduce the visual impact of the towers as much as possible.

It is recommended that Taurus Energy:

- Colour towers light off white/light grey to help reduce visual impact of the towers.

### **Access Road**

It is recommended that Taurus Energy:

- Minimise the visibility of traffic movement when installing towers, including minimising traffic through Breadalbane and other highly populated areas.

### **Substation**

It is recommended that Taurus Energy:

- If possible locate the substation on the western side of Cullerin Range, if possible in a gully or near a well treed area to minimise the visual impact of the substation;
- Use planting around the substation to screen the substation from the surrounding landscape. Planting should use species of the surrounding vegetation community; and
- Colour structure grey to blend into the surrounding landscape and surrounding vegetation.

# 7 Conclusion

The visual assessment involves an evaluation of potential visual impacts and is assessed by the degree of change in the landscape as a consequence of the introduction of the wind farm. The assessment determines the visual contrast of the wind towers, powerlines, and other associated infrastructure to the surrounding landscape.

The assessment of the contrast of the wind farm to the existing landscape character types found that there were no areas where the wind farm would create an unacceptable contrast to the landscape. There are many built elements in the landscape, including prominent electrical infrastructure, telecommunications infrastructure and the Hume Highway, which lessens the impact of a modern element such as a wind farm. Further the landscape has been substantially changed by years of farming practices and these changes are clearly evident.

In relation to the visual impact on users in the area, a summary table below outlines the level of visual impact from various view points and areas surrounding the proposal.

**Table 7: Summary of Visual Impacts**

Viewpoint/ Area	Level of Visual Impact	Contributing Factors
<b>Type A - Country Towns and Rural Residential Communities</b>		
<b>Area 1: Gunning</b>	Low visual impact	<ul style="list-style-type: none"> <li>Gunning sits low in the landscape so the wind farm will not be a significant visual feature for most in the town</li> <li>The visibility of the turbines will be low</li> <li>The wind farm is unlikely to adversely affect the visual character of the town</li> </ul>
<b>Area 2: Collector</b>	Low visual impact	<ul style="list-style-type: none"> <li>There are only a few vantage points within the town that have views to the site and the wind farm will not be a dominant visual feature from the town</li> <li>The Federal Highway adds an existing strong built form to the character of the town</li> <li>The wind farm is unlikely to significantly impact the visual character of the town</li> </ul>
<b>Area 3: Breadalbane</b>	Moderate visual impact	<ul style="list-style-type: none"> <li>The wind farm will be seen from several vantage points within the town</li> <li>Breadalbane is the closest of the towns to the wind farm at 8 to 9 kilometres</li> <li>The wind farm is unlikely to significantly impact the visual character of the town</li> </ul>
<b>Area 4: Parkesbourne</b>	Low visual impact	<ul style="list-style-type: none"> <li>Parkesbourne is an attractive area with several rural residential properties.</li> <li>Views are generally contained within Parkesbourne, so the wind farm will not be a major visual feature</li> <li>The view to the wind farm is across a modified farming landscape common in the region</li> </ul>
<b>Type B – Transport Corridors</b>		
<b>Area 5: Hume Highway</b>	Low to moderate visual impact	<ul style="list-style-type: none"> <li>The view from the Hume Highway is as close as 500 metres to the turbines.</li> <li>The average traveller will have a low sensitivity to the surrounding landscape</li> <li>The view predominantly from the highway is the highway itself and the modified farming landscape</li> <li>The wind farm is unlikely to significantly impact the landscape character of the highway</li> </ul>

<b>Area 6: Sydney to Melbourne Railway</b>	Low to moderate visual impact	<ul style="list-style-type: none"> <li>Views from the railway are clear and from as close as 1 kilometre</li> <li>Passengers are not likely to have any connection with the landscape and therefore a low to moderate sensitivity</li> <li>The wind farm is unlikely to unduly and significantly impact the surrounding landscape character viewed from the rail line</li> </ul>
<b>Area 7: Federal Highway</b>	Low visual impact	<ul style="list-style-type: none"> <li>The highway passes well to the south of the site</li> <li>Views are only intermittent and at 90 degrees to the direction of the road</li> <li>The view predominantly is along the road corridor with intermittent views of the surrounding farming land</li> <li>The wind farm is unlikely to significantly impact the landscape character of the highway</li> </ul>
<b>Type C – Nature Reserves/Wetlands</b>		
<b>Area 8: Wet Lagoon</b>	Moderate to high visual impact	<ul style="list-style-type: none"> <li>Wet Lagoon is close to the site</li> <li>It is a unique landscape in the area and sensitive to changes in the landscape</li> <li>The landscape character will be impacted by the wind farm, but the change will not unduly impact on the landscape character of the area</li> </ul>
<b>Type D – Plains</b>		
<b>Area 9: Mutmutbilli</b>	Moderate to high visual impact	<ul style="list-style-type: none"> <li>The landscape is a modified farming landscape and is not overly sensitive to change</li> <li>There are clear views to the site from some houses in the area</li> <li>These prominent views result in a moderate to high visual impact</li> </ul>
<b>Area 10: Collector Creek</b>	Moderate to high visual impact from house close to the site Low to moderate visual impact from other areas	<ul style="list-style-type: none"> <li>The landscape is a modified farming landscape and is not overly sensitive to change</li> <li>There are clear views to the wind farm from some houses in the area</li> <li>The landscape character will be impacted by the wind farm, but the change will not unduly impact on the landscape character of the area</li> </ul>
<b>Area 11: Breadalbane Plains</b>	Low visual impact	<ul style="list-style-type: none"> <li>There are limited views to the site from this location</li> </ul>
<b>Type E – Rolling Hills with Sparse Vegetation Cover</b>		
<b>Area 12: West of Cullerin Range</b>	Moderate to high visual impact for residences with views to the site within 10 kilometres. Low to moderate visual impact for other areas	<ul style="list-style-type: none"> <li>The landscape is a modified farming landscape and is not overly sensitive to change</li> <li>The landscape character will be impacted by the wind farm, but the change will not unduly impact on the landscape character of the area</li> <li>The greatest visual impact will be on properties with clear views to the wind farm from Cullerin Road</li> <li>The wind farm will have little visual impact on views from the west and north</li> </ul>
<b>Area 13: South of Gunning/ Lerida</b>	Low to moderate visual impact	<ul style="list-style-type: none"> <li>The landscape is a modified farming landscape and is not overly sensitive to change</li> <li>The landscape character will be impacted by the wind farm, but the change will not unduly impact on the landscape character of the area</li> <li>There are clear views to the site from some houses in the area, but these houses tend to be further away from the site</li> <li>Houses closer to the wind farm tend to be screened from the wind farm</li> </ul>



<b>Area 14: Wollogorang</b>	Low to moderate visual impact	<ul style="list-style-type: none"> <li>• Very few houses are located in this area</li> <li>• There is one house with direct views from around 11 kilometres</li> <li>• The landscape is a modified farming landscape</li> <li>• The landscape will be able to absorb the visual impact of the wind farm</li> </ul>
<b>Area 15: North of Breadalbane</b>	Low to moderate visual impact	<ul style="list-style-type: none"> <li>• There are two properties with partially screened views to the site from 10 kilometres</li> <li>• The landscape is a modified farming landscape</li> <li>• The landscape will be able to absorb the visual impact of the wind farm</li> </ul>
<b>Area 16: Gurrundah</b>	Low visual impact	<ul style="list-style-type: none"> <li>• There are limited views to the site from this location</li> </ul>
<b>Type F - Hills with light to moderate vegetation coverage</b>		
<b>Area 17: Cullerin</b>	Moderate to high visual impact	<ul style="list-style-type: none"> <li>• There are a number of properties close to the site in this area</li> <li>• Some have open views to the site with a high visual impact, others are surrounded by trees and are well screened from the site</li> <li>• Although quite well treed, it is a production landscape</li> <li>• The landscape character will be impacted by the wind farm, but the change will not unduly impact on the landscape character of the area</li> </ul>
<b>Area 18: Lerida South</b>	Low to moderate visual impact	<ul style="list-style-type: none"> <li>• The landscape is reasonably well treed but shows signs of past and current farming practices</li> <li>• The landscape character will be impacted by the wind farm, but the change will not unduly impact on the landscape character of the area</li> <li>• There are limited views from houses and the road to the wind farm, with most views screened by vegetation</li> </ul>
<b>Area 19: North of Mutmutbilli</b>	Low to moderate visual impact	<ul style="list-style-type: none"> <li>• There are limited views to the site from this location</li> <li>• One house has direct views from 10 kilometres</li> <li>• These views are end on so few turbines will be in view</li> </ul>
<b>Type G - Ranges/hills with moderate to high vegetation coverage</b>		
<b>Area 20: Cullerin Range North</b>	Low to moderate visual impact	<ul style="list-style-type: none"> <li>• There are limited views to the site from this location</li> </ul>
<b>Area 21: Collector Hill</b>	Low visual impact	<ul style="list-style-type: none"> <li>• There are limited views to the site from this location</li> </ul>
<b>Area 22: Other Areas</b>	Low visual impact	<ul style="list-style-type: none"> <li>• There are limited views to the site from this location</li> </ul>

The greatest visual impact will be on users around the site where there are views to the turbines from close range, including from Wet Lagoon, the plains around Mutmutbilli, houses close to the site on the west of the Cullerin Range, and three properties adjacent to the Collector River to the south-east of the site.

Due to the nature of the site, little can be done to minimise the visual impact on these areas with regard to turbine siting, as there is limited opportunities to relocate turbines on the relatively small area of land along this section of Cullerin Range. Vegetation around existing properties can be very effective in screening views to the site, and providing assistance to landholders to do likewise might be an approach worth undertaking.

The reality of wind farms is that structures of this size are highly visible due to their placement in highly visible locations. To place the turbine in any other location means

that the wind turbines will not function economically. This is not always a negative impact though, as some find the visual aesthetic of wind farms appealing.

As David Suzuki (2005) notes:

“With the growing urgency of climate change, we cannot have it both ways. We cannot shout from the rooftops about the dangers of global warming and then turn around and shout even louder about the “dangers” of windmills. Climate change is one of the greatest challenges humanity will face this century. It cannot be solved through good intentions.”

Balancing the local visual concerns of the community and the global benefits of clean energy production can be difficult. The more positive aspects of the development of a clean energy source and the positive visual landmark that wind farms can provide should not be overlooked.

## 8 Photomontages

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The following photomontages have been taken from 11 sites around the wind farm. The turbine layout on which these photomontages are based are Layout Option B, which is expected to have the greatest visual impact.



Photo 12: Photomontage from Gunning



Photo 13: Photomontage from Collector



Photo 14: Photomontage from the Hume Highway, approximately 8 kilometres east of the site



Photo 15: Photomontage from the Hume Highway, approximately 6 kilometres west of the site



Photo 16: Photomontage from Wet Lagoon



**Photo 17: Photomontage from north of "Sweetwood Lea"**



**Photo 18: Photomontage from the road between Collector and Breadalbane**



**Photo 19: Photomontage from Cullerin Road 4 kms west of the site**



Photo 20: Photomontage from Cullerin Road 8kms west of the site



Photo 21: Photomontage from Cullerin Road near "Illawambra"



Photo 22: Photomontage from road between Collector and Gunning

## 8.1 Photomontage Comparisons

These six photomontages are from 3 locations around the site and are used to compare the visual impact of the two turbine layout options.



Photo 23: Photomontage comparison from Cullerin Road – Layout Option A



Photo 24: Photomontage comparison from Cullerin Road – Layout Option B



Photo 25: Photomontage comparison from north of "Sweetwood Lea" – Layout Option A



Photo 26: Photomontage comparison from north of "Sweetwood Lea" – Layout Option B





**Photo 27: Photomontage comparison from Hume Highway, approximately 6 kilometres west of the site – Layout Option A**



**Photo 28: Photomontage comparison from Hume Highway, approximately 6 kilometres west of the site – Layout Option B**

# 9 Authors

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This report was co-written by Philip Hutchinson and Kate Waldren. The report was reviewed by Jerry De Gryse, who was able to provide valuable input on methodology and technical aspects relating to wind farm visual impact,

Kate Waldren

*Bachelor of Landscape Architecture, University of Canberra & University of Guelph Canada;*

*Graduate Diploma in Environmental Management and Restoration, Charles Sturt University, Bathurst*

Kate is a Director of Scenic Landscape Architecture. Kate Waldren has over nine years of experience in a wide range of landscape architecture, environmental and recreational planning projects and visual assessments. She has completed many Visual Assessments ranging from the assessment of major arterial roads within the ACT and Canberra through to developments within natural areas and national parks.

Kate has developed an inventory procedure to assess the visual impact by identifying existing landform, vegetation, built structures, colour and landscape character. This enables an objective approach to visual assessment by determining the level of contrast between the development and surrounding landscape.

Philip Hutchinson

*Masters of Landscape Architecture, University of Canberra;*

*Graduate Diploma of Resource Management and the Environment, Australian National University;*

*Bachelor of Science University of Tasmania*

Philip is based in Canberra and has been working as a landscape architect since 2004. He has a Masters of Landscape Architecture from the University of Canberra, and has undertaken a range of planning and design projects. Previous visual impact assessments include the visual assessment of a proposed large retardation basin located in Canberra.

Prior to that, Philip worked in environmental policy and environmental program management in the Department of Environment and Heritage.

Jerry de Gryse

*Bachelor of Science (Natural Resources), University of Michigan 1974;*

*Bachelor of Landscape Architecture (with Distinction), University of Minnesota 1979;*

*Masters of Environmental Studies, University of Melbourne 1985*

Jerry grew up and did his professional training in the United States migrating to Tasmania in 1984.

Since then he has worked on approximately 150 projects across the profession of landscape architecture doing landscape design, land management, environmental planning, environmental impact assessment and most recently interpretation - working at scales from "square kilometres to square metres".

Jerry has been a guest lecturer at a number of overseas and Australian universities. In 2001 he was the HWS Cleveland Visiting Professor of Landscape Architecture at the University of Minnesota. In 1999, Jerry was named by his Australian peers as one of the most influential landscape architects of the 1990s.

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