



# Preliminary Visual Impact Assessment Barneys Reef Wind Farm

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BR15: Blue Springs Road

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### **1.0** Introduction

### **1.1 Introduction**

Moir Landscape Architecture have been commissioned by RES to prepare a Preliminary Visual Impact Assessment (PVIA) for the proposed Barneys Reef Wind Farm (the Project).

The Project is State Significant Development (SSD) and requires consent under Division 4.7 of Part 4 of the Environmental Planning & Assessment Act 1979 (EP&A Act). This PVIA is to be submitted in conjunction with the Scoping Report to the Secretary of the Department of Planning, Industry & Environment (DPIE) in support of the development application for the Project.

The Scoping Report will support the Secretary in issuing the Secretary's Environmental Assessment Requirements (SEARs) that will guide the Environmental Impact Statement (EIS) as part of the development application for the Project.

### 1.2 Relevant Experience

The Bulletin states the proponent is expected to engage professionals from relevant natural resource management and design professions (for example environmental planners, geographers, landscape architects, or other visual resource specialists), with demonstrated experience and capabilities in visual assessment to carry out a wind energy project visual assessment.

Moir Landscape Architecture Pty Ltd is a professional design practice and consultancy specialising in the areas of Landscape Architecture, Landscape Planning and Landscape and Visual Impact. Our team has extensive experience in undertaking Landscape and Visual Impact Assessments for wind energy projects. In the context of our experience and with guidance from the Visual Assessment Bulletin we have developed methodologies to ensure a comprehensive and qualitative assessment of the Project.

Relevant experience includes the preparation of Landscape and Visual Impact Assessments for the following Wind Energy Projects:

- Crudine Ridge Wind Farm (Crudine, New South Wales) •
- Bodangora Wind Farm (Bodangora, New South Wales) •
- Capital II Wind Farm (Bungendore, New South Wales)
- Uungula Wind Farm (Wellington, New South Wales) •
- Lord Howe Island Wind Turbines (Lord Howe Island, New South Wales) .
- Hills of Gold Wind Farm (Nundle, New South Wales)

### **1.0** Introduction

### 1.3 Overview of Preliminary Visual Impact Assessment

The purpose of this Preliminary Visual Impact Assessment (PVIA) is to provide a preliminary assessment of the potential visual impacts of the Project and has been prepared in accordance with the Wind Energy: Visual Assessment Bulletin December 2016.

The visual assessment process is broken into two main stages (see **Figure 1**):

Phase 1: Preliminary Environmental Assessment and Phase 2: EIS

This PVIA forms apart of Phase 1: Preliminary Environmental Assessment to be submitted to DPIE together with the Scoping Report for the request for SEARs.

The requirements of Stage 1: Preliminary Environmental Assessment are as follows:

At the Preliminary Environmental Assessment stage, a process consisting of community consultation regarding key landscape values and application of preliminary assessment tools has been developed. The tools include consideration of the potential impact of the proposals on dwellings and key public viewpoints.

The preliminary assessment tools have been designed to assist proponents to drive better outcomes. They will assist in identifying early in the process the locations where wind turbines may have impacts that warrant further consideration. This in turn provides an opportunity to refine the proposed wind turbine layout to avoid or minimise impacts, or justify the proposed design prior to lodgement of the application.

Proponents will be required to submit, with the request for SEARs, a Preliminary Environmental Assessment that includes a map with key information, results of community consultation and the application of the preliminary assessment tools. This will form the basis for the issue of the SEARs that will identify the matters that must be addressed in the EIS.



Figure 1 Steps in Visual Assessment Process (Source: Wind Energy Visual Assessment Bulletin, 2016)

 Undertake community consultation on likely areas of development and establish key landscape features, areas of scenic quality and key viewpoints valued by the community

Undertake an evaluation of the project against the Visual Performance Objectives

DPE undertakes a thorough assessment of the visual impacts of the wind energy project

The consent authority will consider whether conditions of consent should be imposed

• If the project is approved, DPE is responsible for ensuring that the approved project is

### 2.0 Study Method

### 2.1 Study Method

The following has been undertaken to develop the PVIA:

#### **Desktop Assessment:**

- Application of Preliminary Assessment Tools to determine receptors with potential sensitivity.
- Preparation of a preliminary Zone of Visual Influence (ZVI) to establish a theoretical zone of visibility of the Project.
- Identification of key viewpoints and landscape features using available mapping and background documents.

#### Site Inspection:

Photographic survey work for the assessment was undertaken in March and May of 2021 to carry out a preliminary assessment of the existing landscape character from publicly accessible land within the Study Area (as defined in Section 3.3). The findings of the site inspection have been included in the PVIA and will form the basis for discussion with the community in the EIS Phase of the Project.

#### **Community Consultation:**

Community consultation has been undertaken through the scoping phase of the Project. Results of the community consultation documented in previous studies have also been utilised to gain perspective on the landscape values held by the community to inform the PVIA.

Community consultation will be continued through the EIS phase of the Project.

### 2.2 Report Structure

The following table provides an overview of the requirements of the Bulletin and where these have been addressed in the PVIA:

#### Preliminary Visual Impact Assessment Report St

#### **Bulletin Requirements:**

- Undertake community consultation to establish key landscape features valued by the community, key viewpoints in the area (both publi private) along with information about the relative scenic quality of the
- Production of a map detailing key landscape features (informed community consultation and any ground-truthing undertaken preliminary wind turbine layout, the location of dwellings and key viewpoints, and an overlay of the wind resource.
- Results of the preliminary assessment tools for both the visual mag and multiple wind turbine parameters.
- The use of Geographic Information Systems (GIS) to facilita application of the tools will streamline the evaluation phase of a during the pre-lodgement stage. Most GIS systems can establish theoretical 'zone of visual influence' of the proposal (the area from the proposal is theoretically visible or the 'visual catchment').

Summary and Recommendations - Section 8.0

Table 1 Overview of Report Structure

uctu	'e:
	Addressed in report:
atures ic and e area.	Refer to Section 4.0: Community Consultation
ed by ), the public	Refer to Section 5.0 : Existing Landscape Character
nitude	Refer to Section 6.0: Preliminary Assessment Tools
	Appendix A & B Preliminary Dwelling and Viewpoint Assessments
te the project sh the which	Refer to Section 7.0: Preliminary Zone of Visual Influence

### **3.0** Project Overview

### 3.1 Regional Context

The proposed Barney's Reef Wind Farm (Project Area) is located approximately 16 kilometres (km) north of Gulgong and approximately 40 Km north of Mudgee and 80 km east of Dubbo. Accessed via the Castlereagh Highway, the Project Area is within the Mid-Western Region of New South Wales (NSW), (refer to Figure 2).

The Project Area is located within the Central West Orana Renewable Energy Zone (REZ) identified in the NSW Governments Electricity Strategy (refer to Section 2.1.3). The REZ is expected to play a vital role in delivery of affordable energy to the community across NSW. The Project is therefore strategically located in a broad area identified as suitable for renewable energy project.

The Mid-Western Region has been identified as having high wind renewable energy resource potential. Preliminary wind studies undertaken by the Proponent have guided the development of the preliminary turbine layout for the Project. The Project Area was selected as it is located within the Central West Orana REZ, is within close proximity to other renewable energy projects and the proposed Central West Orana REZ Transmission Corridor crosses the north of the Project Area.

Land within and surrounding the Project Area has been subject to extensive vegetation clearing associated with historic agricultural land uses and is predominately utilised for grazing activities, with some cropping, horticulture, forestry and areas of nature conservation. Land use surrounding the Project Area is predominately agriculture, used primarily for grazing. The key industries in the region include coal mining, agriculture, tourism, retail trade, forestry, fishing and manufacturing (NSW Government, 2018).



Figure 2 The Project Area - Regional Context

### **3.0** Project Overview

### 3.2 The Project Area

The Project Area encompasses 14 freehold properties and 4 parcels of Crown Land, covering approximately 7,825 hectares (ha) as presented in Figure 3. These properties are primarily utilised for cropping, and sheep and cattle grazing activities. The preliminary layout for the Project (refer to Figure 4) will be subject to further review and refinement as the environmental and social impact assessment progresses.

### 3.3 The Study Area

Referred to in this report, the Study Area is generally defined as the Project Area and surrounding land which requires assessment. The Study Area is generally defined as the land up to 8,000 m from the nearest turbine, however does extend beyond to include Dunedoo and Gulgong as shown in Figure 3.



Figure 3 Birds Eye View - Study Area (Source: Google Earth)

### 3.4 The Project

The Project includes the construction and operation of approximately 63 wind turbines and associated infrastructure. Associated infrastructure includes operation and maintenance buildings, battery storage, internal access roads, civil works and electrical infrastructure (including two substations) required to connect to the existing electricity transmission network.

RES is also proposing the Tallawang Solar Farm and battery storage immediately south of the Project Area (refer to Figure 4). The Tallawang Solar Farm and battery storage is subject to a separate development application process. However the Barneys Reef and Tallawang Project Areas overlap, with a proposed transmission line and substation for the Tallawang project falling within the Barneys Reef Project Area. This infrastructure will be subject to the assessment process for the Tallawang Solar Farm and does not form part of the Project.

The wind farm will have a capacity of approximately 441 megawatts (MW), with the potential to power ~265,000 homes. The new substation location is proposed to be construction on the north west area of the Project Area and the point of connection into the grid is expected to be via the proposed Central West Orana REZ Transmission Corridor.

The preliminary layout for the Project (refer to Figure 4) has been prepared to locate the turbines within areas identified as having high wind resources and low ecological and archaeological constraints. Figure 4 also includes the locations of involved and non-involved dwellings mapped from aerial photographs. These locations are subject to further groundtruthing.

The key components of the Project include:

- approximately 63 (3 blade steel) wind turbines with a total height (tip height) of approximately 280 m - electrical connections between the proposed wind turbines consisting of a combination of underground

cables and overhead powerlines

- two new substations and transmission connections to connect the proposed turbines to the network other associated infrastructure including internal access roads and tracks, operation and maintenance - buildings and construction facilities (all facilities subject to further detailed design) - temporary on-site concrete batching plant during the construction phase

- Battery Storage

- Targeted road network upgrades to facilitate delivery of wind turbine components to the site as required.

The proposed infrastructure would be contained within the Project Area including all turbine blades. The proposed layout will allow for micro-siting and will be subject to further detailed design as the environmental and social impact assessments progress.

### 3.0 Project Overview



### Preliminary Project Layout Proposed Barneys Reef Wind Farm

Proposed 280 m Turbine Location

### 4.0 Community Consultation

### 4.1 Overview of Community Consultation Process

In accordance with the Visual Assessment Bulletin: community consultation at this early stage may be broad, but should include discussions about the proposed project area, likely corridors of development, or preliminary turbine layouts and must involve people from the visual catchment.

The purpose of community consultation is to:

- Establish key landscape features
- Defined areas of scenic guality and
- Identify key public viewpoints valued by that community.

Community engagement will continue through the EIS Phase and provide the community with further opportunities to provide input into the Visual Baseline Study of the LVIA.

### 4.2 Results of Community Consultation

Understanding of the community perception towards the proposed development is an intrinsic component of the Landscape and Visual Impact Assessment process. A CSIRO study published in 2012: Exploring community acceptance of rural wind farms in Australia provides a snapshot of community acceptance levels regarding Australian wind farms from a variety of stakeholder perspectives. It found levels of acceptance among the public are highly subjective and can differ depending on location, local context and place attachment.

In accordance with the Bulletin, ongoing community consultation has been undertaken by RES through face to face meetings and a questionnaire provided to both involved and non-involved landholders located within the vicinity of the Project Area. As of May 2021, a total of 30 questionnaires had been completed, the results of which have been outlined in the following section.

The likely visual changes to the landscape were identified as a concern by 12 people during the community consultation. During consultation with the Warrumbungle Shire Council it was noted that the Project would be visible for some residents within the LGA, however Council did not express particular concerns in relation to visual amenity. An increase of built infrastructure and associated changes to the rural character of the landscape was described as a concern by some respondents due to their lifestyle choices being affected. This was raised particularly if the Project could impact upon natural features of the landscape that are of high community value, or upon people's continued ability to access these areas.

#### 4.2.1 Landscape Features and Values

In addition to a review of existing landscape maps and detailed field work undertaken by Moir LA (see Section 5.0) the community consultation questionnaire asked respondents to identify key landscape features of importance to them. There were six (6) responses (from the 30 completed questionnaires) to the question: 'What are the key landscape features of importance to you in the area? Which of these features do you value most highly?'. The following landscape features were identified by the community:

- Native vegetation
- Grazing. Bushland, rivers/creeks, vegetation, townships
- Productive farming land •
- Grassy Box Woodlands •
- **Travelling Stock Routes**
- Adams Lead Reserve (Mudgee District Environment Group run reserve) ٠
- Aboriginal site, where local kids swim in the waterhole.
- Ridgeline (at the top of a private property). ۲

#### 4.2.2 Key Public Viewpoints

Key viewpoints identified by the community for further assessment include:

Flirtation Hill, Gulgong ٠

Where possible, these features and viewpoints have been mapped in Section 5.0 of this PVIA. Additional consultation and further detailed assessment of these features and viewpoints will be undertaken during the EIS phase.

Goulburn River National Park -- one of the places of greatest community value and is a sacred

### 5.1 Overview of Bioregion

The Project Area sits within the NSW South Western Slopes Bioregion (see Figure 5), considered as part of the Upper Slopes Sub Region. The South Western Slopes Bio region is characterised by foothills and isolated ranges comprising the lower inland slopes associated with the Great Dividing Range. It extends from north of Cowra through southern NSW into western Victoria. The Upper Slopes sub region in particular is characterised by steep, hilly and undulating ranges and Granite basins and confined river valleys with terrace remnants. The South Western Slopes Bioregion is unique for its diversity of geology, geomorphology and biota which includes well-developed karst landscapes and rich fossil assemblages (Environment NSW, 2016)

Images 1 - 3 illustrate the typical character of the landscape within the Study Area, which is consistent with the character of the NSW South Western Slopes Bioregion.





Figure 5 Bioregions of New South Wales (Source: NPWS)







Image 1 Views across the Study Area



Image 3 Roadside vegetation and cleared grazing land typical of the Study Area.

### 5.2 Land Use Zoning

The Project Area is located within the Mid-Western Regional Council.

The following provides an overview of the main land use zoning within the Study Area and its immediate surrounds (Figure 6).

- **RU1 Primary Production**
- **RU3 Forestry**
- E1 Natural Parks and Nature Reserves
- E3 Environmental Management
- **SP2** Infrastructure
- **B2 Local Centre**
- **R1 General Residential**
- **R2 Low Density Residential**
- **R5 Large Lot Residential**

#### **RU1** Primary Production

The Project Area and surrounding land is predominantly zoned RU1 - Primary Production. The LEP Mid-Western Regional Council state the following objective of the RU1 zoning relevant to the visual impact assessment:

- To maintain the visual amenity and landscape guality of Mid-Western Regional by preserving the area's open rural landscapes and environmental and cultural heritage values.
- To promote the unique rural character of Mid-Western Regional and facilitate a variety of tourist land uses.

#### **RU3 - Forestrv**

Tuckland State Forest is located approximately 10km west of the Project Area, within the Warrumbungle LGA. It is zoned RU3 Forestry and the objectives of this land use is to enable development for forestry purposes and other development that is compatible with forestry land uses.

#### E1 Natural Parks and Nature Reserves

Goodiman State Conservation Area is located within 8km to the west of the Project Site. According to the Goodiman State Conservation Area POM, the area is classed as Zone 3 Community land and is: 'reserved as state conservation areas under the NPW Act to protect and conserve areas that:

contain significant or representative ecosystems, landforms or natural phenomena or places of • cultural significance

are capable of providing opportunities for sustainable visitor or tourist use and enjoyment, the sustainable use of buildings and structures, or research are capable of providing opportunities for uses permitted under other provisions of the NPW Act.

Under the NPW Act (section 30G) state conservation areas are managed to: conserve biodiversity, maintain ecosystem functions, protect natural phenomena and maintain

- natural landscapes
- conserve places, objects and features of cultural value
- provide for the undertaking of uses permitted under other provisions of the NPW Act (including uses permitted under section 47J such as mineral exploration and mining), having regard to the conservation of the natural and cultural values of the state conservation area
- provide for sustainable visitor or tourist use and enjoyment that is compatible with conservation of the area's natural and cultural values and with uses permitted in the area
- provide for sustainable use (including adaptive reuse) of any buildings or structures or modified natural areas having regard to conservation of the area's natural and cultural values and with other uses permitted in the area
- provide for appropriate research and monitoring.'

Yarrobil National Park is located approximately 9.5km to the west of the Project Area.

Zone 1 community conservation areas are reserved as national parks under the NPW Act to protect and conserve areas containing outstanding or representative ecosystems, natural or cultural features or landscapes or phenomena that provide opportunities for public appreciation, inspiration and sustainable visitor or tourist use and enjoyment. Under the NPW Act (section 30E) national parks are managed to:

- conserve biodiversity, maintain ecosystem functions, protect geological and geomorphological features and natural phenomena and maintain natural landscapes conserve places, objects, features and landscapes of cultural value • protect the ecological integrity of one or more ecosystems for present and future generations promote public appreciation and understanding of the park's natural and cultural values provide for sustainable visitor or tourist use and enjoyment that is compatible with conservation of

- natural and cultural values
- provide for sustainable use (including adaptive reuse) of any buildings or structures or modified natural areas having regard to conservation of natural and cultural values
- provide for appropriate research and monitoring.

These areas are classed as E1 - Natural Parks and Nature Reserves.

#### E3 - Environmental Management

The areas associated with the large remnant vegetation and isolated Ridgelines adjoining the Project Area have been classified as E3 - Environmental Management.

The objectives of this land use within the Mid-Western Regional Council LEP applicable to the visual impact assessment are as follows:

- To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values.
- To provide for a limited range of development that does not have an adverse effect on those values.

#### SP2 - Infrastructure

Land associated with the railway stations is generally zoned SP2. There are no applicable objectives as part of this land use typology.

#### **B2 - Local Centre**

The central areas of Gulgong and Dunedoo are classified at B2 - Local Centre. There are currently no objectives that relate to Visual Impact.

#### **R1-** General Residential

Areas zoned R1 surround the local centre core in both Gulgong and Dunedoo. There are no objectives relavent to Visual Impact.

#### R2 - Low Density Residential

Areas zoned R2 are scattered nearby R1 zoned areas within Gulgong. There are no objectives relevant to Visual Impact.

#### **R5 - Large Lot Residential**

Areas zoned R5 - Large Lot Residential is scattered throughout the landscape, in particular, areas to the north of Gulgong. The following objective of R5 zoning is relevant to the visual impact assessment:

' To provide residential housing in a rural setting while preserving, and minimising impacts on, environmentally sensitive locations and scenic quality'



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### Land Use

- RU1 Primary Production
- RU3 Forestry
- E1 Natural Parks and Nature Reserves
- E3 Environmental Management
- SP2 Infrastructure
- B2 Local Centre
- R1- General Residential
- R2 Low Density Residential
- R5 Large Lot Residential
- **RE1-** Public Recreation
- WTG locations
- Site Boundary

### 5.3 Key Landscape Features & Viewpoints

The Bulletin states proponents must identify key landscape features, dwelling locations and key public viewpoints. The following section provides an overview of the key features identified. Refer to Figure 7.

#### **Rivers and Creeks**

The Talbragar River runs generally east west to the north of the Project Area. Talbragar River is a perennial stream and is part of the Macquarie catchment. The River flows to meet with the Macquarie River nearby Dubbo. The river flows through Dunedoo and is noted for its influence on flood, particularly for its capacity for rapid rise and fall, due to the wide catchment.

A portion of the Golden Highway that is located within the study area follows the River and its associated vegetation. The river and is a landscape feature when travelling through the area. A number of small creeklines connect into the Talbragar. A number of dams provide irrigation for crops and livestock.

A part of the Mid-Western Regional Comprehensive Land Use Strategy 2017 a landscape corridor of at least 40 metres either side of rivers and creeklines and connecting of up to 25 metres are to be maintained. The presence of these corridors is noted in the existing visual character of the landscape.

#### **Nature Reserves**

Goodiman State Conservation area is located west of the Project Area. It straddles across the Brigalow Belt South and South Western Slopes bioregions. Goodiman SCA was former state forest that was primarily logged for ironbark for commercial timber production. It is now characterised by the remnant native vegetation and a unique mix of plant species, due to its location within the overlapping transition zone between two bioregions. Goodiman SCA protects habitat for a variety of threatened species, including the powerful owl, barking owl, speckled warbler and varied sittella along with the threatened shrub species, Ausfeld's wattle. There is a recorded Aboriginal site within the SCA, and the SCA may contain other evidence of Aboriginal culture. (POM, 2014). There area a number of fire trails running through the area, however it appears to have a lack of public access to formal walking tracks or amenities.

Yarrobil National Park is located to the west of the Project Area. The National Park is characterised by three distinct areas, surrounded by heavily cleared land primarily used for grazing. The park is comprised of former State Forest tenure and for 100 years was selectively logged for ironbark. Located within the overlap transition zone between the Brigalow Belt South Bioregion and South West Slopes Bioregion, the park protects important remnant native vegetation and a unique mix of native plant species. The park provides habitat for the threatened shrub species, Ausfeld's wattle (Acacia ausfeldii) in addition to a number of native fauna including malleefowl, brown treecreeper (eastern subspecies) speckled warbler, varied sittella, powerful owl, barking owl and glossy black cockatoo. The park also contains historic heritage sites associated with the mining, pastoral and forestry history of the park. (POM, 2005).

#### State Forests

Cope State Forest and Tuckland State Forest are Hardwood Forests located south east and west of the Project respectively. There are no public dedicated recreational opportunities within the State Forests.

#### **Ridge lines**

The landscape is characterised by the generally flat prime production land contrasted by the undulating foothills and ridgelines associated with the Great Dividing Range located to the east of the project area. Isolated undulating and heavily vegetated hillsides with some steep sections and rocky outcrops also feature to the west associated with the National Parks and State Forests and with the E3 zoned land in close proximity to the north of the Project Area. Barneys Reef is a vegetated ridgeline with rocky outcrops located to the north of the Project.

#### Scenic Lookouts and Points of Interest

Flirtation Hill is located at Gulgong, providing expansive views across the town and to the north towards the Site.

Free Flight MX is located within the Study Area. This is a popular purpose built Motocross Park.

The Gwabegar Railway Line runs alongside the western edge of the Project area. Generally, the traffic includes coal trains from the Baal Bone and Charbon Collieries. However, a tourism heritage train infrequently runs between Gulgong and Dunedoo.

### Walking Tracks & Camp Grounds

The Drip Gorge is located within Goulburn River State Conservation Area approximately 17km west of the Project Area. It is a popular walking track however there are no associated camp grounds.

It can be assumed that a number of the State Forests and National Parks are visited by locals in a recreational capacity, though numbers are likely to be low.

A desktop search and site visit identified no record of existing formalised Camp Grounds in the area however, Free Flight MX offer private camping within their facilities.

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Figure 7 Preliminary Landscape Features and Viewpoints

# Landscape Features & Proposed Barneys Reef Wind Farm

Proposed 280 m Turbine Location

8000 m from turbine

National Park / SCA

Non-involved Dwelling

### 5.4 Preliminary Landscape Character Units

A number of Landscape Character typologies exist within the Study Area (refer to Figure 8). As apart of the Preliminary Landscape Character Assessment, a total of six key landscape typologies referred to hereafter as Landscape Character Units have been identified.

Table 2 provides an overview of the LCUs and preliminary Scenic Quality Ratings applied. The LCUs and Scenic Quality Ratings will be refined in the EIS Phase of the Project to reflect input provided by the community during ongoing consultation.

Table 3 provides a brief overview of the potential visibility of the Project from each of the LCUs .

Landscape Character Units			
LCU:	Name:	General Character:	Preliminary Scenic Quality Rating:
LCU01	Gulgong	Gulgong Township and surrounding rural residential land to the south of the Project Area.	Moderate
LCU02	Dunedoo	Dunedoo Township and rural residential land to the south of the town.	Moderate
LCU03	Stubbo	Rural dwellings, predominately cleared grazing land and vegetated road corridors.	Moderate
LCU04	Tallawang Vegetated Hills	Vegetated hills to the west of the Project Area.	Moderate
LCU05	Barneys Reef	Vegetated hills and undulating, cleared grazing land.	Moderate
LCU06	Alluvial Plains	Alluvial plains associated with the Talbragar River to the north and north east of the Project Area.	Low
LCU07	Birriwa Flats	Cleared, primary production land to the north of the Project Area.	Low
LCU08	Talbragar Hills	Vegetated hills to the west of the Project Area, including Ulan Mine.	Low / Moderate

Table 2 Overview of Preliminary Landscape Character Units



BARNEYS REEF WIND FARM | PRELIMINARY VISUAL IMPACT ASSESSMENT

### Preliminary Landscape Character Units Proposed Barneys Reef Wind Farm

- **Project Boundary**
- Proposed Turbine Location
- Main Road
- Minor Road
- 8000 m from turbine
- Creek line
- Preliminary Landscape Character Units:
  - LCU01. Gulgong
  - LCU02. Dunedoo
  - LCU04. Tallawang Vegetated Hills
  - LCU05. Barneys Reef
  - LCU06. Alluvial Plains
  - LCU07. Birriwa Flats
  - LCU08. Talbragar Hills

### LCU01: Gulgong Township

Gulgong Township LCU has been defined by the flat land making up the village of Gulgong, located to the south of the Project Area. Gulgong is a historical gold mining town.

See Image 4 and 5.



Image 4 Typical character of Gulgong Town with views toward rural land



Image 5



The Dunedoo Village has been defined by the flat land making up the village of Dunedoo, located to the north of the Project Area. The LCU is generally bounded to the north by the Talbragar River and to the south by the local isolated rises and hillsides.

See Image 6 and 7.



Image 6 View from Golden Highway, Dunedoo



Image 7 Typical character of Dunedoo

Contained views along the Historical Main Street of Gulgong township

### LCU03: Stubbo Grazing Land

The Stubbo LCU has been defined by the mostly flat and predominately cleared land. The land is generally utilised for grazing on improved and unimproved pastures. Dense bands of roadside vegetation are a characteristic of the LCU. The isolated ridgeline associated with Barneys Reef forms a backdrop to the view from this LCU.

See Image 8 and 9.



Image 8 Roadside vegetation typical of the LCU



Image 9 Cleared grazing land typical of the LCU



### LCU04: Tallawang Vegetated Hills

The Tallawang Vegetated Hills are defined by the heavily timbered and undulating mountains and hillsides which straddle both the Brigalow Belt South and South Western Slopes bioregions, located to the west of the Project Area.

See Image 10 and 11.



Image 10 Vegetated hills typical of the LCU

### LCU05: Barneys Reef

Barneys Reef LCU is characterised by largely cleared, undulating grazing land associated with Barneys Reef and Tallawang.

Barneys Reef vegetated range is characterised by steep rocky slopes and valley sides.

See Image 12 and 13.



Image 12 Cleared land and vegetated hills associated with Barneys Reef



Image 13 Vegetated range associated with Barneys Reef



Image 15 Typical character of the Alluvial Plains LCU

### LCU06: Alluvial Plains

The Alluvial Plains LCU is defined as the alluvial plains associated with the Talbragar River to the north of the Project Area. Land is cleared, flat with the exception of riparian vegetation associated with the river. The land is used for intensive cropping irrigation of vegetables and lucerne improved pastures.

See Image 14 and 15.



Image 14 Talbragar River

### LCU07: Birriwa Flats

The Birriwa Flats LCU is defined by the flat land associated with the mostly cleared primary production land located to the north of the Project Area.

#### See Image 16 and 17.



Image 16 Flat improved pastures associated with Birriwa Flats



Image 17 Typical character of the Birriwa Flats LCU



The Talbragar Hills are characterised as the heavily timbered and undulating mountains and hillsides forming part of the foothills to the Great Dividing Range, located to the east of the Project Area.

See Image 18 and 19.



Cleared grazing land with vegetated hills associated with the LCU in the background



Image 19 View along Wonga Roo Road

Landscape Character Units			
LCU:	Name:	Preliminary Visual Impact Assessment	
LCU01	Gulgong	Views from the Gulgong LCU are in excess of 10 kilometres from the nearest turbine. Views	
		from within the town of Gulgong are generally contained by built form. There is potential to	
		view the Project from rural land to the north of Gulgong, however existing roadside vegetation	
		and planting surrounding houses is likely to reduce visibility.	
LCU02	Dunedoo	The ZVI indicates views to the Project from the Dunedoo township will be screened by	
		topography. Limited views of the Project from rural residential land to the south of Dunedoo	
		may be available to the south.	
LCU03	Stubbo	Views to the Project from the Stubbo LCU will be available due to the close proximity. Existing	
		roadside vegetation and planting surrounding dwellings is likely to reduce the visibility.	
LCU04	Tallawang	Views to the Project will be available to the east of the Tallawang Vegetated Hills LCU.	
	Vegetated Hills	Vegetation typical of the LCU is likely to reduce the potential visibility from a number of	
		dwellings within the LCU.	
LCU05	Barneys Reef	The Project is located within the Barneys Reef LCU and will be visibile from the land within	
		the LCU. Existing roadside vegetation and planting surrounding dwellings is likely to reduce	
		the visibility.	
LCU06	Alluvial Plains	Views to the Project are likely to be available to the south of the Alluvial Plains LCU. Land in	
		this area has a low number of residential dwellings.	
LCU07	Birriwa Flats	Views to the Project are likely to be available to the south of the Birriwa Flats LCU.	
LCU08	Talbragar Hills	Due to the undulating topography and vegetation typical of the LCU, views to the Project are	
		likely to be limited.	

Table 3 Overview of Preliminary Visual Impact Assessment of LCUs

### 6.1 Overview of Preliminary Assessment Tools

To assist in defining the visual catchment, preliminary assessment tools have been developed in the Bulletin. In accordance with the Bulletin, the purpose of the preliminary assessment tools are: to provide an early indication of where turbines require careful consideration because of potential visual impacts. The tools apply to both dwellings and key public viewpoints in the study area. The tools provide an early indication of where placement of turbines will require further assessment and justification, and where consultation with potentially affected landowners needs to be focused – including discussions for landholder agreements.

The preliminary assessment tools involve analysis of two key visual parameters:

- 1. Visual Magnitude (*Refer to Section 6.2*)
- 2. Multiple Wind Turbine Tool (Refer to Section 6.4)

Once defined, the Bulletin states: Further assessment and justification for placement of turbines located in these sensitive areas in the EIS will be required, along with a description of mitigation and management measures being employed to reduce impacts. This assessment may identify that factors such as topography, relative distance and existing vegetation may minimise or eliminate the impacts of the project.

Dwellings identified through the application of the Preliminary Assessment tools have been assessed in detail in Appendix A of this LVIA.

### 6.2 Preliminary Assessment Tool 1: Visual Magnitude

The Visual Magnitude Threshold is based on the height of the proposed wind turbines to the tip of the blade and distance from dwellings or key public viewpoints as shown in Figure 9.

In accordance with the Bulletin: proposed turbines below the black line must be identified along with the dwellings or key public viewpoints as part of the request for SEARs. The proposed wind turbines are based on a worst case scenario with a tip height of 280 metres. The 'black line' intersects at a distance of 3,750 metres and the 'blue line' intersects at 5,500 metres.

For the purpose of the Preliminary Assessment, the Visual Magnitude thresholds are based on a 2D assessment of the Project alone. Further assessment indicates factors such as topography, relative distance and existing vegetation may minimise or eliminate the impacts of the project from residences.



Figure 9 Visual Magnitude thresholds for Barneys Reef Project Layouts (Source: Adapted from Visual Assessment Bulletin)

### BARNEYS REEF WIND FARM | PRELIMINARY VISUAL IMPACT ASSESSMENT



Figure 10 Preliminary Assessment Tool 1: Visual Magnitude - Barneys Reef Wind Farm (Map Source: Six Maps)

### Visual Magnitude Barneys Reef Wind Farm



#### Note:

Preliminary Assessment Tool 1: Visual Magnitude is based on a 2D Assessment alone and does not take into account topography, vegetation or other screening factors which may reduce the potential for viewing turbines.



### BARNEYS REEF WIND FARM | PRELIMINARY VISUAL IMPACT ASSESSMENT

- Proposed 280 m Turbine Location
- Non-involved Dwelling
- 3,750 m from turbine
- 5,500 m from turbine
- 8,000 m from turbine
- National Park / Nature Reserve



### 6.3 Results of Preliminary Assessment Tool 1: Visual Magnitude

Application of the Preliminary Assessment Tools to the Barneys Reef Wind Farm Project identified dwellings which require further assessment in accordance with the Bulletin. Non-involved dwellings identified within 3,750 metres (black line of visual magnitude) and between 3,750 - 5,500 metres (blue line of visual magnitude) of the nearest proposed turbine are shown on Figure 10.

- 45 non-involved dwellings have been identified within 3,750 metres of a proposed wind turbine location (within the black line of visual magnitude).
- Further assessment identified approximately 25 of the dwellings identified within the black line of visibility to the east of the Project Area are likely to have limited visibility of the turbines due to topography, vegetation or a combination of both.
- This includes up to ten (10) of the dwellings on Blue Springs Road from which views will be screened by topography (as shown in the Zone of Visual Influence (ZVI) prepared for the Project (see Section 7.0).
- Detailed assessment and field work identified vegetation would reduce visibility from approximately • 15 of the dwellings within the black line of visibility to the east of the Project Area (rural residential area associated with Wonga Roo Road).
- 41 non-involved dwellings are located within 3,750 5,500 metres of a proposed wind turbine (within the blue line of visual magnitude).
- Preliminary assessment of 22 representative sensitive receptors have been included in Appendix • A. These assessments illustrate existing intervening vegetation typical of the Study Area is likely to reduce views to turbines from a large number of dwellings. Further detailed assessment and site inspections of sensitive receptors to ground truth this analysis will be undertaken during the EIS phase.

### 6.4 Preliminary Assessment Tool 2: Multiple Wind Turbine Tool

The Multiple Wind Turbine Tool provides a preliminary indication of potential cumulative impacts arising from the proposed wind energy project. To establish whether the degree to which dwellings or key public viewpoints may be impacted by multiple wind turbines, the proponent must map into six sectors of 60° any proposed turbines, and any existing or approved turbines within eight kilometres of each dwelling or key public viewpoint. There were no public viewpoints identified within 8,000 m of the nearest turbine. Figure 11 below provides examples of where a dwelling or key public viewpoint may have views to turbines in multiple 60° sectors.





In accordance with the Bulletin Where wind turbines are visible within the horizontal views of the dwelling or key public viewpoints in three or more 60° sectors, the proponents must identify the turbines, relative dwelling and key public viewpoint, along with the relative distance and submit these to the Department as part of the request for SEARs. These turbines will become a focus for assessment in the EIS.

Figure 12 provides an overview of the number of 60° sectors visible from each of the dwellings identified within 8 kilometres.





Figure 12 Preliminary Assessment Tool 2: Multiple Wind Turbine Tool (Map Source: Six Maps)

### LEGEND: Project Boundary

Involved Dwelling 8000m from turbine \_\_\_\_\_

LGA Boundary

$\bigcirc$	In excess
$\bigcirc$	One 60°
$\bigcirc$	Up to 2 6
$\bigcirc$	Up to 3 6
0	Up to 4 6
•	Up to 5 6
•	Up to 6 6

#### Note:

Ν

### Multiple Wind Turbine Tool Barneys Reef Wind Farm

Proposed Turbine Location

Main Road

#### MWTT Results for Dwelling / Key Public Viewpoint:

s of 8 kilometres

Sector (60°)

50° Sectors (120°)

60° Sectors (180°)

50° Sectors (240°)

60° Sectors (300°)

60° Sectors (360°)

Preliminary Assessment Tool 2: Multiple Wind Turbine Tool is based on a 2D Assessment alone and does not take into account topography, vegetation or other screening factors which may reduce the potential for viewing multiple turbines.

### 6.5 Results of Preliminary Assessment Tool 2: Multiple Wind Turbine Tool

When applied to the Project, the 2D Multiple Wind Turbine Tool (see Figure 12) identified eight (8) non-involved dwellings with more than two (2) sectors of turbines (see Table 4). There were no public viewpoints identified within 8,000 m of the nearest turbine. Of the eight (8) non-involved dwellings identified:

- Four (4) non-involved dwellings have turbines in three (3) 60° sectors (up to 180°) ۲
- Four (4) non-involved dwellings in four (4) 60° sectors (up to 240°)

Further assessment of these dwellings using 3D topographic mapping has identified land form is likely to reduce the number of 60 degree sectors with turbines visible from two (2) of the identified dwellings. Seven (7) of the eight (8) dwellings identified with turbines visible in more than three 60° sectors have existing screening factors (including vegetation and structures) which may reduce visibility of the

Dwelling ID	Number of 60° Sectors (Based on a 2D Assessment):	Number of 60° Sectors (Based on a 3D Assessment):	Screening Factors:	
Non-involved dwellings with turbines in up to three (3) 60° Sectors (up to 180°):				
2	3 60° Sectors (up to 180°)	3 60° Sectors (up to 180°)	Existing intervening vegetation Refer to Appendix A.1	
24	3 60° Sectors (up to 180°)	3 60° Sectors (up to 180°)	Existing intervening vegetation Refer to Appendix A.8	
34	3 60° Sectors (up to 180°)	3 60° Sectors (up to 180°)	Existing intervening vegetation Refer to Appendix A.22	
352	3 60° Sectors (up to 180°)	1 60° Sector (up to 60°)	Topography & intervening vegetation Refer to Appendix A.16	
Non-involved dwellings with turbines in up to four (4) 60° Sectors (up to 240°):				
99	4 60° Sectors (up to 240°)	3 60° Sectors (up to 180°)	Existing intervening vegetation Refer to Appendix A.8	
126	4 60° Sectors (up to 240°)	4 60° Sectors (up to 240°)	Existing intervening vegetation Refer to Appendix A.9	
127	4 60° Sectors (up to 240°)	4 60° Sectors (up to 240°)	Refer to Appendix A.10	
346	4 60° Sectors (up to 240°)	3 60° Sectors (up to 180°)	Topography Refer to Appendix A.17	

Table 4 Non-involved Dwellings identified using Multiple Wind Turbine Tool

## 7.0 Zone of Visual Influence

### 7.1 Overview of Preliminary Zone of Visual Influence

The Bulletin states 'the use of Geographic Information Systems (GIS) to facilitate the application of the tools will streamline the evaluation phase of the evaluation phase of a project during the pre-lodgement stage. This can also assist in refining the number of turbines and viewpoints that will ultimately need more detailed assessment.'

Two Zone of Visual Influence (ZVI) diagrams have been prepared for the Project to illustrate the theoretical visibility of the proposed turbines one from hub height, and one from blade tip.

- Figure 13 depicts the areas of land from which the proposed development may be visible and provides an indicative number of wind turbines based on the blade tip height of 280 metres.
- Figure 14 illustrates the areas of land from which the proposed development would be visible at hub height of 182.5 metres.

The ZVI (also known as a Zone of Theoretical Influence Model) represents the area over which a development can theoretically be seen and is based on a Digital Terrain Model (DTM). The ZVI usually presents a bare ground scenario - ie. A landscape without screening, structures or vegetation, and is usually presented on a base map (Scottish Natural Heritage, 2017)

The ZVI has been determined through the use of digital topographic information and 3D modelling software WindPro. The ZVI has been assessed to approximately 10km from the Project Area. Although it is possible for the development to be visible from further than 10km away, it is generally accepted that beyond 10km visibility is diminished.

### 7.2 Summary of Preliminary Zone of Visual Influence

The following provides a summary of the Zone of Visual Influence diagrams prepared for the Preliminary Layout.

- Due the elevated locations of the proposed wind turbines and the blade tip height of 280 m above ground level, the ZVI depicts a large percentage of land immediately surrounding the Project Area from which wind turbines would theoretically be visible.
- The ZVI indicates the town of Gulgong and its surrounds will have the potential to view the Project in its entirety. This is based on an assessment of topography alone and existing intervening elements such as vegetation and built form are expected to reduce the visibility.
- The ZVI indicates the highest level of visibility is likely to be experienced from land within close proximity to the Project Area, particularly to the south and east of the Project Area.
- Viewpoint Analysis from Bungaba (rural residential land to the east of the Project Area) indicates views will be limited by vegetation.
- The undulating topography that characterises the region results in large areas of land from which views of all or most of the proposed turbines would be obstructed, particularly to the north, east and west in excess of 8 kilometres from the Project Area.
- The ZVI indicates views to the Project Area will be screened by topography from the town of Dunedoo.
- Following the development of the ZVI, detailed site investigations (in the form of a viewpoint analysis inventory and dwelling assessments) have been undertaken to ground truth the findings (see Appendix B). Preliminary viewpoint analysis (from 15 public locations) and assessment of 22 representative sensitive receptors have been included in Appendix A and Appendix B. These assessments illustrate existing intervening vegetation typical of the Study Area is likely to reduce views to turbines from a number of locations.
- Further detailed assessment from areas identified in the ZVI will be undertaken in the EIS Phase of the assessment.

## 7.0 Preliminary Zone of Visual Influence



#### Figure 13 Zone of Visual Influence - Blade tip (280 metres)

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The ZVI is a preliminary assessment tool that represents a bare ground scenario-ie. a landscape without screening, structures or vegetation. As accurate information on the height and coverage of vegetation and buildings is unavailable, it is important to note the ZVI is based solely on topographic information. Therefore this form of mapping should be acknowledged as representing the worst case scenario.

### Zone of Visual Influence Blade Tip Height 280 m Barneys Reef Wind Farm

Project Area

Proposed Turbine Location

Involved Dwelling

Non-involved Dwelling

3,750 m from turbine

5,500 m from turbine

8,000 m from turbine

Number of visible turbines (at blade tip height) (Based on topography alone):

## 7.0 Preliminary Zone of Visual Influence



Figure 14 Zone of Visual Influence - Hub Height (182.5 metres)

### Zone of Visual Influence Hub Height 182.5 m Barneys Reef Wind Farm

Proposed Turbine Location

Non-involved Dwelling

5,500 m from turbine

8,000 m from turbine

Number of visible turbines (at hub height)

The ZVI is a preliminary assessment tool that represents a bare ground scenario-ie. a landscape without screening, structures or vegetation. As accurate information on the height and coverage of vegetation and buildings is unavailable, it is important to note the ZVI is based solely on topographic information. Therefore this form of mapping should be acknowledged as representing

## **8.0** Preliminary Dwelling and Viewpoint Assessments

### 8.1 Preliminary Assessment of Dwellings

Examples of the preliminary assessment tools applied to 22 representative non-involved dwellings (as shown on Figure 15) within 3,750 m of the nearest turbine have been included in Appendix A.

The preliminary assessment identifies existing vegetation surrounding many of the dwellings which would reduce the potential visual impacts identified by the preliminary assessment tools and Zone of Visual Influence.

### 8.2 Preliminary Assessment of Public Viewpoints

Appendix B provides preliminary assessments from Public Viewpoints. A total of 15 preliminary viewpoints have been selected to illustrate the varying landscape character typologies throughout the Study Area and provide a preliminary assessment of the potential visibility of the Project (as shown on Figure 15).

### **8.0** Preliminary Dwelling and Viewpoint Assessments



BARNEYS REEF WIND FARM | PRELIMINARY VISUAL IMPACT ASSESSMENT

# Preliminary Dwelling & Viewpoint Assessment

### Proposed Barneys Reef Wind Farm

Project Boundary

Proposed 280 m Turbine Location

Involved Dwelling

Non-involved Dwelling

3,750 m from turbine

5,500 m from turbine

8,000 m from turbine

Main Road

Minor Road

LGA Boundary

Preliminary Dwelling Assessment - Dwellings within 2950 m

#### Refer to Appendix A

Preliminary Public Viewpoint Assessment Location -

#### Refer to Appendix B

## 9.0 Summary and Recommendations

### 9.1 Summary of Preliminary Visual Impact Assessment

This PVIA report has been undertaken in accordance with the Visual Assessment Bulletin, and will be submitted with the Scoping Report in the request for Secretary's Environmental Assessment Requirements SEARs. The following provides a brief summary of the PVIA and outlines the steps that will be undertaken in the Landscape and Visual Impact Assessment (LVIA) which will be undertaken during the EIS Phase of the Project.

### **Community Consultation**

The report outlined the findings of community consultation to date which assisted in establishing the following:

- Key landscape features
- Defined areas of scenic quality and
- Identify key public viewpoints valued by that community.

### **Next Steps:**

Community consultation will be ongoing through the Project. Ongoing input from the community will assist the preparation of the LVIA.

### **Existing Landscape Character**

This PVIA provided a detailed assessment of the existing landscape character of the Study Area through the following:

- Identified land uses, key landscape features and key viewpoints,
- Categorisation of eight (8) preliminary Landscape Character Units (LCUs),
- Application of preliminary scenic quality ratings to each of the LCUs ranging from Low Moderate, •
- A brief preliminary overview of the potential visual impacts has been provided for each LCU.

#### **Next Steps:**

- Utilise the landscape character assessment to prepare a detailed Visual Baseline Study.
- Identify any additional key features, key viewpoints valued by the community through consultation.
- Refine the Landscape Character Units and allow the community to provide feedback on the relative scenic quality ratings of LCUs.
- Determine the Visual Influence Zone of key viewpoints and assess against the objectives outlined in the Visual Assessment Bulletin.

### BARNEYS REEF WIND FARM | PRELIMINARY VISUAL IMPACT ASSESSMENT

### **Application of the Preliminary Assessment Tools:**

The purpose of the Preliminary Assessment Tools in the PVIA is to identify 'sensitive receptors' for further assessment in the EIS Phase of the Project.

- The Visual Magnitude Tool identified a total of 45 non-involved dwellings within the black line of visual magnitude (3,750 m) and 41 non-involved dwellings within the blue line of visual magnitude (3,750 - 5,500 m).
- The Multiple Wind Turbine Tool (MWTT) was applied to all dwellings within 8000 m of the nearest proposed turbine.
- The MWTT identified eight (8) dwellings with turbines in more than two (2) 60 degree sectors. There were no public viewpoints identified within 8,000 m of the nearest turbine.

### Next Steps:

- Groundtruthing of all identified non-involved dwellings.
- Undertake site inspection and detailed dwelling assessment at sensitive non-involved dwellings.
- The LVIA will assess each 'sensitive receptor' in detail to take into account topography, vegetation and other screening factors.
- Determine the potential visual impact of each sensitive receptor and provide mitigation methods to reduce potential visual impacts.

### **Zone of Visual Influence**

A Zone of Visual Influence (ZVI) has been prepared to illustrate the theoretical visibility of the Project and to assist in defining the visual catchment. Two Preliminary ZVI have been prepared: one from a blade tip height of 280 m and one from a hub height of 182.5 m to illustrate areas which have potential visibility of the Project.

### Next Steps:

- The LVIA will require further detailed assessment from areas identified as having potential visibility in the Preliminary ZVIs.
- Graphic representations of the Project using GIS technology including wire frame diagrams and photomontages will be provided in the EIS phase.

### **References**

### **References:**

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Google Earth Pro 2021 [Viewed March 2021 - May 2021] www.google.com/earth/index.html


# Appendix A Preliminary Dwelling Assessments

# A.1 Dwelling 2 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2.064 km</b> ( <i>T</i> 11)
Number of proposed turbines within Black Line (3,750 m):	20
Number of theoretical 60° sectors (Based on 2D assessment):	<b>3</b> (Up to 180°)

# A.2 Dwelling 3 Preliminary Assessment



60° sector with turbines

Non-involved Dwelling



Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2.052 km</b> ( <i>T65</i> )
Number of proposed turbines within Black Line (3,750 m):	11
Number of theoretical 60° sectors (Based on 2D assessment):	<b>2</b> (Up to 120°)

# A.3 Dwelling 23 Preliminary Assessment





Aerial Image (Aerial Image Source: Google Earth)

Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2.045</b> km ( <i>T50</i> )
Number of proposed turbines within Black Line (3,750 m):	10
Number of theoretical 60° sectors (Based on 2D assessment):	<b>2</b> (Up to 120°)

# A.4 Dwelling 26 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2.369 km</b> ( <i>T16</i> )
Number of proposed turbines within Black Line (3,750 m):	10
Number of theoretical 60° sectors (Based on 2D assessment):	10

# A.5 Dwelling 28 Preliminary Assessment





Aerial Image (Aerial Image Source: Google Earth)

Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2.016 km</b> ( <i>T49</i> )
Number of proposed turbines within Black Line (3,750 m):	8
Number of theoretical 60° sectors (Based on 2D assessment):	<b>2</b> (Up to 120°)

# A.6 Dwelling 30 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2,687 km</b> ( <i>T20</i> )
Number of proposed turbines within Black Line (3,750 m):	10
Number of theoretical 60° sectors (Based on 2D assessment):	<b>2</b> (Up to 120°)

# A.7 Dwelling 39 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2.504 km</b> ( <i>T49</i> )
Number of proposed turbines within Black Line (3,750 m):	<b>1</b> ( <i>T49</i> )
Number of theoretical 60° sectors (Based on 2D assessment):	<b>2</b> (Up to 120°)

# A.8 Dwelling 99 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2.032 km</b> ( <i>T43</i> )
Number of proposed turbines within Black Line (3,750 m):	13
Number of theoretical 60° sectors (Based on 2D assessment):	<b>4</b> (Up to 240°)

# A.9 Dwelling 126 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>1.928 km</b> ( <i>T63</i> )
Number of proposed turbines within Black Line (3,750 m):	20
Number of theoretical 60° sectors (Based on 2D assessment):	<b>4</b> (Up to 240°)

# A.10 Dwelling 127 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2.487 km</b> ( <i>T43</i> )
Number of proposed turbines within Black Line (3,750 m):	8
Number of theoretical 60° sectors (Based on 2D assessment):	<b>4</b> (Up to 240°)

# A.11 Dwelling 136 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>1.927 km</b> ( <i>T52</i> )
Number of proposed turbines within Black Line (3,750 m):	9
Number of theoretical 60° sectors (Based on 2D assessment):	<b>2</b> (Up to 120°)

# A.12 Dwelling 141 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2.344 km</b> ( <i>T55</i> )
Number of proposed turbines within Black Line (3,750 m):	5
Number of theoretical 60° sectors (Based on 2D assessment):	<b>1</b> (Up to 60°)

# A.13 Dwelling 146 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2.370 km</b> ( <i>T55</i> )
Number of proposed turbines within Black Line (3,750 m):	5
Number of theoretical 60° sectors (Based on 2D assessment):	<b>1</b> (Up to 60°)

### A.14 Dwelling 149 Preliminary Assessment





Aerial Image (Aerial Image Source: Google Earth)

Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2.321 km</b> ( <i>T67</i> )
Number of proposed turbines within Black Line (3,750 m):	6
Number of theoretical 60° sectors (Based on 2D assessment):	<b>2</b> (Up to 120°)

# A.15 Dwelling 304 Preliminary Assessment





Aerial Image (Aerial Image Source: Google Earth)

Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2.828 km</b> ( <i>T55</i> )
Number of proposed turbines within Black Line (3,750 m):	<b>1</b> ( <i>T55</i> )
Number of theoretical 60° sectors (Based on 2D assessment):	<b>1</b> (Up to 60°)

### A.16 Dwelling 352 Preliminary Assessment





Aerial Image (Aerial Image Source: Google Earth)

Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2.828 km</b> ( <i>T55</i> )
Number of proposed turbines within Black Line (3,750 m):	<b>1</b> (755)
Number of theoretical 60° sectors (Based on 2D assessment):	<b>1</b> (Up to 60°)

# A.17 Dwelling 346 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>1.545 km</b> ( <i>T42</i> )
Number of proposed turbines within Black Line (3,750 m):	14
Number of theoretical 60° sectors (Based on 2D assessment):	<b>4</b> (Up to 240°)

# A.18 Dwelling 24 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>3.251 km</b> ( <i>T46</i> )
Number of proposed turbines within Black Line (3,750 m):	2
Number of theoretical 60° sectors (Based on 2D assessment):	<b>3</b> (Up to 180°)

# A.19 Dwelling 42 Preliminary Assessment



60° sector

60° sector with turbines

nvolved Dwelling

Non-involved Dwelling



Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>3.455 km</b> ( <i>T67</i> )
Number of proposed turbines within Black Line (3,750 m):	1
Number of theoretical 60° sectors (Based on 2D assessment):	<b>1</b> (Up to 60°)

# A.20 Dwelling 285 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>2.985 km</b> ( <i>T55</i> )
Number of proposed turbines within Black Line (3,750 m):	4
Number of theoretical 60° sectors (Based on 2D assessment):	<b>1</b> (Up to 60°)

# A.21 Dwelling 25 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>3.334 km</b> ( <i>T2</i> )
Number of proposed turbines within Black Line (3,750 m):	2
Number of theoretical 60° sectors (Based on 2D assessment):	<b>1</b> (Up to 60°)

# A.22 Dwelling 34 Preliminary Assessment





Summary of Preliminary Assessment Tools:	
Distance to Nearest Turbine:	<b>4.535 km</b> ( <i>T2</i> )
Number of proposed turbines within Black Line (3,750 m):	Nil
Number of theoretical 60° sectors (Based on 2D assessment):	<b>3</b> (Up to 180°)



# Appendix B Preliminary Viewpoint Assessments

### BR01 Bullinda Street, Dunedoo.





### **VIEWPOINT BR01**

Viewpoint Summary:	
Location:	
Bullinda Street, Dunedoo.	
Coordinates:	Viewing Direction:
32° 1'19.73"S 149°23'40.52"E	East
Distance to nearest WTG:	Elevation:
17.23km 425m	
Multiple Wind Turbine Tool:	
Nil 60° Sectors (In excess of 8000m from nearest turbine).	

#### Existing Landscape Character Description:

This viewpoint was taken from a highpoint located on Bullinda Street, on the southern edge of Dunedoo. The street is located within a residential zone. The road runs east - west and terminates at Wargundry Street towards the east. Land is gently undulating with vegetation on either sides of the road. Views are partially screened by the vegetation. Detrimental features include power lines and a water tank.

#### Potential Visual Impact:

The viewpoint is located approximately 17 kilometres to the north of the Project. Views towards the south will be screened by a combination of topography and vegetation from this location and the town of Dunedoo.

Aerial Image BR01 (Aerial Image Source: Six Maps)



### BR02 Birrawa Road, Birrawa.

Approximate extent of visible turbines (based on 3D assessment alone)



### **VIEWPOINT BR02**

Viewpoint Summary:	
Location:	
Birrawa Road, Birrawa.	
Coordinates:	Viewing Direction:
32° 7'13.59"S 149°27'53.12"E	Southeast
Distance to nearest WTG:	Elevation:
4.80km	446m
Multiple Wind Turbine Tool:	
One (1) 60° Sector with turbines within 8000m	

#### **Existing Landscape Character Description:**

Viewpoint is located on Birrawa Road near the Birrawa train station. The area is largely cleared and open grasslands with moderately dense vegetation in the background that partially screens views towards the ridgeline that lies beyond. The topography is largely flat and very gently rises towards the south. Existing agricultural buildings, power lines and train tracks are visible from this viewpoint.

#### **Potential Visual Impact:**

A preliminary assessment based on topography alone determined the Project will be visible to the south and south east. The trees located along Castlereagh Highway assist in screening the ridgeline in the direction of the Project.

Aerial Image BR02 (Aerial Image Source: Six Maps)



### BR03 Castlereagh Highway, Tallawang.





#### **VIEWPOINT BR03**

Viewpoint Summary:	
Location:	
Castlereagh Highway, Tallawang.	
Coordinates:	Viewing Direction:
32°11'8.87"S 149°26'6.19"E	East
Distance to nearest WTG:	Elevation:
2.12km	515m
Multiple Wind Turbine Tool: Two (2) 60° Sectors with turbines within 8000m	

#### Existing Landscape Character Description:

The photograph was taken from Castlereagh Highway in Tallwang. Castlereagh Highway is a major road that connects Dunedoo in the north to Tallawang, Stubbo and Gulgong to the south. It conveys moderate traffic. Large, cleared and flat pastures utilised for grazing are the predominant character of this area. A few trees that constitute as windbreaks for the rural lots are visible in the background.

#### Potential Visual Impact:

Views to the Project will be available on the ridgeline to the east. Views towards the east are open and expansive with limited existing screening factors.

Aerial Image BR03 (Aerial Image Source: Six Maps)

### BR04 Castlereagh Highway, Tallawang.





#### **VIEWPOINT BR04**

Viewpoint Summary:	
Location:	
Castlereagh Highway, Tallwang.	
Coordinates:	Viewing Direction:
32°14'24.67"S 149°26'11.40"E	Northeast
Distance to nearest WTG:	Elevation:
4.39km	467m
Multiple Wind Turbine Tool: Two (2) 60° Sectors with turbines within 8000m	

#### **Existing Landscape Character Description:**

The photograph was taken from Castlereagh Highway in Tallwang at the entry to Dwelling 165. The surrounding topography is flat, cleared and offers open views in most directions. Surrounding land uses is generally grazing land with rural dwellings. A small number of trees are scattered in the near middleground. Deterimental features include power lines and farm buildings.

#### **Potential Visual Impact:**

Views to the Project will be available to the NNE. There are no existing screening factors which will obscure views towards the Project.

Aerial Image BR04 (Aerial Image Source: Six Maps)

### BR05 Beela Road, Stubbo.

Approximate extent of visible turbines (based on 3D assessment alone)



W 280° 290° 300° 310° 320° 330° 340° 350° N 10° 20° 30° 40° 50° 60° 70° 80° E



#### **VIEWPOINT BR05**

Viewpoint Summary:	
Location:	
Beela Road, Stubbo.	
Coordinates:	Viewing Direction:
32°18'31.34"S 149°35'13.52"E	North
Distance to nearest WTG:Elevation:10.15km467m	
Nil 60° Sectors (In excess of 8000m from nearest turbine).	

#### **Existing Landscape Character Description:**

This photograph was taken from Beela Road, 670m from the intersection Cope Road. Beela Road is a low use, unsealed road which runs generally north from Cope Road to Carramar Road, servicing approximately six rural residential dwellings. Land is generally flat to gently undulating with dense vegetation in the background to the north. The surrounding land use is predominantly agricultural.

#### Potential Visual Impact:

It is likely that the vegetation towards the north (typical of the Stubbo area) will screen views towards the Project. The dense corridor vegetation and distance from the proposed site will make it difficult to view the Project.

Aerial Image BR05 (Aerial Image Source: Six Maps)

### BR06 Blue Springs Road, Stubbo.





#### **VIEWPOINT BR06**

Viewpoint Summary:	
Location:	
Blue Springs Road, Stubbo.	
Coordinates:	Viewing Direction:
32°14'32.19"S 149°36'54.95"E	Northwest
Distance to nearest WTG:	Elevation:
9.28km	564m
Multiple Wind Turbine Tool: One (1) 60° Sector with turbines within 8000m	

#### **Existing Landscape Character Description:**

This photograph was taken from Blue Springs Road at the entry to 'The Pinnacle' rural residence. Land is generally cleared with undulations in the foreground to the northwest. Dense roadside vegetation, typical of Blue Springs Road is visible along the road. The surrounding land use is agricultural and rural residential.

#### **Potential Visual Impact:**

A combination of topography and roadside vegetation would screen views to the Project from this location.

Aerial Image BR06 (Aerial Image Source: Six Maps)

### BR07 Blue Springs Road, Bungawa.

Approximate extent of visible turbines (based on 3D assessment alone)





#### **VIEWPOINT BR07**

Viewpoint Summary:	
Location:	
Blue Springs Road, Bungawa.	
Coordinates:	Viewing Direction:
32°11'25.37"S 149°37'35.34"E	West
Distance to nearest WTG:	Elevation:
2.25km	444m
Multiple Wind Turbine Tool:	
One (1) 60° Sector with turbines within 8000m	

#### **Existing Landscape Character Description:**

The photograph was taken on Blue Springs Road, and is indicative of the views from residences 145-146. Cockabutta Creek and its associated vegetation can be seen in the fore ground of the view. Land in the area is characterised by flat grassland with scattered to dense vegetation along creeklines, fencelines and roadsides.

#### **Potential Visual Impact:**

Views towards the Project will be visible to the west. Corridor vegetation along this road will contribute towards screening some of the views of the Project.

Aerial Image BR07 (Aerial Image Source: Six Maps)

### BR08 Merotherie Road, Merotherie.

Approximate extent of visible turbines (based on 3D assessment alone)



S 190° 200° 210° 220° 230° 240° 250° 260° W 280° 290° 300° 310° 320° 330° 330° 340° 350° N



#### **VIEWPOINT BR08**

Viewpoint Summary:	
Location:	
Castlereagh Highway, Tallwang.	
Coordinates:	Viewing Direction:
32°11'58.82"S 149°33'51.82"E	West
Distance to nearest WTG:	Elevation:
2.00km	527m
Multiple Wind Turbine Tool:	
Four (4) 60° Sectors with turbines within 8000m	

#### **Existing Landscape Character Description:**

This viewpoint is located at Merotherie Road. Merotherie Road is used to access approximately eight rural residences and runs generally in a north/south direction connecting to Barneys Reef Road and eventually Gulgong to the south and the Golden Highway to the north. Scattered road side vegetation can be seen in the fore ground of the view. Land is gently undulating, cleared agricultural land which slopes down to the south east toward Merotherie Creek.

#### **Potential Visual Impact:**

Views to the Project will be available from the west to the north. The rise in topography in the foreground may assist in reducing the extent of visibility from this location.

Aerial Image BR08 (Aerial Image Source: Six Maps)

### BR09 Merotherie Road, Stubbo.

Approximate extent of visible turbines (based on 3D assessment alone)





#### **VIEWPOINT BR09**

Viewpoint Summary:		
Location:		
Merotherie Road, Stubbo.		
Coordinates:	Viewing Direction:	
32°14'15.19"S 149°32'28.49"E	Northwest	
Distance to nearest WTG:	Elevation:	
2.24km	463m	
Multiple Wind Turbine Tool:		
Two (2) 60° Sectors with turbines within 8000m		

#### Existing Landscape Character Description:

This photograph was taken from Barneys Reef Road at the entry to a rural residence (Dwelling ID:10). Barneys Reef Road connects with Merotherie Road to the north and the township of Gulgong to the south. Land is generally flat and predominantly cleared grassland. Dense roadside vegetation can be seen in the foreground of the view. Windbreak plantations that runs along the driveway of adjacent lot can be seen towards the west.

#### **Potential Visual Impact:**

Due to the dense corridor planting towards the north and the east, most views towards the Project will be screened. However, views towards the west are open and the Project would be visible to the west - north west.

Aerial Image BR09 (Aerial Image Source: Six Maps)

### BR10 Flirtation Hill, Gulgong.

Approximate extent of visible turbines (based on 3D assessment alone)



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#### **VIEWPOINT BR10**

Viewpoint Summary:	
Location: Flirtation Hill, Gulgong	
32°22'0.03"S 149°32'34.51"E	North
Distance to nearest WTG:	Elevation:
14.30km	519m
Multiple Wind Turbine Tool: Nil 60° Sectors (In excess of 8000m from nearest turbine	

#### **Existing Landscape Character Description:**

This photograph was taken from Flirtation Hill Lookout in Gulgong. Flirtation Hill is an elevated viewpoint with expansive viewa available to the north. Although the viewpoint is located at a considerable distance from the Project Site, the elevation of this viewpoint allows open and expansive views of the Site. Residential land associated with the town of Gulgong is visible in the middleground.

#### **Potential Visual Impact:**

The Project will be visible in the distance from this viewpoint due to the high elevation and expansive views. The Project is likely to form a small portion of the overall view from this location.

Aerial Image BR10 (Aerial Image Source: Six Maps)

### BR11 Intersection of Wonga Roo Road and Fire Trail Lane, Bungaba

Approximate extent of Project Site



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### VIEWPOINT BR11

#### **Viewpoint Summary:**

#### Location:

Intersection of Wonga Roo Road and Fire Trail Lane, Bungaba - near dwelling ID 303.

	Coordinates:	Viewing Direction:
	32°10'41.73"S 149°39'28.76"E	West
	Distance to nearest WTG:	Elevation:
	4.69 km	460m
Multiple Wind Turbine Tool:		
	One (1) 60° Sector with turbin	es within 8000m

#### **Existing Landscape Character Description:**

View from Wonga Roo Road at the intersection with Fire Trail Lane. Land in this area is R5 Large Lot Rural Residential (Dwelling 303 is located in the foreground). Land is generally cleared around the dwelling with dense vegetation to the east and west typical of the LCU.

#### **Potential Visual Impact:**

Views to the Project are generally located to the south west of this location. Existing roadside vegetation is likely to screen views from this location, however the blade of turbines are likely to be visible from cleared areas to the north and south of the viewpoint.

Aerial Image BR11 (Aerial Image Source: Six Maps)

### BR12 Wonga Roo Road, Bungaba



Approximate extent of Project Site

S 190° 200° 210° 220° 230° 240° 250° 260° W 280° 290° 300° 310° 320° 330° 330° 340° 350° N

**Existing View** 



### **VIEWPOINT BR12**

Viewpoint Summary:		
Location:		
Opposite entrance gate of Lot 171 Wonga Roo Road, Bungaba (Dwelling ID: 202).		
Coordinates:	Viewing Direction:	
32°11'2.73"S 149°38'29.22"E	West	
Distance to nearest WTG:	Elevation:	
3.21km	449m	
Multiple Wind Turbine Tool:		
One (1) 60° Sector with turbines within 8000m		

#### Existing Landscape Character Description:

View from Wonga Roo Road, approximately 1500 metres east of Blue Springs Road. Land in this area is predominately cleared with the exception of dense roadside vegetation.

#### Potential Visual Impact:

Views to the Project from this location are likely to be contained by dense roadside vegetation.

Aerial Image BRVP06 (Aerial Image Source: Six Maps)
# BR13 Wonga Roo Road, Bungaba



S 190° 200° 210° 220° 230° 240° 250° 260° W 280° 290° 300° 310° 320° 330° 340° 350° N

**Existing View** 



### **VIEWPOINT BR13**

Viewpoint Summary:		
Location:		
Opposite entrance gate of 57 Wonga Roo Road, Bungaba (Dwelling ID: 306).		
Coordinates:	Viewing Direction:	
32°10'50.44"S 149°37'56.93"E	West	
Distance to nearest WTG:	Elevation:	
2.31km	447m	
Multiple Wind Turbine Tool:		
One (1) 60° Sector with turbines within 8000m		

### **Existing Landscape Character Description:**

View from Wonga Roo Road opposite the entry gate of 57 Wonga Roo Road, Bungaba. Land in this area is generally zoned R5 Large Lot Residential. Land typically flat with dense vegetation containing views.

#### Potential Visual Impact:

From this viewpoint, views to the Project will be screened by dense vegetation to the west.

Aerial Image BR13 (Aerial Image Source: Six Maps)

# BR14 Blue Springs Road, Bungaba

Approximate direction of Project Site



 $140^{\circ} 150^{\circ} 160^{\circ} 170^{\circ} S 190^{\circ} 200^{\circ} 210^{\circ} 220^{\circ} 200^{\circ} 210^{\circ} 220^{\circ} 200^{\circ} 200^{\circ} 200^{\circ} 300^{\circ} 310^{\circ} 31$ 

**Existing View** 



### **VIEWPOINT BR14**

Viewpoint Summary:		
Location:		
Near lot 1729, Blue Springs Road 'Dayview', Bungaba (Dwelling ID: 293, 207, 206).		
Coordinates:	Viewing Direction:	
32° 9'30.41"S 149°37'54.85"E	Southwest	
Distance to nearest WTG:	Elevation:	
3.08km	461m	
Multiple Wind Turbine Tool:		
One (1) 60° Sector with turbines within 8000m		

### **Existing Landscape Character Description:**

View from Blue Springs Road at the entry to the property 'Dayview' and 'Karievale', Bungaba. Land in this area is typical of the Talbragar Hills LCU with dense vegetation along the western side of Blue Springs Road containing views to the west.

#### Potential Visual Impact:

Views to the Project will be screened by a combination of topography and vegetation from this location.

Aerial Image BR14 (Aerial Image Source: Six Maps)

# BR15 Blue Springs Road, Bungaba



S 190° 200° 210° 220° 230° 240° 250° 260° W 280° 290° 300° 310° 320° 330° 330° 340° 350° N

**Existing View** 



## **VIEWPOINT BR15**

Viewpoint Summary:		
Location:		
Near Lot 1424, Blue Springs Road, Bungaba (Dwelling ID: 145).		
Coordinates:	Viewing Direction:	
32°11'4.92"S 149°37'29.56"E	West	
Distance to nearest WTG:	Elevation:	
1.76km	438m	
Multiple Wind Turbine Tool:		
One (1) 60° Sector with turbines within 8000m		

#### Existing Landscape Character Description:

View from Blue Springs Road, to the east of the Site. Land in this area is characterised by flat grazing land typical of the Stubbo LCU. Vegetation associated with Cockabutta Creek in the middle ground. Views to vegetated hills in the distance are visible through small breaks in the vegetation.

#### Potential Visual Impact:

Views to the Project will be available to the west of this location beyond vegetation in the middle ground.

Aerial Image BR15 (Aerial Image Source: Six Maps)