

**UNION FENOSA**  
WIND AUSTRALIA



PALING YARDS WIND FARM  
CHAPTER 19

# **GEOTECHNICAL IMPACTS**



## 19 Geotechnical Impacts

### 19.1 Introduction

URS Australia Pty Ltd (URS) was commissioned by UFWA in order to assess the potential geotechnical impacts in relation to the project. The full report undertaken by URS accompanies this application as **Appendix 13**.

The assessment has been prepared in order to;

- provide a preliminary understanding of the geological setting and its potential impact on footing type and size for turbines, monitoring towers, substations and transmission towers;
- consider groundwater and slope stability issues and their implications for footing types, trenching and access tracks;
- make a preliminary assessment of geotechnical constraints that could affect the construction of access roads, hardstand and lay down areas including the use of locally sourced materials;
- provide preliminary indication regarding electrical resistivity and thermal conductivity of site soils; and
- consider the potential for soil erosion and/or soil/groundwater contamination.

The report presents findings on a number of geotechnical aspects relevant to the project. These include the following:

- Details of the investigation
- Subsurface conditions and geotechnical considerations for the proposed wind turbine sites.
- Groundwater issues
- Potential slope stability considerations
- Construction considerations
- Recommendations for future investigations

### 19.2 Assessment Methodology

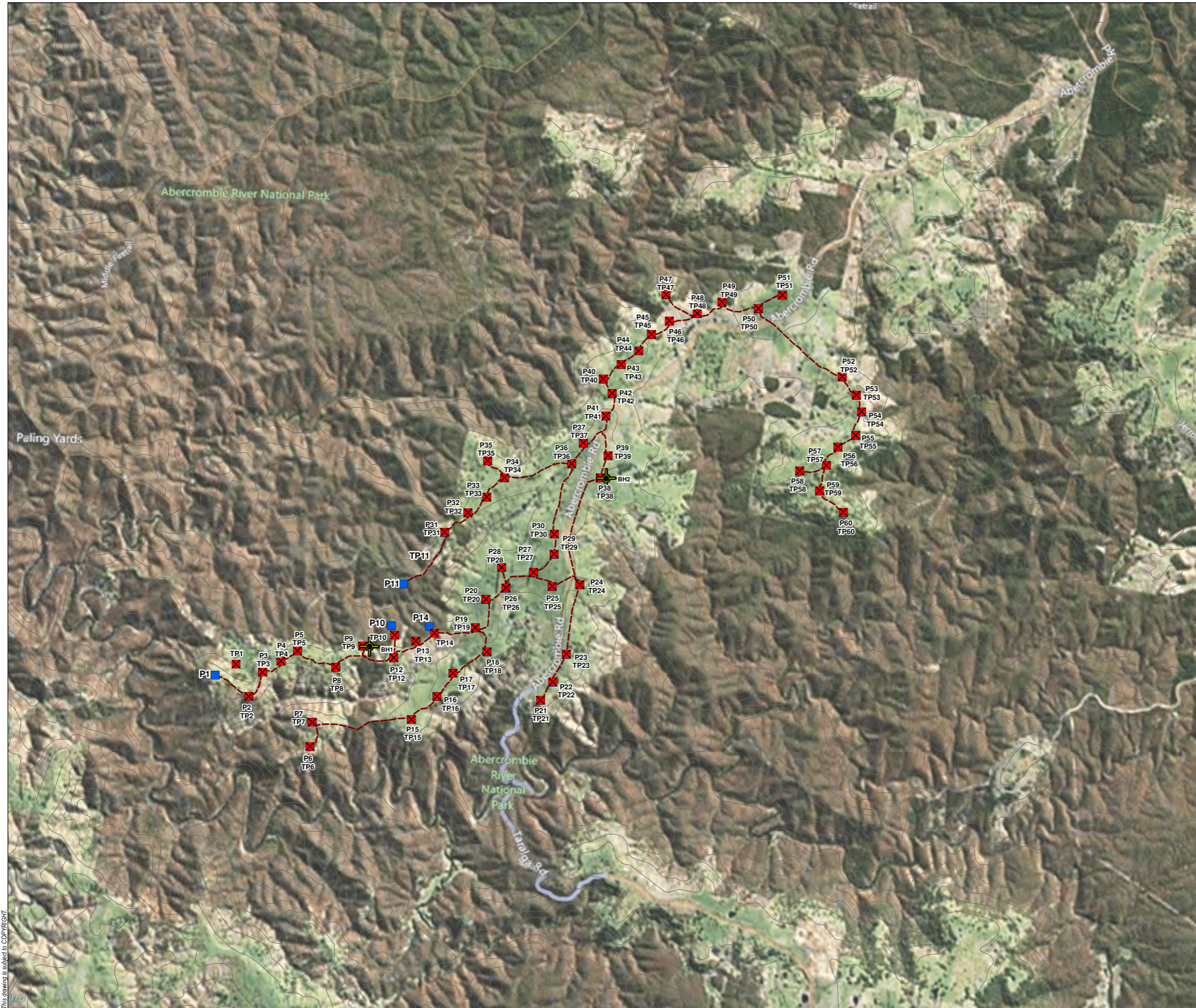
Preliminary geotechnical investigations were carried out between 11 April 2011 and 21 July 2011 to identify and characterise the main geologic units at the site. All the geotechnical investigation work was carried out by an experienced URS geotechnical engineer.

The following works were carried out to characterise the soil and rock properties of the main geologic units across the site:





- A walk over inspection of the site and surroundings.
- Drilling of two geotechnical boreholes up to a depth of 20m.
- Excavation of sixty test pits.
- A total of sixty Dynamic Cone Penetrometer (DCP) tests were carried out, ensuring a DCP test adjacent to each test pit.
- Collection of representative soils samples for laboratory testing.
- The Test Pit and DCP locations are shown on Figure 1, Appendix A of the geotechnical report.

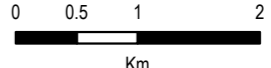
The test pit locations for the geotechnical assessment are shown on **Figure 59**.





**LEGEND**

-  TEST PIT  
 TP1
-  TURBINES  
 P1
-  BOREHOLES
-  33kV UNDERGROUND CABLE



Datum: GDA94

Source: Aerial Image from Bing Maps Copyright © 2010 Microsoft Corporation and/or its suppliers

Whilst every care is taken by URS to ensure the accuracy of the digital data, URS makes no representation or warranties about its accuracy, reliability, completeness, suitability for any particular purpose and disclaims all responsibility and liability (including without limitation, liability in negligence) for any expenses, losses, damages (including indirect or consequential damage) and costs which may be incurred as a result of data being inaccurate in any way for any reason. Electronic files are provided for information only. The data in these files is not

PATH: T:\JOBS\43167888\WORKSPACES

FILE NO: 43167888.001.MXD

DRAWN: AO/AY APPROVED: TH DATE: 25-07-2011

UNION FENOSA  
WIND AUSTRALIA

PALING YARDS  
WIND FARM

**TEST PIT LOCATION  
SITE PLAN**



Figure: 1  
Rev. A A3

Figure 59 Geotechnical Investigations Test Pit Locations



### 19.3 General Site Geology and Topography

The majority of the site comprises farmland with farm houses and stock sheds present. The site is accessible from Abercrombie Road and via a network of unsealed roads.

The site topography comprises 'plateau' and 'hillcrest' areas at an elevation of between 900 metres and 1065 metres surrounded by steeply sloping gullies and creek lines that flow to the Abercrombie River. The gently sloping plateau areas are generally cleared and used for grazing, while the more steeply sloping areas are generally uncleared and heavily vegetated.

The plateau areas are *"underlain by Tertiary aged Volcanics which typically comprises residual clay, frequently with cobbles and boulders, overlying variably weathered basalt at relatively shallow depths"*. Tertiary aged alluvial deposits *"underlie the Tertiary Volcanics at depth, overlying Ordovician aged meta-siltstone basement"*.

### 19.4 Results

Importantly, the report highlights that *"It has revealed that from the investigations carried out, there are no major geological issues that would potential prevent the construction of the proposed development, provided the recommendations of this study are followed and further investigation is undertaken at a later stage where warranted"*.

#### 19.4.1 Geological conditions

The geological conditions of the site were found to comprise Tertiary Volcanics and Ordovician materials with associated residual soils. The surface soils were determined as predominantly silty sand that is fine grained and dense, as well as some gravel, cobble, and boulder basalt.

The residual soils were found to be a mix of clayey sand, gravel sand, sandy clay and clay, with some fine grained and some course grained gravel basalt, as well as some cobble basalt. The bedrock in the Tertiary Volcanics area is basalt of medium to high strength, and distinctly to extremely weathered, while the Ordovician bedrock is siltstone, ranging from low to medium strength, and also distinctly to extremely weathered.

URS note that *"no major faults of shear zones cross the site and the boundaries between the rock units are erosional"* and *"the Basalt and Siltstone are fractured on a regional scale, the Basalt due to cooling and the Siltstone due to folding and low grade metamorphism"*.

#### 19.4.2 Groundwater

In relation to groundwater conditions, URS did not observe any groundwater in the test pits or boreholes during drilling. However, URS emphasise that *"these observations were made at the time of the field investigation and actual groundwater levels may fluctuate significantly in response to seasonal effects, regional rainfall, and other factors that are not related to this investigation"*.

URS note that *"it is anticipated that the fractured Basalt and the underlying Tertiary sediments are typically water bearing and can form perched water tables on weathered Ordovician basement"*.

#### 19.4.3 Footing Systems

The conventional turbine foundations are reinforced concrete gravity footings founded 1.5 to 3 metres below the existing ground surface. URS found that the footings are sized such that the maximum allowable bearing pressure is not exceeded on one side of the footing while the other side of the footing experiences uplift loads.

URS identifies the potential foundation system suitable for the proposed wind turbines currently under consideration. The two main footing systems available to be utilised for the wind turbine generators in this project are:

- gravity footings; and
- anchored footings.

The use of these different types of footings would largely rely on the final turbine type selection and the localised conditions at the base of each individual turbine.

The report concludes that further geotechnical investigations at the turbine sites are recommended to guide footing designs.

#### 19.4.4 Excavation conditions

Based on the subsurface conditions assessed from the test pits, excavations for access roads, construction platform and foundations for the proposed wind turbines would likely encounter a 'variable thickness' of *"sandy clay/clayey sand with some basalt cobble and boulder, weathered basalt and siltstone bedrock"*.

URS note that some basalt boulders may be encountered when excavating within first few meters, which may require large plant or over excavation to remove.

Bulk excavation in the 'extremely to distinctly weathered' basalt or siltstone may be generally carried out using a heavy bulldozer or a heavy hydraulic excavator.

#### 19.4.5 Cut Batter Slope and Fill Batter Stability

All batter slopes will need to be assessed and confirmed on site as construction work proceeds. URS note that *"the stability of batter slopes within the basalt and siltstone rock will depend on the orientation and spacing of joints and defects, which should be assessed during construction phase"*. Temporary surface protection may be provided for temporary cuts subject to the frequency of rainfall during the construction period.

Fill batters up to 10m high may be supported by battering at '2Horizontal:1Vertical'. On sloping ground fill batters shall be keyed into the slope using terraces not less than 1.0 metre high and 1.0 metre wide.

#### 19.4.6 Re-use of In-Situ Materials

URS make the following comments on the potential re-use of excavated materials for engineered fill:

- *The performance of the residual sandy clay and clayey sand soils is likely to be sensitive to changes in moisture content.*
- *Careful moisture conditioning and compaction will be required to compact these materials effectively.*
- *The extremely to distinctly weathered basalt and siltstone rock may be re-used as engineered fill if, during excavation, handling and re-compaction, the rock breaks down to fragments in the order of 100mm or less.*



#### 19.4.7 Pavement sub-grade

The results of limited soaked California Bearing Ratio (CBR) tests conducted on selected sub-grade samples of residual sandy clay, sandy or gravelly sand, indicated CBR values of between 1.5% and 10%.

URS recommends that a CBR value of 2% to be adopted for sub-grade materials with a high clay content (such as where the Basalt outcrops), and a CBR value of 10% adopted for predominantly weathered siltstone bedrock in the design of flexible sealed or unsealed granular pavement.

#### 19.4.8 Slope Stability Assessment and Erosion

URS found slope instability issues along Abercrombie (Goulburn-Oberon) Road, adjacent to the southern central boundary of the site. The subject area and its hilly surrounds support 'mature, healthy native forest vegetation'. URS found that "*small slope failure has occurred during the investigation period*" but "*no evidence of major slope instability was observed*".

The report notes that slope instability issues are likely to be confined to steeply sloping land at the head of a gully. URS recommends that:

- *Access roads should be designed to stay on the ridge crests and remain clear of potential land slips.*
- *if crossing a potential land slip is required then the road formation should be designed to remove any potentially unstable material and found on stable bedrock.*
- *site works, including excavation and filling, be planned accordingly to reduce the risk of high concentrated surface water runoff.*

### 19.5 Mitigation

Based on the preliminary investigations on site, the report outlined the following recommendations and measures to mitigate any adverse geotechnical impacts:

- *further detailed subsurface geotechnical investigation and analysis be conducted to provide information for the detailed design of footings, access road, slope stability, and other associated infrastructure.*
- *access roads should be designed to stay on the ridge crests and remain clear of potential land slips.*
- *if crossing a potential land slip is required then the road formation should be designed to remove any potentially unstable material and found on stable bedrock.*
- *site works, including excavation and filling, be planned accordingly to reduce the risk of high concentrated surface water runoff.*
- *a Soil Erosion Management Plan be prepared as part of the Construction Environmental Management Plan.*

In relation to sub-grade preparation and fill replacement, URS recommend that the following site preparation be carried out for pavement sub-grade and fill placement beneath structures and footings using predominantly residual sandy clay and clayey sand soils and broken up basalt and siltstone rock:

- *Remove any soft, wet, and highly compressible material or topsoil material and organics.*

- Assess moisture contents of the bulk excavated soils and weathered rock. For compaction of any materials other than free draining sands, the moisture content should be in range OMC +/-2% (wet/dry), where OMC is the optimum moisture content at Standard Compaction.
- Test roll the complete surface of the sub-grade in order to detect the presence of any soft or loose zones, which should be excavated out and replaced with approved filling. Test rolling should be carried out with a smooth drum roller with a minimum static weight of 8 tonne.
- For pavements, compact the natural foundation soil to a minimum dry density ratio of 98% Standard for clay soils or a minimum density index of 75% for sand soils.
- For pavements, approved filling excavated from site, should be placed in layers not exceeding 250mm loose thickness, with each layer compacted to a minimum dry density ratio of 98% Standard or a minimum density index of 75% for filling greater than 0.5m below top of finished subgrade level. It is recommended that the final upper 0.5m of filling sub-grade be compacted to a minimum dry density ratio of 100% Standard or 80% density index. Where filling has a clay content, moisture content within the filling should be maintained within OMC -2% (dry) to OMC +2% (wet) during and after compaction.
- All filling beneath structures and footings should be compacted to a dry density ratio of at least 100% Standard or relative density index of at least 80%. This compaction should apply to all filling extending from a nominal horizontal distance of 2m at the edge of each structure with a nominal zone of influence of 1H:1V down and away from the proposed sub-grade level.
- Any compaction of silty or sandy clay foundation soils at or close to footing formation level should be sealed or covered as soon as practicable, to reduce the opportunity for occurrence of desiccation and cracking.
- Level 1 testing and supervision of filling, in accordance with AS3798, is recommended where the filling is to be used for support of structural loads, within the 2m horizontal distance and spread from structures as outlined above.
- All weathered rock, excavated from site for re-use beneath structures and as pavement sub-grade filling, should be processed so that individual particles are in the order of 100mm or less.
- All weathered rock, excavated from site for re-use beneath structures and as pavement sub-grade filling, should be processed so that individual particles are in the order of 100mm or less.
- Approved rock filling excavated from site should be placed in layers not exceeding 300mm loose thickness with care taken to minimise the occurrence of voids. Fine sands and dispersive clays should not be included in the fill due to the susceptibility to erosion.
- Where pavements are proposed over bulk rock filling, it is recommended that the rock fill be covered with a non-woven, needle punched, continuous filament polyester geofabric of sufficient strength to avoid punching failure.
- Place a minimum 0.5m thick cover of granular bridging on the geofabric in two layers of 250mm loose thickness, to provide sub-grade support for the pavement. The bridging layers should be compacted to a minimum dry density ratio of 100% Standard or 80% density index.
- Granular bridging or sub-grade filling should comprise engineered fill material.

In relation to potential water contamination, the CEMP will include measures to ensure that any contaminated soil encountered during any excavation works construction is appropriately managed and disposed of offsite.



**UNION FENOSA**  
WIND AUSTRALIA



PALING YARDS WIND FARM  
CHAPTER 20

# HYDROLOGICAL IMPACTS



## 20 Hydrological Impacts

### 20.1 Introduction

Environmental Resources Management Australia (ERM) Pty Ltd was commissioned by UFWA to assess the potential hydrological impacts in relation to the project. The full report undertaken by ERM Pty Ltd accompanies this report at **Appendix 14**.

A wind farm in a rural area can potentially impact on the hydrology of the area, notably on streams, drainage lines, dams and water catchments.

This hydrological assessment identifies potential water-related risks and appropriate management and mitigation measures to ensure that construction and operation of the project would not result in any unacceptable hydrological impacts.

### 20.2 Methodology

ERM undertook a site visit to assess the existing conditions on site and in the surrounding area and to identify potential water-related risks.

The assessment was prepared to:

- Address the DGRs relating to “Water Supply and Waterways”.
- Describe the existing soil and water conditions across the Project area;
- Identify the key potential soil and water impacts and assess associated risks;
- Identify likely impacts to waterway crossings and measures to minimise impacts;
- Provide details of waterway crossings;
- Identify appropriate management and mitigation measures. A Conceptual Soil and Water Management Plan is provided;
- Analyse water demands and supply options to determine whether an adequate and secure water supply is available for the life of the project;
- Identify the statutory (licensing) context of the water supply sources and assess potential impacts;
- Determine the balance of water supply based on expected construction and operation water requirements; and
- Where the project lies within the Sydney drinking water catchment area, assess potential impacts for water pollution consistent with the heads of consideration provided in *Drinking Water Catchments Regional Environmental Plan No. 1*.

### 20.3 Existing Environment

The site is characterised by a prominent elevated plateau landscape dissected by deep valleys. More than 50 ephemeral first order watercourses are present within the site, including the Abercrombie River. The watercourses flow generally towards the south and west, to the Abercrombie River. Refer to Section 2.3 ‘Surface Waters and Watercourse Crossings’ of **Appendix 14** for further information.

These first order watercourses exist within open depressions mostly without incised channels or defined bed or banks; they are for the most part stable and well vegetated with pasture grasses. There are very few instances of active erosion along watercourses.

The higher order watercourses also tend to be stable and well vegetated, with only minor areas of active erosion.

The Abercrombie River is present directly south of the site, flowing along the site's south-eastern boundary. It is 130 km in length and commences from Mount Werong in the east to the Wyangala Dam near Cowra to the west. The river is a tributary of the Lachlan, a significant river in central New South Wales, which it joins at Wyangala lake.

The Goulburn-Oberon (Abercrombie) Road crosses the Abercrombie River in the Abercrombie Gorge.

The site is located within the jurisdiction of two water sharing plans:

- Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012; and
- Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011.

The provisions of these two water sharing plans apply where water supply for the project is to be accessed via surface water and/or groundwater. Further discussion of these plans and how they relate to the project is provided in Section 3 'Water Licensing and Statutory Matters' of **Appendix 14**.

#### **20.4 Water Requirements and Supply Options**

The main water requirements during construction are expected to be for the following activities:

- Concrete production;
- Construction of roads and hardstands; and
- Dust suppression.

ERM estimates that the total water demand over the 12 month construction period will be approximately 30ML. Refer to Section 4.1 'Construction Water Demands' of **Appendix 14**. The total amount of water required for the project will depend on the time of year for construction, moisture present in the ground, final foundation design, and final road design. Water use during the operation of the project is negligible.

A number of water supply options have been identified for the water required during construction, the key options being:

- surface water collection from existing (or new) dams;
- groundwater pumping from existing (or new) bores;
- water abstraction from a nearby permanent water source (i.e. Abercrombie River); and
- tankering water to site.

ERM considers that the existing dams at Paling Yards and Mingary Park have the capacity to provide a good proportion of the project needs in a good rainfall year, but may be restricted in a dry year. Therefore ERM note that *"Construction of a new dam, particularly in a spring fed location, would greatly improve security of surface water supply and would meet the project needs under most rainfall scenarios"*.

ERM also note that *"groundwater supply from a new bore would be capable of supplying a large proportion of the project needs, and this could be considered in combination with use of surface water from existing dams"*.

While the Abercrombie River offers a highly secure source of water for road construction and dust suppression, the option of obtaining a Water Access License (WAL) from the Abercrombie River, while feasible, has logistical issues that require



further investigation. ERM consider that “*water extraction from the river would not be expected to diminish flows to the extent that environmental values or existing water users are adversely affected*”.

UFWA will consult with the NSW Office of Water in determining the preferred water supply option for the project and to ensure that all regulatory requirements are addressed and all required water access licences are obtained. Water access licensing would need to be addressed depending on the preferred option, and should be discussed with licensing officers at the NSW Office of Water. Refer to Section 3.1.6 ‘Water Access Licences’ of **Appendix 14** for further information.

## **20.5 Impact Assessment**

There is the potential that soil and water may be adversely affected during the construction, operation and decommissioning stages of a wind farm project.

As previously mentioned, ERM estimates that the total water demand over the 12 month construction period is 30ML. ERM assessed that the overall impact on water resources is expected to be negligible.

There are no instances where proposed access tracks are required to cross significant watercourses that would require construction of bridges or culverts. Further, there are no crossings over third order or higher watercourses.

The transmission line route options 1, 2 and 3 on **Figure 17 – Former Transmission Line Options Plan** cross a number of watercourses in approximately 17 locations. However, the Northern Transmission Line Route (option 4) does not cross any third order or higher watercourses. UFWA has selected option 4 as the preferred option due to its shorter length and reduced potential impacts. The potential hydrological impacts associated with the transmission line are therefore minimal..

Accordingly, ERM note that the potential soil and water impacts of the project relate mainly to:

- *“construction activities such as road and turbine construction;*
- *trenching for service installation;*
- *production and delivery of concrete (and managing concrete wastes);*
- *storage and handling, or incidental spills, of fuels, oils, concrete wastes and other hazardous substances; and*
- *inadequate management of the site compound facility’s waste water and sewage runoff”.*

As identified in Section 5 ‘Potential Impacts to Soil and Water’ of **Appendix 14**, potential water-related impacts are primarily associated with the construction stage of the project. Once operational, the water usage requirements and potential impacts on water due to the project will be minimal.

Through appropriate management of construction activities, such as erosion and sediment control, hazardous material storage and handling, and spill emergency response and clean-up procedures, ERM note that potential water-related impacts could be contained on site and prevented from impacting watercourses.

These measures will be outlined in a detailed Soil and Water Management Plan (SWMP) to be prepared prior to construction.

The installation of wind turbine infrastructure is focused on high elevation areas, avoiding drainage lines. All disturbance areas associated with turbine construction

would be located greater than 20 metres from all watercourses and would be significantly further away from third order and higher order watercourses.

It is proposed that water recycling would be implemented during the construction phase. A stormwater recycling system will be provided with capacity sufficient to store runoff and to reuse collected wastewater. This would include the capture of water at the wash-down areas in the entrance gates and reuse for dust containment on unsealed access tracks and the watering of rehabilitated areas. Refer to Section 6 'Conceptual Soil and Water Management Plan' and Section 8 'Mitigation Measures' of **Appendix 14** for further details.

ERM's qualitative risk assessment found that "*the overall potential risks to water and soils are relatively minor*".

ERM recommends that the identified risks can be adequately managed through the implementation of appropriate preventative and management measures as part of the construction environmental management plan (CEMP) and SWMP. ERM provides a conceptual SWMP in Section 6 'Conceptual Soil and Water Management Plan' of (**Appendix 14**).

Based on the nature of the project and management techniques to be implemented, it is not expected that any of the local water bodies would be unreasonably impacted by the project.

## **20.6 Transmission Line Impacts**

ERM identifies in Section 7.1 'Sydney Catchment Area and REP1' of **Appendix 14** that approximately 9 km of the southernmost section of the transmission line route comprising the common part of Options 1, 2 and 3, occurs within the hydrological catchment for Sydney's drinking water supply (*Drinking Water Catchments Regional Environmental Plan No 1 (REP1)*).

It is important to note that, following further assessment, these connections options for the transmission line route are no longer proposed as the northern transmission line option (Refer to **Figure 13** and option 4 on **Figure 17**) has been identified as the preferred option.

ERM nonetheless assesses the impacts of transmission line route Options 1, 2 and 3 on **Figure 17** under REP1 and notes that, were these options to be implemented, potential water-related impacts could be contained on site and prevented from reaching watercourses through appropriate management of construction activities, to be outlined in a detailed SWMP prepared prior to the construction phase.

ERM accordingly concludes that the project complies with Clause 28(3)(b) of the REP1 and would maintain a 'neutral' or 'beneficial' effect on water quality.

## **20.7 Mitigation**

ERM recommends the following management and mitigation measures to address potential soil and water impacts:

- prepare a detailed Soil and Water Management Plan (SWMP) prior to construction commencing. The SWMP should be prepared by a suitably qualified person, such as a soil conservationist;
- prepare Progressive Erosion and Sediment Control Plans as the project progresses to address management requirements at individual work sites;
- design and construct the wind farm and transmission line to minimise land disturbance and therefore reduce the erosion hazard;

- stage construction activities to minimise the duration and extent of land disturbance;
- manage topsoil resources to minimise the risk of erosion and sedimentation, and maximize reuse of topsoil during rehabilitation;
- divert upslope (clean) stormwater around the disturbed site capture sediment-laden runoff from within the disturbed site for diversion to sediment control devices;
- rehabilitate the site promptly and progressively as works progress;
- inspect and maintain erosion and sediment control devices for the duration of the project;
- avoid construction of new vehicle watercourse crossings;
- if need, any water crossings would be designed to minimise impacts on existing banks, water flow, animal passage and on the movement of flows.
- avoid land disturbance within 20 m of minor streams (first and second order watercourses) and 40 m of third order or higher watercourses;
- ensure appropriate procedures are in place for the transport, storage and handling of fuels, oils and other hazardous substances, including availability of spill cleanup kits;
- minimise disturbance during transmission line construction by using existing access tracks and roads, and avoiding construction of a permanent access track along the transmission line easement;
- avoid over-extraction of surface water or groundwater to prevent adverse impacts on environmental flows and water availability for existing licensed users;
- obtain any necessary water access licenses; and
- ensure appropriate stormwater, collection, treatment and recycling at the concrete batch plant, in accordance with relevant best practice guidelines and any requirements of the NSW Office of Environment and Heritage.

The above list of mitigation measures is included in Section 8 'Mitigation Measures' of **Appendix 14**.

Water would be reused where possible to reduce water consumption. No water would be sourced from creeks or rivers without relevant permits being sought.

Dust suppression would be carried out as required through either watering or chemical means (via environmentally friendly polymer based additives to the water).

A Spill Control Plan would be developed, as a sub-plan of the Construction Environmental Management Plan.

With the mitigation measures outlined in this report, and given the site characteristics, the overall impact on water resources is expected to be negligible.



**UNION FENOSA**  
WIND AUSTRALIA



PALING YARDS WIND FARM  
CHAPTER 21

# CUMULATIVE EFFECTS



## 21 Cumulative Effects

### 21.1 Introduction

The New South Wales Central Tablelands and NSW/ACT Border Region has been identified as being highly suitable for wind turbines and the generation of renewable energy. As a result:

- other wind farms are proposed, approved or already operating in the wider region;
- companies are active in the wider region identifying suitable future wind farm sites; and
- the NSW Government has included Paling Yards within a designated renewable energy precinct.

When a number of wind farms are proposed or constructed in an area, there is potential for the impacts of one project to combine with the impacts of another to generate greater collective impacts than the individual projects themselves.

Cumulative effects are the total or combined impacts arising from a number of connected or separate projects, affecting the same environmental issue.

Cumulative impacts are defined as *“the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (CEQ, 2010).*

This chapter assesses the potential cumulative impacts of the project with surrounding proposed, approved and operating wind farms in the locality.

### 21.2 General impacts

Assessment agencies and the wind industry itself acknowledge the difficulties associated with undertaking cumulative impact assessments, due to the lack of information about the final form and expected impacts of proposed or approved wind farms, and whether surrounding wind farm proposals would actually proceed.

It is not uncommon for a permitted wind farm to sit idle for many years before construction commences, if at all. A decision to refuse a particular wind farm based on the unacceptable cumulative impacts of it together with another nearby wind farm relies on the certainty that the adjoining project would proceed.

Established planning practice does not allow for the development of a wind farm project to be conditional on the abandonment of another.

The potential for cumulative impacts arising out of a proposal is dependent on the type of impact and the proximity of the projects. For example, shadow flicker has a very localised impact, and therefore requires two very closely placed wind farms in order for cumulative impacts to arise.

Flora and fauna impacts, however, are more regional in that a large number of wind farms in a given region may give rise to impacts to threatened species that depend on the wider region for habitat. Similarly, visual impacts of a wind farm can extend tens of kilometers and, when viewed in conjunction with another wind farm, can result in unacceptable cumulative impact.

A number of wind farms in the region either exist or are in various stages of the approvals process.

The greatest potential for cumulative impacts arising from the project is with the wind farms closest to the site, being the proposed Golspie Wind Farm and the approved Taralga Wind Farm, approximately 25km and 28km south of the site respectively. All other wind farms (proposed, approved or operating) are greater than 30km from the site.

Golspie Wind Farm is located approximately 25km south-west of the site. It is currently proposed, and includes upward of 100 turbines and a total capacity of 250 MW.

Taralga Wind Farm is located approximately 28km south-east of the site. It is an approved wind farm, and includes 62 turbines and a total capacity of 186 MW.

The project is located within a generally isolated location, and given that all wind farms (proposed, approved or operating) are a distance of approximately 25km or greater from the site. As a result, it is not anticipated that any significant cumulative impacts will occur due to the project.

### **21.3 Wind farm developments in the Central Tablelands**

The NSW Department of Environment, Climate Change and Water (DECCW) has established six Renewable Energy Precincts. Precinct 4: NSW/ACT Border Region (within which the site lies) is home to several wind farms, with a number of others either approved or in planning stages (refer to **Figure 7** in **Chapter 3 – Site Context**).

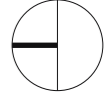
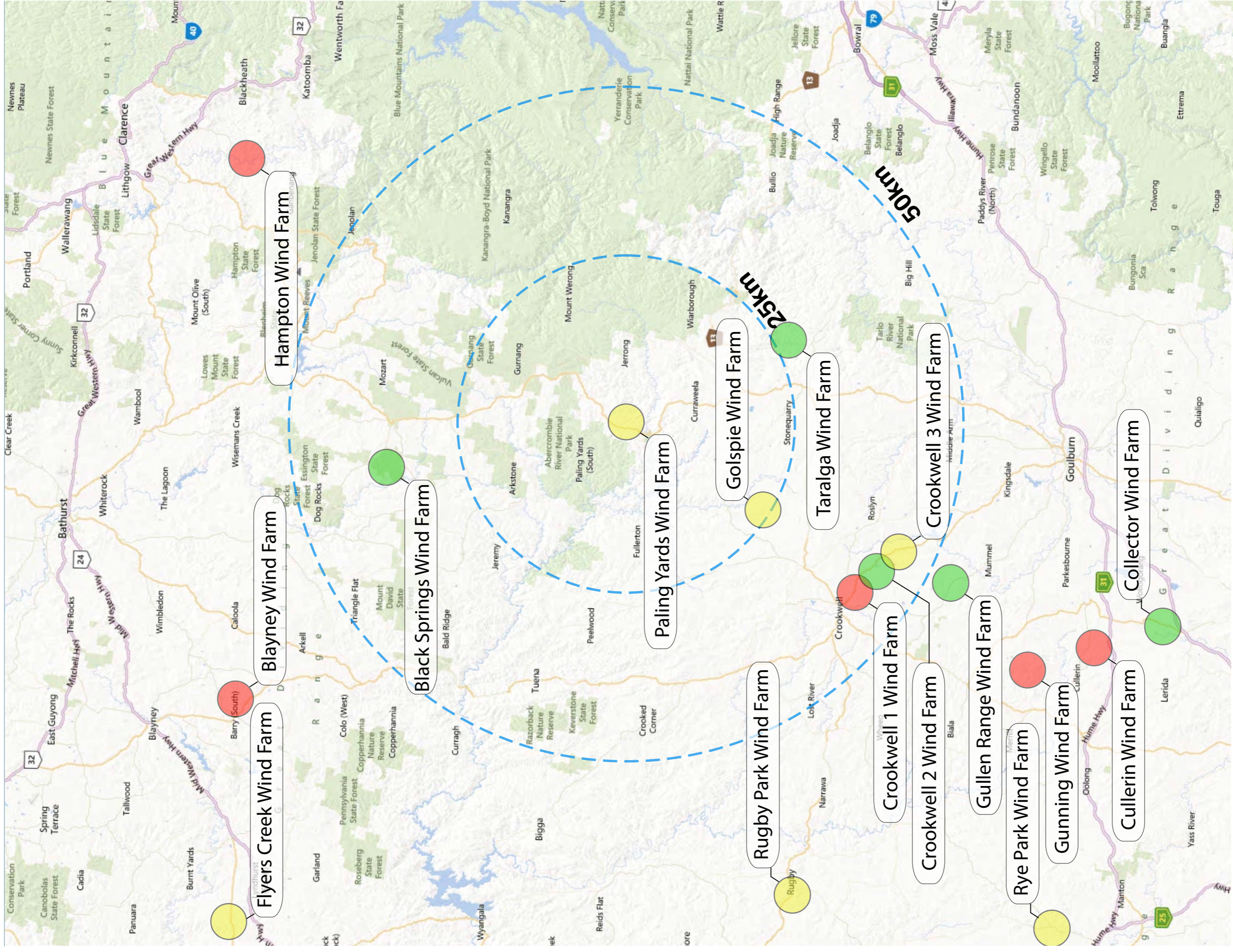
Each of the six Renewable Energy Precincts precincts have been established as locations for the State's future wind power investment due to the area's suitability for the technology.

There are currently 14 proposed wind farms, ten approved wind farms and five wind farms in operation in NSW. Of these 29 wind farms, none are located within a 20 km radius of the site, and only one is located within a 25km radius, being the proposed Golspie Wind Farm.

The table below summaries wind farms within the region and includes information on the number of turbines, the status (proposed, approved or in operation) and the proponent for each of the wind farms.

Please refer to **Figure 60 – Cumulative Impacts Plan** for the project locations.





LEGEND

- Proposed
- Approved
- In Operation

**Figure 60** Cumulative Impacts Plan



**Table 28** Surrounding wind farms

Wind Farm	Proponent	No. of Turbines	Site Area	Total Capacity	Status
Adjungbilly Wind Farm	Wind-CBD Adjungbilly Pty Ltd	26	*	39 MW	DGRs lapsed
Birremer Wind Farm	Epuron Pty Ltd	60-80	*	90-272 MW	Proposed
Black Springs Wind Farm	Wind Corporation Australia Ltd	9	635ha	18.9 MW	Approved
Blayney Wind Farm	Eraring Energy	15	*	9.9 MW	In Operation
Boco Rock Wind Farm	Boco Rock Wind Farm Pty Ltd	67	11,750 ha	113 MW	Approved
<b>Bodangora Wind Farm</b>	<b>Infigen Energy</b>	<b>33</b>	<b>*</b>	<b>99 MW</b>	<b>Approved</b>
Capital Wind Farm	Renewable Power Ventures Pty Ltd	67	1,200ha	140 MW	In Operation
Collector Wind Farm	Transfield Services (Australia)	55	3,300ha	182 MW	Approved
Conroy's Gap Wind Farm	Origin Energy	15	*	30 MW	Approved
Crookwell 1 Wind Farm	Eraring Energy Pty Ltd	8	*	4.8 MW	In Operation
Crookwell 2 Wind Farm	Union Fenosa Wind Australia Pty Ltd	46	2,088ha	92 MW	Approved
Crookwell 3	Crookwell Development Pty Ltd	30	1,500ha	54-102 MW	Proposed
Cullerin Wind Farm	Origin Energy Pty Ltd	15	*	30 MW	In Operation
Flyers Creek Wind Farm	Flyers Creek Wind Farm Pty Ltd	44	*	80-132 MW	Proposed
Glen Innes Wind Farm	Glen Innes Wind Power Pty Ltd	27	*	54-81 MW	Approved
Golspie Wind Farm	Wind Prospect CWP Pty Ltd	100	*	250 MW	DGRs lapsed
Gullen Range Wind Farm	Epuron Pty Ltd	73	*	165.5 MW	Approved
Gunning Wind Farm	Acciona Energy	31	*	46.5 MW	In Operation
Hampton Wind Farm	Hampton Wind Park Company	2	*	1.2 MW	In Operation
Rugby Wind Farm	Suzlon Energy Australia Pty Ltd	50	*	160 MW	Proposed
Rye Park Wind Farm	Epuron Pty Ltd	80-110	*	120-374 MW	Proposed

Wind Farm	Proponent	No. of Turbines	Site Area	Total Capacity	Status
Sapphire Wind Farm	Wind Prospect CWP Pty Ltd	159	*	397 MW	Approved
Silverton Wind Farm	Silverton Wind Farm Developments Pty Ltd	598	*	1000 MW	Approved
Taralga Wind Farm	RES Australia Pty Ltd	51	*	107 MW	Approved
White Rock Wind Farm	Epuron Pty Ltd	119	*	357 MW	Approved
Woodlawn Wind Farm	Woodland Wind Pty Ltd	23	*	46 MW	In Operation
Yass Wind Farm	Epuron Pty Ltd	152	*	266-500 MW	Proposed

\* Information not available

#### 21.4 Visual Impacts

It is acknowledged that a cumulative landscape and visual impact may result from a wind farm being constructed in conjunction with other nearby wind farm developments.

However, due to the distance of the closest wind farm being approximately 25km from the site, it is not anticipated that any significant cumulative visual impacts will occur as a result of the project.

The LVIA prepared by Green Bean Design determined that the project is unlikely to result in any significant 'direct', 'indirect' or 'sequential' cumulative visual impact and is unlikely to significantly increase the level of visual impact. The LVIA notes that;

- *'Direct' cumulative visual impacts may occur where two or more wind farms have been constructed within the same locality, and may be viewed from the same view location simultaneously.*
- *'Indirect' cumulative visual impacts may occur where two or more wind farms have been constructed within the same locality, and may be viewed from the same view location but not within the same field of view (i.e. the viewer has to turn their head in order to view both wind farms).*
- *'Sequential' cumulative visual impacts may arise as a result of multiple wind farms being observed at different locations during the course of a journey (e.g. from a vehicle travelling along a highway or from a network of local roads), which may form an impression of greater magnitude within the construct of short term memory.*

The report found that there are opportunities for intervisibility between the project turbines and other proposed, approved or operating turbines from discrete elevated and cleared ridgeline areas to the east and south of the project. The assessment considered the Crookwell 1, 2 and 3 Wind Farms, Gullen Range Wind Farm, Golspie Wind Farm and Taralga Wind Farm in particular.

The assessment found that the opportunity for 'direct' or 'indirect' views to other approved wind farms is limited for most of the residential dwellings within the Paling Yards Wind Farm 10km viewshed due to residential dwelling position and orientation and the distribution of dense and scattered tree cover and undulating topography.

The LVIA concluded that:

- *The project is unlikely to result in any significant 'direct', 'indirect' or 'sequential' cumulative visual impact and is unlikely to significantly increase the level of visual impact that has been determined for the nominated view locations in relation to the project development.*
- *The potential for the occurrence of 'direct' and 'indirect' cumulative visual impact is mitigated to a degree by the screening or partial filtering of views toward approved and existing wind farms.*
- *Sequential views from local roads would be mitigated to some extent by undulating landform and tree cover alongside road corridors.*

As tall structures, some of the wind turbines may (depending on the legislation at the time of construction) require obstacle lighting. The LVIA noted that only a relatively small number of residential dwellings within 5km of the lit turbines would experience some degree of potential visual impact. The impact can be significantly reduced by curtains or blinds being drawn at night time.

Furthermore, the intensity of the visual impact of night time lighting would tend to *"diminish over 3 to 4km from the lit turbines, and would be more likely to be screened by topography and vegetation surrounding individual residential dwellings"*.

The LVIA found that night time lighting associated with the project is unlikely to have a significant visual impact on the majority of view locations.

## **21.5 Flora and Fauna Impacts**

Significant environmental impact has occurred in the vicinity of the site due to the clearing of native vegetation for grazing and subsequent settlement. The vegetation across the site is represented for the most part by cleared grazing paddock, most of which is highly disturbed.

The wind turbines are proposed to be located primarily on cleared grazing lands, as are the access roads and other associated infrastructure. Some vegetation clearance is required for turbines and tracks, but not in areas deemed to be significant.

As the closest wind farm is more than 25km away, the cumulative ecological impacts arising from the project in conjunction with other nearby wind farms is considered low.

## **21.6 Noise Impacts**

Due to the distance of the closest wind farm being approximately 25km from the site, it is not anticipated that any significant cumulative noise impacts will occur as a result of the project.

## **21.7 Aeronautical Impacts**

It is acknowledged that an increase in the number of wind farms in a given area would increase the number of hazards that pilots must avoid during flights. Therefore additional wind farms in the region can create a cumulative aeronautical impact.

The risk is mitigated through notification to the relevant authorities in order to include the wind farm layout on local aeronautical mapping systems.

The aeronautical assessment prepared by Aviation Projects Pty Ltd found that the project is relatively remote from other existing or approved wind farms. According to DoPI NSW Wind Farm map dated 18 April 2011 and accessed 21 October 2011, the nearest approved wind farm is located at Taralga, some 25 km distant.

For this reason it has been assessed “that there is no significant cumulative impact arising from nearby existing or approved wind farms”.

### **21.8 Traffic Impacts**

It is acknowledged that there is potential for cumulative traffic impacts arising out of the construction phase of a wind farm project.

It is considered that the highways and roads between the ports (Port Kembla and the Port of Newcastle) and the site have sufficient capacity to cater for the project, as well as a number of other wind farms in the region to be built without compromising the road network.

An analysis of the site access routes was conducted in the transport impact assessment (TIA) prepared by URS, which found that;

*“Traffic generated by this proposal is not considered to have a significant impact on the existing transport network, with current operation anticipated to remain at an acceptable Level of Service for key roads”.*

Therefore, it is not anticipated that significant cumulative impacts will occur as a result of the project.

### **21.9 Economic and Social Impacts**

The cumulative social and economic impacts arising out of several wind farms within a region can be both positive and negative.

The cumulative economic impacts are outlined below:

- if a number of wind farms are constructed sequentially then this allows for an industry to be developed in the region – generating ongoing work and continuing skill improvement for local people;
- greater wind farm development in the region increases the opportunity for local business to capture more of the investment locally;
- tourism generated by wind farms, and visits to viewing platform such as Crookwell I, are likely to increase with greater wind farm development; and
- greater diversification of the local economic base away from agriculture.

The cumulative social impacts are outlined below:

- the building of several successful wind farms in the region can decrease fear associated with an unknown infrastructure development;
- multiple wind farms can add to the annoyance of those opposing any single wind farm;
- there is potential for multiple wind farms to alter the character of the region – whilst some residents and visitors may consider wind farms positively add to the character of the region others may consider that several wind farms in the region are a negative addition to the character; and
- multiple wind farms can assist in the positioning of the region as a leader in renewable energy and the generation of new opportunities for local residents.

**UNION FENOSA**  
WIND AUSTRALIA



PALING YARDS WIND FARM  
CHAPTER 22

**CONSULTATION**





## 22 Consultation

### 22.1 Introduction

The proponent understands the need to effectively communicate with residents and all relevant stakeholders through a program of community consultation. Further, the proponent is also required to consult with communities prior to development of the project under the:

- Draft National Wind Farm Guidelines (July 2010);
- Draft NSW Wind Farm Guidelines (December 2011);
- Director General's Requirements (6 May 2010);
- Supplementary Director General's Requirements (16 August 2011);
- Oberon Shire Council DCP requirements

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by the proponent to undertake public consultation and make recommendations for future actions.

The following scope of work was undertaken by ERM:

- attendance at an onsite inception meeting organised by the proponent to obtain an overview of the project, an appreciation of the site, its setting and location, timetables for planned activities and preliminary identification of anticipated issues and impacts;
- reporting on the Community Engagement Strategy and activities undertaken by the proponent, ERM and other members of the environmental assessment team;
- reporting of surveyed community attitudes;
- a baseline review of publicly available information to gain an understanding of existing socio-economic conditions in the local area and the potential challenges for developing the project; and
- analysis of the baseline data to determine the potential project impacts and to systematically assess their significance, and reporting of the findings of this research and assessment;

The full socio-economic impact assessment report, which considers community consultation, is found at **Appendix 5**.

The proponent has undertaken a comprehensive program of stakeholder engagement and community consultation throughout the application process in accordance with the DGRs and supplementary DGRs. The consultation program has been guided by the Community Engagement Strategy which sets out how to engage with all identified stakeholders during the project.

Consultation undertaken to date for the project has taken the form of direct face-to-face engagement, phone and email dialogue, website information, and the distribution of a project newsletter.

A key step in the stakeholder identification process and community consultation was undertaken through the door-knock consultation and surveys carried out by representatives of the proponent and an ERM representative.

## 22.2 Objectives

The key objectives of the Community Engagement Strategy are to:

- identify stakeholders that should be engaged in the consultation process;
- identify the appropriate methods and extent of engaging with identified stakeholders;
- ensure that key stakeholders are aware of the approval process;
- ensure that the community and stakeholders are informed about the project through the provision of factual project information;
- identify the potential issues or concerns that stakeholders and the community raise in relation to this project; and
- provide feedback to the community and stakeholder enquiries and explain that how their input will influence the final project design.

## 22.3 Community Engagement Activities

As part of project, the consultation program involves:

- consultation with State Government agencies and other government bodies;
- consultation with Oberon Shire Council and Upper Lachlan Shire Council;
- identification of stakeholder groups (which are listed in **Table 29** below);
- consultation with landholders immediately surrounding the boundaries of the site;
- newsletters widely distributed in the region (to all registered addresses in the Bathurst, Oberon, Crookwell, Goulburn and Taralga post offices districts, to relevant government agencies and to anyone else who registered interest in the project);
- advertisements in local newspapers;
- a door-knock consultation and survey;
- consultation with the local community;
- a second independent round of consultation with the community/stakeholders.
- responding to queries via the information line and email;
- compilation of the community engagement material and outcomes;
- a media release informing the community about the establishment of a Community Consultative Committee;
- hosting of a widely advertised Information Day for residents and other stakeholders during the public exhibition period; and
- providing responses to the submissions received during public exhibition of the application.

Refer to Annex A of the socio-economic report at **Appendix 5** of this report for the full *Union Fenosa Wind Australia Stakeholder Consultation & Engagement Strategy for Paling Yards Wind Farm* as well as **Table 29** below.

The consultation activities commenced many years ago at the beginning of the project in 2004 and are proposed to continue throughout the various phases of the project, including during the operation of the project. The consultation timeline will be dynamic

and will be updated as required to suit the planning process and feedback from key stakeholders.

Further details of the engagement and consultation program for this project are outlined below.

#### 22.3.1 Stakeholder engagement

The stakeholders identified and consulted in this project include project involved landowners, local residents within a 5km radius of the site, the wider communities of Oberon Shire Council, Upper Lachlan Shire Council, relevant government departments and agencies, organisations, and community groups. The socio-economic report details all of the stakeholders engaged, and is summarised in **Table 29** of this report.

Planning for the proposed project commenced in 2002 and included initial consultation with the key stakeholders, primarily with the owners of land on which the proposed wind farm is situated. The scope of consultation was then broadened to include the local councils, government agencies, neighbouring landowners and the wider local community.

In accordance with the Aboriginal Cultural Heritage Consultation requirements for proponents 2010 (OEH 2010) and its predecessor guidelines, the relevant aboriginal stakeholders (organisations and individuals) were identified and contacted via direct mail.

The consultation with stakeholders (refer to **Table 29 – Stakeholders**) that has taken place prior to the submission of this EA included:

- telephone discussions (including with one local resident prior to the door-knock and two local residents after the door-knock on the 1800 information line, and with the majority of government departments, agencies and organisations listed in the table below);
- emails (including two emails to the project email address from local residents advising of different addresses to which correspondence should be sent, and to the majority of government departments, agencies and organisations listed in the table below);
- letters (other than community newsletters) (including residents within 5km of the site who were absent during the door-knock and some government departments and organisations);
- publication and distribution of a newsletter in the region in May 2011;
- advertisements in local newspapers regarding the upcoming door-knock (17, 19, 24 and 26 May, 2011 in the Crookwell Gazette; and 19 and 26 May, 2011 in the Oberon Review).
- a door-knock consultation survey, whereby the proponent visited households within a 5 km radius of the proposed wind farm and along the transmission line route options on 30 and 31 May and 1 June 2011;
- a second round of door-knock consultations on 5 and 6 July 2011;
- responses to further information requests from some residents in relation to aspects of the proposal;
- formal briefings and meetings with heads of relevant State and local government departments, councillors, council officers, and relevant government agencies and organisations (refer to the list of stakeholders in the table below); and

- a media release advertised in local newspapers regarding nominations for the Community Consultative Committee (9 and 23 October, 2012 and 6 and 20 November, 2012 in the Crookwell Gazette; 17 and 31 October, 2012 and 14 November, 2012 in the Goulburn Post; and 11 and 25 October, 2012 and 8 and 22 November, 2012 in the Oberon Review).

Additional stakeholder engagement and consultation activities that are proposed to take place following the lodgement of this EA include:

- Warrabinga Native Title Claimants Aboriginal Corporation - included in the list for consultation as a registered aboriginal stakeholder for this project and will be included in the consultation process for additional field surveys post approval and preparation of the Cultural Heritage Management Plan (CHMP).
- Mr Bill Allen (as an individual also representing the Muri Clan Group of the Wiradyri People) - included in the list for consultation as a registered aboriginal stakeholder for this project and will be included in the consultation process for additional field surveys post approval and preparation of the CHMP.
- publication and distribution of another newsletter in the region providing an update on the proposal and the process;
- responses to website, phone and written requests for further information in relation to aspects of the proposal;
- meetings with government agencies (refer to the table below);
- hosting of a Community Information Day, whereby interested members of the community have the opportunity to talk directly with the proponent and the consultant team; and
- requesting and responding to submissions in the public exhibition period.

The individual issues raised in the engagement and consultation process have been valuable in guiding the development of the proposed wind farm. Refer to **Chapter 22.4** for the details on the key issues identified and the responses to these issues.

Since 2010, a number of revisions to the site plan and turbine layout have been specifically influenced by stakeholder input, as well as by the specialists studies completed, including:

- Selection of the northern transmission line as the least impact option;
- Removal of the southern substation;
- Removal of turbine P26 in response to the findings of the noise assessment to reduce potential noise impact for the project involved landowners;
- Removal of turbines P2, P6, and P7 in response to the findings of the flora and fauna assessment and the Conservation Agreement in place for the Box Gum Grassy Woodland project as part of the Commonwealth Government's Environmental Stewardship program;
- Removal of turbine P11;
  - removal of associated crane pad from the remnant area; and
  - removal of associated 1,184m of access track of which 353m were in the remnant area.
- Relocation of turbine P10 to 184m south of original location;
  - removing 184m of access track from the remnant area.

- Relocation of turbine P13 to 70m south-east of original location;
  - removing 77m of access track from the remnant area; and
  - turbine and crane pad will be located in a more cleared area, hence reducing the vegetation clearing by approximately 50% for this location.
- Relocation of turbine P14 to 86m south-east of original location;
  - removing 101m of access track from the remnant area; and
  - turbine and crane pad will be located closer to the edge of the remnant area, hence reducing the vegetation clearing by approximately 20% for this location.
- Micrositing of the turbines to minimise local impacts;
- Changes to the location of:
  - several access tracks to further utilise the existing farm tracks and reduce the infrastructure footprint;
  - underground cabling to provide more efficient transfer of electricity and reduce the infrastructure footprint;
  - an access road to separate the wind farm construction vehicle traffic from the access used by the project involved landowners;
  - selecting a smaller wind turbine envelope size for specific locations to reduce potential noise and shadow flicker impact for the project involved landowners;
  - substations to reduce length of overhead powerlines; and
  - powerline poles for the northern transmission line route to minimise and avoid where possible the removal of native vegetation.

Refer to **Figure 10 – History Plan** for further details.

The project team intends to continue the consultation process through the planning, construction and operation of the project. It is proposed that the consultation process would be reviewed to assess its effectiveness over these stages.

The following modes of consultation will continue to be used throughout the planning process:

- face-to-face meetings; and
- regular project liaison including emails and telephone calls.

DoPI is the main government agency in the approvals process. Regular liaison with the DoPI will continue to occur throughout the assessment process.

**Table 29** outlines the parties that have been consulted to date.

**Table 29 Stakeholders**

Sector	Relevant Persons
Local Community	<ul style="list-style-type: none"> <li>▪ Landowners who would host turbines on their land</li> <li>▪ Landowners within a 5km radius of the wind farm</li> <li>▪ Landowners along transmission line route options</li> <li>▪ Other interested community members</li> <li>▪ Aboriginal stakeholder individuals, including Mr. Bill Allen (as an individual also representing the Muri Clan Group of the Wiradyri People)</li> </ul>
Government Agencies	<ul style="list-style-type: none"> <li>▪ Civil Aviation Safety Authority (CASA)</li> <li>▪ Commonwealth Department of Defence</li> <li>▪ Lachlan Catchment Management Authority</li> <li>▪ Land and Property Information (LPI)</li> <li>▪ Livestock Health and Pest Authorities State Management Council</li> <li>▪ NSW Crown Lands Division</li> <li>▪ NSW Department of Planning and Infrastructure (DoPI)</li> <li>▪ NSW Department of Trade and Investment (formerly the Department of Industry &amp; Investment)</li> <li>▪ NSW National Parks</li> <li>▪ NSW Office of Environment &amp; Heritage (OEH) (formerly the Department of Environment, Climate Change &amp; Water)</li> <li>▪ NSW Office of Water (formerly the Department of Water &amp; Energy)</li> <li>▪ NSW Police Force Telecommunications</li> <li>▪ NSW Rural Fire Service (RFS)</li> <li>▪ Oberon Shire Council</li> <li>▪ Office of the Registrar, Aboriginal Land Rights Act 1983 (NSW) [Registrar of Aboriginal Owners]</li> <li>▪ Roads and Maritime Services (formerly the Road and Traffic Authority)</li> <li>▪ Sustainability Environment Water Population and Communities (SEWPAC) (formerly the Department of the Environment, Water, Heritage and the Arts)</li> <li>▪ Sydney Catchment Authority</li> <li>▪ Upper Lachlan Shire Council</li> </ul>
Non-Government Agencies and Organisations	<ul style="list-style-type: none"> <li>▪ Aboriginal stakeholder organisations</li> <li>▪ Airservices Australia (AA)</li> <li>▪ Aerial Agricultural Association of Australia (AAAA)</li> <li>▪ Ambulance Service of NSW</li> <li>▪ Bureau of Meteorology (BOM)</li> <li>▪ Dhuuluu-Yala Aboriginal Corporation</li> <li>▪ Endeavour Energy</li> <li>▪ Essential Energy</li> </ul>

Sector	Relevant Persons
	<ul style="list-style-type: none"> <li>▪ Gundungurra Aboriginal Heritage Association Inc</li> <li>▪ Gundungurra Tribal Council Aboriginal Corporation</li> <li>▪ Local Aboriginal Land Councils (LALCs)</li> <li>▪ Local Environmental Group(s)</li> <li>▪ Local Community Group(s)</li> <li>▪ Industry Groups (ICNSW)</li> <li>▪ Local tourism Organisation(s)</li> <li>▪ Mineral exploration and mining title holders</li> <li>▪ Mingaan Aboriginal Corporation</li> <li>▪ Mooka Traditional Owners Council</li> <li>▪ Murray River Regional Telecommunications Company Ltd</li> <li>▪ Native Title Services Corporation</li> <li>▪ North-Eastern Wiradjuri</li> <li>▪ State Emergency Services</li> <li>▪ St John Ambulance Australia</li> <li>▪ Telstra</li> <li>▪ TransGrid</li> <li>▪ Warrabinga Native Title Claimants Aboriginal Corporation</li> <li>▪ Wiradjuri Council of Elders</li> <li>▪ Wiradjuri Interim Working Party</li> <li>▪ Wiradjuri Traditional Owners Central West Aboriginal Corporation</li> <li>▪ Other Organisation(s)</li> </ul>
Media	<ul style="list-style-type: none"> <li>▪ Oberon Review</li> <li>▪ Crookwell Gazette</li> <li>▪ Goulburn Post</li> </ul>

### 22.3.2 Project Inception

The proponent approached landowners in the local area during the project inception in 2002 with a proposal to host a monitoring station to assess the suitability of the area and determine whether there was an adequate and consistent wind resource to support a commercial wind farm.

After determining that the wind conditions in the area were suitable for a wind farm, the proponent commenced consultation with property owners between 2004 and 2006 to establish their interest in being involved in the project.

The discussions with landowners over leasing arrangements were confidential, which is a standard procedure for wind farm and other large commercial projects.

Once the project gained some certainty, broader consultation was also undertaken with identified stakeholders in the local area and the greater region, as outlined below. Up until that point, the project may not have proceeded.

### 22.3.3 Consultation with the local community

The proponent has conducted considerable consultation with the landowners hosting turbines (project involved residences), landowners within a 5km radius of the site, landowners hosting/adjacent to transmission line route options, and other interested residents of the wider community (refer to **Table 29**), including through:

- Door-knock consultation meetings in May, June and July 2011,
- A community newsletter in May 2011,
- Advertisements in local newspapers regarding the upcoming door-knock (17, 19, 24 and 26 May, 2011 in the Crookwell Gazette; and 19 and 26 May, 2011 in the Oberon Review),
- Advertisements in local newspapers regarding the establishment and nominations for the Community Consultative Committee (9 and 23 October, 2012 and 6 and 20 November, 2012 in the Crookwell Gazette; 17 and 31 October, 2012 and 14 November, 2012 in the Goulburn Post; and 11 and 25 October, 2012 and 8 and 22 November, 2012 in the Oberon Review),
- Direct mail on 16 May 2013 to listed Aboriginal stakeholder individuals with a request for confirmation of their interest to register as an Aboriginal stakeholder for the project, and
- Website information.

In addition, landowners agreeing to host turbines (project involved residences) have received regular correspondence in regards to various issues such as preliminary assessments, impact findings and issues related to the project in general.

The local community will continue to be informed and involved in the project through community newsletters and a community information day session.

### 22.3.4 Consultation with government and non-government agencies and organisations

The proponent has conducted considerable consultation with the relevant government agencies, non-government agencies and organisations, including all those listed in the DGRs, in relation to the project (refer to **Table 29**), by way of:

- phone calls;
- emails;
- letters;
- face-to-face meetings;
- advertisement in local newspapers;
- media release; and/or
- website information.

The consultation with government and non-government agencies and organisations served primarily to:

- inform the agency about the project;
- encourage the agency to review the project details and contact the proponent with any concerns or feedback; and
- encourage the agency to register for participation in the consultation process.



All issues raised or feedback on the project was documented, and is addressed in the relevant section of this EA. A summary of the discussions with each stakeholder and the proponent's response is provided in Table 2.1 of the socio-economic report at **Appendix 5**.

DoPI and Oberon Shire Council will continue to be directly involved throughout the consultation process through regular project liaison, community newsletter distributions, and informed of a community information day session. The remaining government agencies (refer to **Table 29**) will continue to be provided with all of the relevant project information in order to be able to provide feedback and will be informed of a community information day session.

The non-government agencies and organisations listed in **Table 29** will continue to be consulted and involved in the project through receipt of all relevant project information in order to be able to provide feedback and informed of a community information day session.

#### 22.3.5 Newsletter

A newsletter was prepared in May 2011 providing details and a map of the proposal. The newsletter introduced the project, the proponent and the project team and also included the scope of issues to be explored by the project team during the environmental assessment of the project.

The newsletter contained information on:

- details of the proposed wind farm;
- the approvals process; the matters to be addressed as part of the environmental assessment; and
- the upcoming door-knock and invited people to request a face-to-face meeting.

Additionally, company contact details were provided for telephone, post, email and internet.

In May 2011, 812 copies of the newsletter were distributed to all registered addresses in the Bathurst, Oberon, Crookwell and Taralga post office districts, and to anyone who had already expressed interest in the project.

The newsletter was subsequently posted on the proponent's website. A copy of the newsletter is found at **Appendix 15**.

After the newsletter was distributed the proponent received one phone call requesting a face-to-face meeting during the door-knock.

The next newsletter is proposed to be distributed before the exhibition phase and will advise residents of the opportunity to prepare and lodge a submission. The newsletters will provide general information about the project, the planning and approvals process, details of the planned community information day session, and project updates.

The distribution of the next newsletter is proposed to be expanded to include any additional interested parties identified in the interim period. The newsletter will also be made available to the wider community at the Oberon Shire Council offices and the information centres.

### 22.3.6 Advertisements and media release

The proponent placed advertisements in the following local newspapers:

- Crookwell Gazette;
- Goulburn Post; and
- Oberon Review,

These ran for two consecutive weeks between 17 and 26 May 2011 advising the community of the upcoming door-knock and inviting individuals to make appointments to register and participate in the consultation process. As a result of the advertisements one appointment was made.

Copies of the advertisements are provided at **Appendix 16**.

In October 2012, the proponent issued a media release informing the community that the proponent is seeking nominations from local community members and/or affected stakeholders to represent the community for the proposed Paling Yards Wind Farm's Community Consultative Committee (CCC). This advertisement included the proponent's free-call number for interested members of the community to contact the company. Copies of the media release are found at **Appendix 16**. To date, no response has been received from the local community.

### 22.3.7 Door-knock consultations and surveys

A significant component of the stakeholder identification process and community consultation was the undertaking of the door-knock surveys.

On 30 and 31 May and 1 June 2011, the proponent's representatives and an ERM representative conducted a door-knock consultation of households within a 5 km radius of the site and along the transmission line route options.

The purpose of face-to-face door-knock meetings was:

- to provide stakeholders with detailed information about the project and the approvals process;
- to provide the opportunity for individuals to have their say in relation to the project; and
- to enable the proponent to gather information about peoples' opinions and any concerns they may have.

A total of 142 dwellings were identified for the door-knock exercise. The proponent representatives and the ERM representative could not gain access to all properties due to gates being locked or driveways being unsuitable or unsafe to access.

During the door-knock, 20 surveys were completed in the vicinity of the wind farm and 25 surveys in the vicinity of the transmission line. Where access was not available or no one was home, the proponent's representative left a letter in the letterbox informing the owner of the visit and inviting the owner to contact the proponent to discuss the project.

Following the door-knock, the proponent received two phone calls to the 1800 information line number to discuss the project. Feedback from these calls was recorded in the survey form used in the door-knock survey.

A supplementary two-day door-knock was undertaken on 5 and 6 July 2011 to consult with those residents who were not available during the last door-knock timeframe or who had responded to the letter informing the owner of the visit.

Community concerns raised during the door-knock surveys have been recorded, as has the response provided to the issues of concern (refer to **Appendix 17 – Door-knock Consultation Meeting Record template**). Specialist assessments commissioned by the proponent have been undertaken and reports prepared to address these concerns. These assessments and reports have been included in this report.

Survey forms were completed by:

- 20 households in the vicinity of the wind farm; and
- 25 households in the vicinity of the transmission lines options,
- during the door-knock.

Both survey forms asked respondents to grade their level of support for wind farms. The majority (52 %) of the householders surveyed in the vicinity of the wind farm indicated that they are supportive or highly supportive of wind farms.

Refer to **Chapter 22.4** below for the key issues identified and the response to each issue.

#### 22.3.8 Community Information Day

A Community Information Day is proposed to be held at a venue in the local area during the public exhibition period (which will be nominated by DoPI) of the wind farm application. This will take form of an information session where interested members of the community will have the opportunity to talk directly with the proponent's representatives and the environmental assessment team about the project. A range of experts in their fields will attend the information day to answer any questions and provide further details relating to the project.

The information day will include display of posters explaining the project and the approvals process. The session will be advertised in local papers two weeks prior to the session occurring. The timing of the information day is intended to coincide with the start of the exhibition period, allowing interested parties an opportunity to learn more about the project to inform their submission. The information day will also advertise the exhibition period and invite for submissions.

Feedback forms will be made available to all attendees, to provide an opportunity for the community to further comment on the project, in addition to the formal exhibition and submission process. Comments received through this feedback will be documented as part of the community consultation process.

#### 22.3.9 Website and information line

The proponent has established a dedicated e-mail address, website and a freecall 1800 number that is to be included on all project material to allow stakeholders to make contact and make enquiries or comments.

Any comments or complaints received via the e-mail address, website and a freecall 1800 number will be recorded on a '*Record of Contact Form*' and actioned as necessary.

The proponent provides information to the public on approved and proposed wind farm developments via the website: <[www.unionfenosa.com.au](http://www.unionfenosa.com.au)>. The website provides information on wind energy, renewable energy targets and information about the company history and structure. The May 2011 newsletter that was distributed in region was posted on the website, as well as the advertisement in October 2012 seeking nominations for the Community Consultative Committee.

The proponent endeavours in all correspondence to answer the community's questions in a timely manner.

#### 22.3.10 Documentation of stakeholder input into the approvals process

In order to adequately respond to local community members and stakeholders' enquiries, records of all correspondence to date have been compiled and distributed to the relevant consultant for their review and consideration as part of this consultation program.

#### 22.3.11 Response to submissions

All records of the correspondence with stakeholders after the lodgement of this report will be compiled and reviewed.

The proponent will review and respond to the issues raised during the Community Information Day, by formal submissions and during the ongoing consultation program. Where necessary, the proponent may make changes to the project to address the issues raised. In this way, further feedback received will be incorporated into the project design.

### 22.4 Key Issues Identified

The key issues identified during the consultations and UWFA's responses to these issues are shown in **Table 30** below. These issues are further discussed in the full socio-economic report found at **Appendix 5** as well as in the relevant technical reports annexed to this report.

The proponent's response and approach to all the issues raised in the table below also includes a commitment to implement the impact mitigation measures recommended in the technical reports and outlined under each chapter of this EA.

**Table 30** Summary of issues raised

Issue Category	Specific Issues	The Proponent's Response and Approach
High Voltage Transmission Lines	Visual impacts and the loss of privacy due to the introduction of infrastructure to remote areas.	Visual impacts have been addressed in the Landscape and Visual Impact Assessment (LVIA) prepared by Green Bean Design at <b>Appendix 6</b> .  The proposed northern transmission line route option (option 4) has been selected in part due to reduced landscape and visual impacts.
Visual Impact	Concerns about the appearance of wind turbines in the landscape, especially the height; and concerns about proliferation of wind farms in the local area.	Visual impacts have been addressed in the LVIA prepared by Green Bean Design at <b>Appendix 6</b> .  The LVIA determined that the landscape surrounding the project has an overall 'medium to high sensitivity' to accommodate change and that the wind farm would not be an unacceptable development within the region.  The proponent has selected the northern transmission line route as the

		<p>preferred and proposed option due to its shorter length, and as a result of concerns raised through the consultation process regarding the potential impacts of the extensive infrastructure for the southern transmission line route options.</p> <p>The visual impact mitigation measures proposed include:</p> <ul style="list-style-type: none"> <li>▪ Vegetation planting for screening.</li> <li>▪ Careful selection of final transmission line route.</li> <li>▪ Use of low-reflective materials and colour that reduces visual contrast with the background.</li> <li>▪ Revegetation post-construction.</li> <li>▪ Designing and locating ancillary infrastructure sympathetically.</li> </ul> <p>Refer to <b>Chapter 9.8</b> for further details.</p>
Impacts to land value	Concerns about impacts to land values as a result of the wind farm.	<p>An economic assessment on the potential impact to land and property values is provided at Section 3.6 of the socio-economic impact assessment at <b>Appendix 5</b> and in <b>Chapter 8.3.3</b> of this EA.</p> <p>There is no strong evidence to suggest that wind farms negatively impact property prices. Potential impacts on property prices are generally confined to the short term due to buyer uncertainty about future developments in the region.</p> <p>The potential impact on property prices can also be positive for landowners who accommodate wind turbines on their land.</p>
Noise	Concerns about noise impacts from the wind farm and high voltage transmission line.	<p>Potential noise impacts from the project are addressed in the Noise Impact Assessment report prepared by SLR Pty Ltd at <b>Appendix 7</b>.</p> <p>The noise assessment found that all non-project involved receptors were found to be below the relevant noise criteria, and therefore comply with the relevant noise standards.</p> <p>Further noise monitoring will be conducted and mitigation measures will be put in place. Agreements with affected project involved landowners will also be put in place.</p>

		<p>If undue turbine noise impacts are identified during operations, then adaptive management' measures may be implemented to mitigate or remove the impact, including:</p> <ul style="list-style-type: none"> <li>▪ Receiving and documenting noise impact complaint through 'hotline' or other means.</li> <li>▪ Investigating the nature of the reported impact.</li> <li>▪ Identifying exactly what conditions or times lead to undue impacts.</li> <li>▪ Operating turbines in a reduced 'noise optimised' mode during identified times and conditions.</li> <li>▪ Providing acoustic upgrades (glazing, façade, masking noise etc) to affected dwellings.</li> <li>▪ Turning off turbines that are identified as causing the undue impact during identified times and conditions.</li> </ul> <p>Upon finalising the layout and turbine models a revised noise assessment will be completed and noise impact mitigation techniques investigated in order to ensure a fully noise compliant turbine layout.</p>
Fire Hazard	Concerns about wind turbines causing fire.	<p>Mitigation measure to minimise the risk of fire is found at <b>Chapter 16</b>.</p> <p>Wind turbines incorporate high quality standards to avoid ignition and are fitted with remote monitoring systems to enable shut down in the event that a threshold temperature is reached or an electrical fault is discovered. Lightning conductors will also be installed in turbines to ground lightning strikes to minimise the risk of fire ignition and damage to the turbines.</p> <p>Overhead transmission lines will be located over predominantly cleared grazing land, thus reducing the risk of fire. Vegetation along the transmission lines will be routinely maintained.</p>
Impacts to flora and fauna	Potential impacts to threatened species (flora and fauna) and potential habitat loss.	<p>Potential flora and fauna impacts of the project have been assessed in the Flora and Fauna Impact Assessment reports prepared by Anderson Environmental Consultants Pty Ltd and ERM Pty Ltd at <b>Appendix 8a</b> and <b>Appendix 8b</b> respectively.</p>

		<p>The results of the assessment concluded that the project is not likely to result in a significant impact on any endangered ecological community or flora species and fauna species listed under the EPBC Act or TSC Act.</p> <p>A total area of approximately 14 hectares of remnant vegetation removal would be required for the project, of which approximately 1.4 hectares is proposed to be rehabilitated post-construction. Native vegetation disturbed during construction would be rehabilitated as part of a Vegetation Management Plan.</p> <p>The proponent has selected the northern transmission line route as the preferred and proposed option due to its shorter length, and as a result of concerns raised through the consultation process regarding the potential impacts of the extensive infrastructure for the southern transmission line route options.</p>
Impacts to Aerial Agriculture	Impacts to aerial agricultural applications (increased cost, difficulty).	<p>Potential impacts arising from the project on aerial agriculture are addressed in the Aeronautical Impact Assessment prepared by Aviation Projects Pty Ltd at <b>Appendix 9</b>.</p> <p>The project will most likely prevent fixed wing aerial agricultural operations on the wind farm site; however, safe aerial application operations would be possible on properties neighbouring the project, subject to final turbine locations, and subject to a case-by-case assessment.</p> <p>In the event the immediate neighbouring landowner(s) would require aerial agriculture spraying of their land adjacent to the wind farm and there is an increase in cost associated with the proximity to turbines, the proponent will cover the reasonable cost increase for the aerial agriculture activity. The landowner seeking compensation for the cost increase must demonstrate and justify this increase with previous records.</p>

<p>Electro Magnetic Interference (EMI)</p>	<p>Interference to radio and TV reception; and concerns about adverse impacts to health.</p>	<p>Concerns about impacts arising from EMI around the turbines are addressed in the Electromagnetic Interference Impact Assessment prepared by Garrad Hassan at <b>Appendix 11</b>.</p> <p>The assessment found that in relation to radio and TV reception:</p> <ul style="list-style-type: none"> <li>▪ FM signals may be susceptible to interference from wind turbines, which can be mitigated by the installation of a high quality antenna.</li> <li>▪ Interference to analogue television could potentially occur at particular houses (listed in the report), however, analogue television is being phased out across Australia, and if digital reception is marginal, residents in the vicinity of the site may be eligible to receive access to the Government-funded satellite television service to view free-to-air television.</li> </ul> <p>Other mitigation measures proposed to address EMI include:</p> <ul style="list-style-type: none"> <li>▪ For any interference with fixed point-to-point links, either the relevant turbines or the communications tower may be slightly relocated, where possible.</li> <li>▪ Realigning or relocating the householder's TV antenna.</li> <li>▪ The installation of an external antenna or more directional and/or higher gain antenna at the affected household;</li> <li>▪ The installation of cable/satellite TV at the affected household; and</li> <li>▪ Installation of a TV relay station.</li> <li>▪ A person with portable device moving a short distance to a new or higher location until the signal strength improves.</li> </ul>
--	--	--



Shadow Flicker	Concerns about shadow flicker from wind turbines.	Concerns about shadow flicker impacts are addressed in the assessment prepared by Garrad Hassan Pacific Pty Ltd and included as part of the LVIA at <b>Appendix 6</b> .  The assessment found that all except seven of the residential view locations will be subject to levels of shadow flicker below the recommended limit of 30 shadow flicker hours per year. The seven residences are project-involved landowners, and the proponent will negotiate an agreement with the owners of these dwellings.
Heritage Impact	The Pejar LALC recommends: <ul style="list-style-type: none"> <li>▪ Avoid impacts on known sites.</li> <li>▪ Prepare a CHMP in collaboration with the Aboriginal Stakeholders registered for the project</li> <li>▪ Cooperate with the Aboriginal Stakeholders registered for the project to determine the management options for artefacts</li> <li>▪ If impacts to additional sites identified cannot be avoided then further investigation is required in consultation with the Aboriginal Stakeholders registered for the project</li> <li>▪ Undertake additional targeted surveys once the disturbance areas (particularly the access tracks) have been pegged post-approval</li> </ul>	As recommended in the heritage impact assessment there will be additional field surveys post-approval once all access tracks have been pegged prior to construction, and the preparation of the CHMP will be undertaken in collaboration with Pejar LALC along with other registered Aboriginal Stakeholders.

## 22.5 Draft NSW Wind Farm Guidelines

### 22.5.1 Community Consultative Committee

The proponent is in the process of establishing a Community Consultative Committee (CCC), in accordance with Guideline 1.3(d) of the Draft Guidelines.

The purpose of the CCC is to provide a forum for open discussion between the proponent, the community, Council and other stakeholders about issues relating to the wind farm development. If the wind farm is approved, the CCC will function as a forum for ongoing communication with the community during the construction, operation and decommissioning phases.

The CCC will comprise, in accordance with the Draft Guidelines:

- an independent chairperson;
- five to seven representatives of the local community and other stakeholders;
- one representative of the local council; and
- two representatives of the proponent.

The proponent issued a media release in October 2012 seeking nominations from local community members and/or affected stakeholders to represent the community for the proposed Paling Yards Wind Farm CCC. A copy of the media release and advertisements are found at **Appendix 16**.

On 9 October 2012 Oberon Council sent a letter to the proponent nominating the Council representatives for the CCC.

The closing date for nominations was 30 November 2012. No community nominations have been received to date to be a member of the CCC.

Once the CCC is established, meetings will be held in accordance with the Draft Guidelines. If the project is refused, the committee will be abandoned.

Committee members will be encouraged to discuss issues and circulate information about the project with the wider community. The proponent will keep minutes of all CCC meetings, which will be presented to Council, CCC members, and published on the website.

Once the CCC is established, the proponent will provide the committee with updates on the assessment studies being prepared and the issues being investigated, the design layout options being considered during the assessment process.

If the project is approved, the proponent will comply with its responsibilities contained in Appendix C of the Draft Guidelines.

#### 22.5.2 Neighbours Agreement

No neighbours agreements are required for the project. The site is in a generally isolated location and there are no non-project involved, identified dwellings within 2km of any of the proposed turbines.

It is noted that one non-project involved building is located within 2km of the proposed wind farm, however this building has not been identified as an official dwelling and the owner cannot be contacted. The proponent has made several attempts over a two year period to contact the owner of the land on which the building is erected with no success.

The proponent was provided with a name and contact number of the landowner and attempted contacting this landowner for the first time over the phone on 26 May 2011 and left a message on the voicemail. The proponent has tried several times since this date to contact the landowner. During the door-knock the proponent tried to access/find the property but with no success. Attempts were also made in 2012 to contact the landowner, but the phone number has been disconnected.

### 22.6 Recommendations

The proponent appreciates that the Community Engagement Strategy is a critical element in understanding and managing community and stakeholder expectations of the project, especially as the project moves through the approval and construction process.

The proponent will:

- progress a number of recommendations in consultation with government and non-government agencies, local groups and organisations, local council, and the local community;
- continue to provide up-to-date information about the proposed wind farm to the community, stakeholders and government agencies through newsletters, website

information, responding to calls on the 1800 free-call line, responding to emails and letters, and a community information done;

- continue to implement the Community Engagement Strategy; and
- formalise, maintain and promote a consultation register, grievance mechanism and issue resolution tracking mechanism which is integrated into the proponent day-to-day operations as well as supplier agreements.



**UNION FENOSA**  
WIND AUSTRALIA



PALING YARDS WIND FARM  
CHAPTER 23

## **RISK ANALYSIS**



## 23 Risk Analysis

This chapter provides an environmental risk assessment of the project. It has been prepared in accordance Australian Standard 203:2006 *Environmental Risk Management – Principles and Process* and the associated Companion. This is the commonly adopted and accepted method for a high level qualitative assessment of a wind farm project.

It identifies the key environmental risks, the severity (or consequence), likelihood, mitigation commitments, and the consequential level of risk. This risk analysis has been based on the variety of specialist investigations that form part of this EA, and the statement of commitments outlined in **Chapter 24**.

The following explains the methods used in the analysis in this chapter. **Table 31** outlines the criteria used to determine the correct classification of consequence for the particular environmental risk. **Table 32** provides the criteria to determine the degree of likelihood of the risk occurring.

**Table 31** Classification of severity/consequence (Companion to AS 203:2006)

Category	Rank	Health and Safety	Environment	Community
Catastrophic	1	Multiple fatalities or significant irreversible effects.	Long term and possible eradication of populations or habitats, serious negative impacts on ecosystem, permanent damage to a significant area.	Major public or media outcry, major long-term detrimental effects, community outrage on broader community and substantial formal opposition.
Major	2	Single fatality and/or severe irreversible injury or disability.	Major changes in population or habitat, negative impact on ecosystem, lasting damage to a significant area.	Significant adverse effects on the local community resulting in high level of community opposition.
Moderate	3	Injury or illness (hospitalisation).	Moderate impacts on populations and habitat but no negative impacts on ecosystem function, damage to a limited area.	Moderate inconvenience leading to general community concern.
Minor	4	Reversible injury (off-site medical care).	Minor impacts on populations and habitat but no negative impacts on ecosystem function, limited damage to a limited area.	Minor inconvenience on local community, restricted to localised community concerns.
Insignificant	5	Negligible injury (first aid sufficient).	Impacts on populations and habitat that could be reversed, insignificant damage to a limited area.	None to insignificant local community concern.

**Table 32** Classification of likelihood (Companion to AS 203:2006)

Category	Rank	Description	Frequency
Almost certain	A	Expected to occur frequently	At least annually or more frequently
Likely	B	The event has occurred in the past	Once every three years
Possible	C	The event may occur, unusual but possible	Once every 10 years
Unlikely	D	Not expected to occur	Once every 30 years
Rare	E	Conceivable only in exceptional circumstance	Once every 100 years

Having established the severity/consequence, and the likelihood of the risk, the table below provides a matrix to establish the overall risk rating for each issue.

**Table 33** Qualitative risk analysis matrix (Companion to AS 203:2006)

		Severity/Consequence				
		Catastrophe	Major	Moderate	Minor	Insignificant
Likelihood		1	2	3	4	5
Almost Certain	A	Extreme	Extreme	Extreme	High	High
Likely	B	Extreme	Extreme	High	High	Moderate
Possible	C	Extreme	Extreme	High	Moderate	Low
Unlikely	D	Extreme	High	Moderate	Low	Low
Rare	E	High	High	Moderate	Low	Low

The following risk analysis considers the mitigated risk of the project. This means that it considers the construction, operation and decommissioning of the project as described in this EA after any mitigation measures outlined in **Chapter 24**. The mitigation measures are an integral part of the project and will be required as conditions of approval. This scenario is therefore the most accurate assessment of the environmental risks associated with the project.

The following table has focussed on the negative impacts of the project, and the mitigation measures are designed to avoid or reduce the impacts. This EA also details a range of positive impacts of the project.

**Table 34** Risk analysis

Sector	Issue	Project Stage	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk Rating
<b>Economic and Social</b>	Community Division	C/O/D	3	D	Medium
	Loss of agricultural land	C/O/D	4	E	Low
	Reduction in property values	C/O	3	E	Medium
	Lack of project awareness and	C/O/D	4	D	Low



Sector	Issue	Project Stage	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk Rating
	community involvement				
<b>Visual</b>	Significant visual impact of turbines on nearby dwellings	C/O	3	D	Medium
	Significant visual impact of transmission line on nearby dwellings	C/O	4	D	Low
	Significant change to landscape character	C/O	4	C	Medium
<b>Noise</b>	Operational noise exceedances of turbines on non-involved dwellings	O	3	D	Medium
	Construction noise impacts including blasting	C	4	D	Low
	Substation and transmission line noise impacts	O	5	D	Low
	Negative impacts arising from special audible characteristics	O	3	E	Medium
<b>Health</b>	Negative impacts on human health	C/O	3	E	Medium
<b>Flora and Fauna</b>	Impacts on native vegetation	C	4	C	Medium
	Impact on threatened species (exc Birds)	C/O	4	D	Low
	Bird and Bat Strike	O	4	D	Low
<b>Aviation</b>	Creation of significant aviation hazard	O	3	E	Medium
	Limitations on aerial agriculture by neighbours	O	4	C	Medium
	Visual impacts of obstacle aviation lighting	O	4	C	Medium
<b>Transport</b>	Impacts on road condition	C/O/D	4	D	Low
	Negative impacts on traffic flow and capacity	C/O/D	4	D	Low
<b>EMI and Telecommunications</b>	Television and radio signal impacts	O	4	E	Low
	Interferences to Point to Point link	O	4	D	Low
<b>Fire</b>	Turbine fire ignition	C/O/D	3	E	Medium
	Fire ignition from other infrastructure	C/O/D	3	E	Medium

Sector	Issue	Project Stage	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk Rating
	Limitations on ability to fight fire in local area	O	3	E	Medium
<b>Shadow Flicker</b>	Significant Impacts on non-involved persons / dwellings	O	4	D	Low
<b>Blade Glint</b>	Annoyance and distraction to nearby persons	O	4	D	Low
<b>Heritage</b>	Impact on indigenous heritage values	C/O/D	4	D	Low
	Impact on non-indigenous heritage values	C/O/D	4	D	Low
<b>Land Resources and Geotechnical</b>	Significant soil loss and erosion	C/O/D	4	D	Low
	Landform stability failure	C/O/D	3	E	Medium
<b>Hydrology</b>	Deterioration of water quality	C/O/D	3	D	Medium
	Impacts on groundwater	C/O/D	3	E	Medium
	Impacts on water levels from extraction	C/O/D	4	C	Medium
	Water pollution from spills and leaks	C/O/D	3	D	Medium
<b>Resource Impacts</b>	Waste generation	C/O/D	5	C	Low

Notes: C = Construction, O = Operation, D = Decommissioning  
The numbers under 'Mitigated Consequence' and letters under 'Mitigated Likelihood' are explained in previous tables.

The information in **Table 35** shows that risks associated with key environmental issues have been identified and considered, and that potential impacts can be effectively managed through the mitigation commitments made.

Consideration has been given as to whether there are other potential environmental impacts associated with the project which were not identified in the DGRs. The current assessment has adequately considered and addressed all known and perceived risks, including an assessment of any additional risks identified through the construction and operation of other operating wind farms.

**UNION FENOSA**  
WIND AUSTRALIA



PALING YARDS WIND FARM  
CHAPTER 24

**STATEMENT OF  
COMMITMENTS**



## 24 Statement of Commitments

**Table 35** outlines the tasks and actions that the proponent is committed to undertaking if the project is approved. These commitments seek to ensure that further specific details are provided on certain aspects of the wind farm, and that relevant standards are met throughout the construction, operation and decommissioning phases.

In the table below, some commitments address more than one sector, such as vegetation replanting that assists in minimising visual impacts and improving biodiversity. Commitments have been included only once in the following table, in the sector deemed to be the most relevant.

**Table 35** Statement of commitments

Sector	Issue	Commitment
<b>General</b>	Micrositing	1. Ensure that micrositing or any minor changes to the project do not create any material increase in overall environmental impact. In the event of any significant changes to the proposed wind turbine layout, an updated noise assessment and visual impact assessment will be submitted prior to construction.
<b>Pre-construction compliance</b>	Pre-Construction Compliance Report	2. The proponent will submit a Pre-Construction Compliance Report for each stage of the project to the Director-General at least two weeks prior to the commencement of construction of that stage (or such later time agreed to by the Director-General). The Pre-Construction Compliance Report will include details of the compliance with all pre-construction conditions of approval that are relevant for the specific stage(s) of the project.
	Construction Environmental Management Plan	3. The proponent will submit a Construction Environmental Management Plan (CEMP) for each stage of the project to the Director-General at least two weeks prior to the commencement of construction of that stage (or such later time agreed to by the Director-General). The CEMP will address the construction impacts of the relevant stage of the project including the specific matters set out below. The proponent will implement the CEMP of each stage of the project as approved by the Director-General
<b>Pre-operational compliance</b>	Operation Environmental Management Plan	4. The Proponent will prepare and implement an Operation Environmental Management Plan (OEMP) and submit it as a draft for approval to the Director-General at least one month prior to the commencement of operation (or such later time agreed to by the Director-General). The OEMP will address the operational impacts of the project including the specific matters set out below. The proponent will implement the OEMP as approved by the Director-General.
<b>Economic and Social</b>	Effect on local economy	5. Full time jobs and contractors for the construction and future decommissioning will be sourced locally if the skills and experience exist within the community.
	Economy and livelihoods	6. Assess the viability of conducting aerial agricultural operations on properties adjacent to the site, particularly by the use of helicopters. In the event the immediate neighbouring landowner(s) would require aerial agriculture spraying of their land adjacent to the project and there is an increase in cost associated with the proximity to turbines, the proponent will cover the reasonable cost increase for the

Sector	Issue	Commitment
		aerial agriculture activity. The landowner seeking compensation for the cost increase must demonstrate and justify this increase with previous records.
	Community Consultation	<p>7. The proponent will develop and maintain a community consultation and engagement program aimed at:</p> <ul style="list-style-type: none"> <li>- Providing the community with factual information about the project; and</li> <li>- Gathering feedback from the community and stakeholders about their concerns and interest, which can be subsequently addressed in the approvals process.</li> </ul> <p>A dedicated email address, website and free call 1800 number will be available and responded to for the life of the project.</p>
	Infrastructure	<p>8. In relation to infrastructure in the local area, UFWA will:</p> <ul style="list-style-type: none"> <li>- Carry out a pre-construction road survey to determine existing conditions of local roads.</li> <li>- Carry out any upgrades and strengthening works as required by the Transport Management Plan to be prepared before works commence, along the access road network to provide safe construction access for the project.</li> <li>- Prepare and implement a Transport Management Plan to ensure local roads are not adversely impacted by heavy vehicles.</li> <li>- Notify the local community of changed traffic conditions and proposed road works via a newsletter or information line.</li> </ul>
	Community amenity	<p>9. To minimise potential noise impacts associated with night-time deliveries, prior notification will be provided to the affected public where night-time convoys are scheduled, and restrict use of exhaust/engine breaks in built up areas.</p>
		<p>10. Landscape screening or minor adjustments to wind turbine locations will be explored and implemented to ameliorate any identified visual impacts.</p>
		<p>11. Transmission lines will be sited sensitively to reduce visual impacts to residents where possible.</p>
		<p>12. Clearing for transmission lines will be kept to a minimum for safety requirements.</p>
	Community Consultative Committee	<p>13. In accordance with the Draft Guidelines, UFWA will establish a Community Consultative Committee (CCC). The purpose of the CCC is to provide a forum for discussion between the proponent, the community, Council and other stakeholders about the project, if the project is approved. The CCC would provide a forum for ongoing communication with the community during the construction, operation and decommissioning of the project.</p>
	Potential	<p>14. UFWA is exploring potential options to support the local</p>

Sector	Issue	Commitment
	Community Enhancement Fund	community surrounding the site, including the potential establishment of the Oberon Community Enhancement Fund for community groups and organisations. The door-knock survey which UFWA representatives and environmental consultants undertook asked respondents to suggest community funding projects that they would like to see occur if the project went ahead.
<b>Visual</b>	Visual impact to nearby properties	<p>15. Screening planting will be undertaken by the proponent in locations agreed between the proponent and local landowners where the planting is seen as effective and is desired by the landowner to limit the view to the proposed wind turbines. It will involve a variety of dense native vegetation, including both trees and shrubs, and will be carried out at no cost to the landowner.</p> <p>16. The wind generator blades, tower and nacelle will be treated/painted with a non-reflective white or off white colour and matt finish to reduce glare and minimise blade glint.</p> <p>17. No advertising, signs or logos will be mounted on turbine structures, except those required for safety purposes.</p> <p>18. Site control building and facilities will be designed and constructed sympathetically with the nature of the locality.</p> <p>19. Substations will be located away from direct views from roads and residential dwellings.</p> <p>20. Safeguards will be implemented to control and minimise fugitive dust emissions.</p> <p>21. The height of earth stockpiles will be restricted to minimise visibility from outside the site.</p> <p>22. Activities that require night time lighting will be minimised, and low lux (intensity) lighting designed with the light projecting inwards will be used where necessary to minimise glare at night.</p> <p>23. Cut and fill for site tracks will be minimised and disturbed soils will be revegetated as soon as possible after construction.</p> <p>24. Revegetation of disturbed areas will be undertaken to ensure effective cover is achieved.</p> <p>25. Options for planting screening vegetation in the vicinity of nearby residences and along roadsides will be explored to screen potential views of turbines.</p> <p>26. Works to minimise visual impacts will take into consideration the consultation with local residents and authorities.</p> <p>27. Should obstacle lighting be required, the lighting will comply with CASA standards to minimise unnecessary light spill. The downward component of light will be restricted to either,</p>

Sector	Issue	Commitment
		<p>or both, of the following:</p> <ul style="list-style-type: none"> <li>- Such that no more than 5% of the nominal intensity is emitted at or below 5° below the horizontal; and</li> <li>- Such that no light is emitted at or below 10° below the horizontal.</li> </ul>
		28. The transmission line route selection process will avoid sensitive view locations and loss of existing vegetation where possible.
		29. Wherever possible, transmission lines infrastructure angle positions will be selected in strategic locations to minimise potential visual impact and to provide a maximum setback from residential dwellings and road corridors.
		30. Suitable component materials with low reflective properties will be selected for the substation and transmission lines.
		31. Suitable storage areas for materials will be selected with minimum visibility from residences and roads, with plant screening used where necessary.
		32. Strategic tree or shrub planting will be undertaken where necessary between view locations and the transmission line.
	Cumulative visual impact to nearby properties	33. Should obstacle lighting be required, the flashing of obstacle lights of wind farms within close proximity will be synchronised to each other (wherever possible) to minimise visual impact.
<b>Noise</b>	Construction noise	34. Standard construction hours will apply to the project, as outlined below, <ul style="list-style-type: none"> <li>- Monday to Friday: 7:00am to 6:00pm</li> <li>- Saturdays: 7:00am to 1:00pm</li> <li>- Sundays: No construction</li> </ul> In the event that it is required to undertake other works outside the above construction hours, prior approval will be obtained from the relevant authority.
	Blasting	35. The proponent will ensure that any blasting complies with the ANZECC guideline.
	Operational Noise	36. The proponent will undertake routine noise monitoring, assessment and reporting at compliance critical locations.



Sector	Issue	Commitment
		<p data-bbox="841 409 1458 533">37. If undue turbine noise impacts are identified during operations due to temperature inversion, atmospheric stability or other reasons, then adaptive management measures may be implemented to mitigate or remove the impact. This process may include:</p> <ul data-bbox="888 555 1458 936" style="list-style-type: none"> <li>- Receiving and documenting noise impact complaint through 'hotline' or other means.</li> <li>- Investigating the nature of the reported impact.</li> <li>- Identifying exactly what conditions or times lead to undue impacts.</li> <li>- Operating turbines in a reduced 'noise optimised' mode during identified times and conditions (sector management).</li> <li>- Providing acoustic upgrades (glazing, façade, masking noise etc) to affected dwellings.</li> <li>- Turning off turbines that are identified as causing the undue impact during identified times and conditions.</li> </ul> <p data-bbox="841 981 1458 1059">38. During commissioning the actual received turbine noise level will be verified and determined through extensive monitoring.</p> <p data-bbox="841 1093 1458 1350">39. The proponent will ensure that operational noise levels will comply with the South Australia EPA Environmental Noise Guidelines principal acceptability criteria that the wind farm LA90 (10 min) noise should not exceed the greater of an amenity limit of 35 dBA or the pre-existing background noise by more than 5 dBA at each integer wind speed from cut in to rated power at any non-host property or residential receiver where noise agreements (in accordance with Section 2.3 of the SA EPA Guidelines) have not been entered into with the property owner.</p> <p data-bbox="841 1384 1458 1585">40. The proponent will ensure that the operational noise levels comply with the World Health Organization (WHO) <i>Guidelines for Community Noise</i> of 45 dBA or the pre-existing background noise by more than 5 dBA (whichever is the higher) for any host property or residential receiver where noise agreements (in accordance with Section 2.3 of the SA EPA Guidelines) have been entered into with the property owner.</p> <p data-bbox="841 1619 1458 1742">41. When the turbine model is known, a Noise Management Plan will be prepared and implemented as part of the OEMP to ensure that if the selected turbine does not comply under the predictive noise modelling, mitigation will be undertaken so that SA EPA Guideline standards are met.</p>

Sector	Issue	Commitment
		<p>42. In circumstances where undue turbine noise impacts are identified during operations then an '<i>adaptive management</i>' approach will be implemented to achieve compliance with the applicable noise limits. This will include:</p> <ul style="list-style-type: none"> <li>- Identifying exactly what conditions or times lead to undue impacts.</li> <li>- Operating selected turbines in a reduced 'noise optimised' mode during identified times and conditions (sector management).</li> <li>- Providing acoustic upgrades (glazing, façade, masking noise etc) to affected dwellings.</li> <li>- Turning off turbines that are identified as causing the undue impact during identified times and conditions.</li> </ul> <p>43. If a turbine model that is ultimately selected that has not been assessed as part of the noise impact assessment, further noise modelling for that turbine will be undertaken.</p>
<b>Health</b>	Health and safety of persons	<p>44. The proponent will provide accessible information to the public on wind farm impacts including the benefits, and project details, process and updates.</p> <p>45. The wind generator blades, tower and nacelle will be treated/painted with a non-reflective white or off white colour to reduce glare and minimise blade glint.</p> <p>46. Warning signs will be installed to alert the public to the risk of unauthorised site entry.</p> <p>47. Access to the wind turbines and associated infrastructure will be restricted to reduce personal injury and public hazards, including:</p> <ul style="list-style-type: none"> <li>- Locked access to towers and electrical equipment.</li> <li>- Warning signs with postings of 24-hour emergency numbers.</li> <li>- Fenced storage yards for equipment and spare parts.</li> </ul> <p>48. Wind turbines will be equipped with sensors that can react to any imbalance in the rotor blades and shut down the turbine if necessary.</p> <p>49. Cable markers will identify the path of the underground cabling to prevent accidental digging around the cable trenches.</p> <p>50. The turbines and associated infrastructure will be regularly maintained by the proponent as part of the operation of the wind farm.</p> <p>51. Noise levels will comply with the applicable noise guidelines, unless an agreement is in place with the effected landowner(s), and in any case should not be more than the 45dB(A) noise limit (for indoors) recommended by the World Health Organisation (WHO) publication Guidelines for Community Noise.</p>

Sector	Issue	Commitment
		52. Shadow flicker at any dwelling will not exceed 30 hours per year unless an agreement is in place with the effected landowner(s).
	Blade Throw	53. Choose turbine models meets the relevant standards including: <ul style="list-style-type: none"> <li>• IEC 61400-23 [Wind turbine generator systems, Full-scale structural testing of rotor blades]; and</li> <li>• IEC 62305-1 / 3 / 4 [Protection Against Lightning].</li> </ul>
		54. Incorporate lighting protection and safety shutdown systems.
		55. Repair any degradation to the blades.
		56. Install fencing and signage to discourage unauthorised access to the wind turbines.
<b>Flora and Fauna</b>	Loss of biodiversity	57. Where trees are removed the relevant land owner will be consulted and a suitable native species which does not affect the wind resource will be planted in place of the removed vegetation.
		58. The southern sub-option for the northern transmission line will be selected as this option would minimise clearing of native vegetation.
		59. The proponent will develop an offset package in accordance with the Principles for the use of biodiversity offsets in NSW.
		60. The CEMP will contain mechanisms to prevent the spread of weeds and animals. Mechanisms may include: <ul style="list-style-type: none"> <li>- Machinery wash downs</li> <li>- Staff training</li> <li>- Soil and fill screening</li> <li>- Other commonly used techniques</li> <li>- Coordinated management regimes managed by the wind farm developer.</li> </ul>
		61. Bat Monitoring and Habitat Tree Inspections <ul style="list-style-type: none"> <li>- Once the access roads and access tracks are pegged by surveyors potential habitat trees (that require removal) will be identified by an ecological survey.</li> <li>- These trees will be stage watched at dusk using infra-red spotlights and anabat detectors to determine usage by any threatened microchiropteran bats.</li> <li>- Accessible tree hollows that require removal will be inspected for fauna by infrared telescopic camera prior to removal to ensure that no species are present in the hollow are harmed during removal.</li> </ul>
		62. Bird Monitoring and Bat Strike Monitoring <ul style="list-style-type: none"> <li>- An additional baseline pre-commissioning survey will</li> </ul>

Sector	Issue	Commitment
		<p>be undertaken at each turbine site during the spring/summer season. This will provide baseline data for the bird and bat strike monitoring study which will be undertaken during the first year of the operation of the wind farm.</p> <ul style="list-style-type: none"> <li>- The recording of calls utilising Anabat recorders will enable information such as time of flybys and also if any feeding buzzes are recorded. This will allow area usage data to be gained (by species) and also active use data through feeding buzz recording. Activity levels can then be used to modify wind farm management if required.</li> </ul>
		<p>63. A Vegetation/Ecological Restoration Plan will be developed as part of the CEMP and will address the post-construction works to be undertaken to rehabilitate the areas that are disturbed as part of the construction works once construction is finalised.</p> <p>Detailed surveys before any vegetation is removed will record any microhabitat features and provide a detailed plan outlining areas of impacts at a micro level. This will allow for placing of sediment and erosion control fence designs to reduce any indirect impacts on vegetation.</p>
		<p>64. A Riparian Vegetation Management Plan will be developed as part of the CEMP and will address the issues associated with the proposed creek crossings where any native vegetation is proposed to be disturbed.</p>
		<p>65. An Erosion and Sediment Control Plan will be prepared to avoid and reduce disturbance to drainage lines within the site. Runoffs from work sites will be managed by appropriately designing the wind farm access tracks and other infrastructure by incorporating erosion and sediment control methods during the construction and operational stages.</p>
		<p>66. An Ecological Restoration Plan will be prepared that will outline the specific measures for rehabilitation, including:</p> <ul style="list-style-type: none"> <li>- revegetation (including use of locally occurring species);</li> <li>- instructions for how to reuse cleared vegetation in situ (including the spreading of mulched vegetation over cleared areas);</li> <li>- areas of pasture should be re-seeded with pasture grass species removed; and</li> <li>- areas where crane pads have been sited in native vegetation should be mechanically loosened with machinery to alleviate compaction, enhancing seed germination potential in loose soil and micro-topography to enhance seed retention from surrounding woodland areas.</li> </ul>
		<p>67. A Native Vegetation Management Plan will be prepared to ensure minimal removal of native vegetation for the construction of the wind farm infrastructure, and measures to ensure native vegetation in the vicinity of the development footprint are not affected.</p>

Sector	Issue	Commitment
		<p>All environmental controls will be audited for compliance regularly during construction and after commissioning. This would include micro mapping of vegetation around each turbine to avoid any unnecessary removal of vegetation and also the access tracks. This would also allow for vegetation planting species when the wind farm is decommissioned.</p> <p>68. Vegetation clearing will be undertaken with the following measures:</p> <ul style="list-style-type: none"> <li>- all site staff are to be inducted on the procedures of the CEMP in relation to flora and fauna;</li> <li>- the area to be cleared at the site will be clearly demarcated using flagging or fencing, and mapped on construction plans, to prevent breaches of the construction boundary;</li> <li>- laydown or temporary disturbance areas will be located in already disturbed areas to avoid any unnecessary clearing of native vegetation and habitat;</li> <li>- vehicles will remain on formed roads or tracks designed specifically for the purposes of the wind farm construction where possible;</li> <li>- care will to be taken when working near wooded areas to prevent damage to adjacent tree roots and indirect impact to habitat areas;</li> <li>- trenches will be excavated at least 15 m away from the base of trees where possible to prevent root damage;</li> <li>- where practical, suitable fencing to be erected along trenches to prevent fauna falling in;</li> <li>- habitat features such as logs, large rocks and fallen hollows within the proposed clearance footprint will be relocated to adjacent areas to supplement habitat where possible;</li> <li>- any individual hollows removed will be replaced with artificial hollows within adjacent suitable habitat;</li> <li>- Environmental Compliance Manager or field officer qualified in the handling of fauna to be present on-site during clearing to capture and re-release fauna (where appropriate);</li> <li>- regular checking of trenches by the Environmental Compliance Manager to ensure any captured fauna are released according to the CEMP;</li> <li>- pre-clearance surveys (including diurnal and nocturnal) undertaken to determine if roosts, nests or dens are present in any trees proposed for clearing;</li> <li>- implement a two stage approach to clearing works; o non-hollow bearing trees will be cleared before habitat trees to allow fauna an opportunity to move from the hollow bearing trees and allow time to concentrate rescue efforts on the trees that are most likely to be inhabited; and o hollow bearing trees will be felled after a minimum 24 hour delay after clearing of non-habitat trees.</li> <li>- native vegetation that is removed will be chipped and</li> </ul>

Sector	Issue	Commitment
		<p>mulched for on-site use where practical;</p> <ul style="list-style-type: none"> <li>- where practical, native vegetation greater than 3 m in height to be retained during transmission line construction; and</li> <li>- rehabilitation of internal access roads that are not required following construction to be undertaken.</li> </ul> <p>69. A Weed Management Plan will be prepared to ensure that the construction and operation of the project does not contribute or cause an increase in the weed species within the site. The plan will put in place control measures for minimising weed during and after construction.</p> <p>Plans for revegetation of disturbed areas will reduce opportunities for weed species to take hold.</p> <p>Wash bays will be sited so trucks and machinery can be washed down to prevent weed seed being spread both onto and off site.</p> <p>Weed management will be undertaken with the following measures:</p> <ul style="list-style-type: none"> <li>- where a specific weed risk has been identified, all machinery, equipment and vehicles are to be washed down before entry and egress of the site;</li> <li>- piling of soil that may contain seeds of exotic species at least 50 m away from creeks, drainage lines and other areas of native vegetation, to prevent spread into adjacent areas during rainfall or wind events;</li> <li>- topsoil recovery will be undertaken in areas that have a high proportion of native vegetation and few weeds in the ground layer of vegetation;</li> <li>- all construction staff and sub-contractors educated on noxious weeds present at the site and ways to prevent spread;</li> <li>- where practical, topsoil that has very few weeds to be harvested to salvage the native soil seed bank and reintroduced into disturbed areas. Otherwise, revegetate with locally native endemic species characteristic of the cleared vegetation type;</li> <li>- control of perennial weed grasses within the disturbance zone for 3 to 5 years after construction;</li> <li>- where practical, and in consultation with host landowners, manage stock access during periods of revegetation; and</li> <li>- imported soil and rubble to be certified as free of weeds and weed seeds.</li> </ul> <p>70. A Bat and Avifauna Management Plan will be prepared to manage and mitigate any bird and bat strikes resulting from the operation of the project. Carcass search protocol will be implemented to identify more accurately the mortality rates of the bats and birds within the site.</p> <p>Identification of any species lost along with the data gained from Anabat recording would enable adaptive management of the project if required.</p> <p>A specific Bird and Bat Monitoring Plan will be developed.</p>

Sector	Issue	Commitment
		<p>The Bird and Bat Monitoring Plan will:</p> <ul style="list-style-type: none"> <li>- outline the required monitoring measures, key thresholds for determining permissible impacts and corrective actions that are required in order to achieve the objectives of the plan</li> <li>- outline the roles and responsibilities for the proponent, operator and agencies in implementing, assessing and enforcing the plan.</li> <li>- be developed in consultation with OEH</li> <li>- determine the frequency of report strike data during the preparation of the monitoring programme.</li> </ul> <p>The adaptive management measures that could be implemented will be negotiated with OEH when significant strike rates are detected. Bird and bat strike monitoring will be undertaken with consideration for the monitoring guidelines provided by the Australian Wind Energy Association.</p>
	Impacts from temporary facilities	<p>71. All temporary and construction facilities will be located so as to avoid vegetation loss and the land will be rehabilitated to its former state at the conclusion of the construction stage.</p> <p>72. Where possible, raw materials for the concrete batching plant will be sourced on site, with all materials brought in from external sources being as clean as possible to minimise the potential of introducing weeds to the site.</p> <p>73. The water for the concrete will either be sourced on site subject to a separate licence issued by the NSW Office of Water, or transported to the site via tanker trucks.</p>
	Landscape impacts resulting from de-commission	<p>74. At the completion of the wind farm's operating life, the turbines will either be replaced or the land will be rehabilitated to its previous or better condition.</p> <p>75. Tracks considered surplus to the farmers' requirements will be rehabilitated and revegetated by introducing soil, mulch and grass seeds or local provenance.</p>
<b>Aeronautics</b>	Creation of hazard	<p>76. Once the turbine locations are finalised, the proponent will notify the RAAF Aeronautical Information Service (AIS) of the location and height details of the turbines.</p> <p>77. The rotor blades, nacelle and the supporting mast of the wind turbines will be painted white, off-white or a light grey colour.</p> <p>78. An aeronautical study to determine the requirement for obstacle lighting, in the form of a detailed and thorough risk assessment using internationally recognised standards, will be prepared once the final approved turbine layout and design turbine height are known.</p> <p>79. An assessment will be undertaken in consultation with applicable stakeholders prior to construction as to whether marking or lighting will be required to enhance the level of safety.</p>

Sector	Issue	Commitment
		<p>80. If required, medium intensity obstacle lighting will be installed:</p> <ul style="list-style-type: none"> <li>- To identify the perimeter of the wind farm;</li> <li>- At longitudinal intervals not exceeding 900m;</li> <li>- So that they are synchronised to flash simultaneously (both within the wind farm and with other wind farms in the vicinity); and</li> <li>- So that any wind turbines of significantly higher elevation are also identified.</li> </ul> <p>The obstacle lights will have the characteristics specified in MOS 139, Chapter 9.</p> <p>81. A monitoring, reporting and maintenance program will be established in accordance with the requirements set out in MOS 139, Chapter 9 to ensure the ongoing availability of obstacle lights.</p> <p>82. The obstacle lighting (if required) layout will meet the CASA objectives of:</p> <ul style="list-style-type: none"> <li>- Defining the “general definition and extent of the objects” for each cluster or linear array;</li> <li>- Lighted turbines to be spaced “at longitudinal intervals not exceeding 900 m” for each cluster or linear array ; and</li> <li>- Lighting the most prominent (highest for the terrain) turbine in each cluster or linear array.</li> </ul> <p>83. Marking the wind monitoring towers according to the requirements set out in MOS 139 Section 8.10 will be considered.</p> <p>84. Marking of electricity transmission lines:</p> <ul style="list-style-type: none"> <li>- Overhead transmission lines and/or supporting poles that are located where they could adversely affect aerial application operations will be marked in accordance with MOS 139 Section 8.10, or</li> <li>- Alternatively, the AAAA endorsed power line marker reportedly developed in conjunction with Country Energy will be installed.</li> </ul> <p>85. The need for obstacle lighting will be reviewed at regular intervals by the proponent.</p>
<b>Transport</b>	Safety and asset protection	<p>86. A detailed <b>Transport Management Plan</b> will be developed as part of the CEMP to include the finalised transport details and include management and mitigation measures for the project. This will be prepared before the construction phase of the project and will form the foundations for all traffic related activities.</p> <p>87. Traffic generation numbers and proposed routes will be finalised and included in the Transport Management Plan.</p> <p>88. The haulage contractor will be confirmed and Haulage Transport Plan prepared, prior to the finalisation of the</p>



Sector	Issue	Commitment
		Transport Management Plan.
		89. The proponent will liaise with appropriate road authorities.
		90. The design of access points will be finalised and included in Transport Management Plan.
		91. The design of the internal site tracks network will be finalised prior to the construction phase.
		92. An existing conditions and roadside vegetation assessment will be undertaken and included in Transport Management Plan.
		93. If required by the Transport Management Plan, intersection and road upgrades along OD route to safely accommodate the manoeuvrability of these vehicles will be implemented.
		94. Carry out a pre-construction road survey to determine existing conditions of local roads.
		95. Carry out any necessary upgrades and strengthening works along the access road network to provide safe construction access for the project.
		96. Prepare and implement a traffic management plan to ensure local roads are not adversely impacted by heavy vehicles.
		97. Notify the local community of changed traffic conditions and proposed road works via a newsletter or information line.
	Traffic flow and capacity	98. Access tracks will only intersect with government roads at nominated access points.
<b>Telecommunications</b>	Television signal strength reduced	<p>99. In the event that TV interference is an issue during wind farm construction or after wind farm commissioning, the following options are recommended, in approximate order of increasing cost:</p> <ul style="list-style-type: none"> <li>- Realigning the householder's TV antenna directly towards their existing transmitter.</li> <li>- Tuning householder's antenna into alternative sources of the same or suitable TV signal.</li> <li>- The installation of more directional and/or higher gain antenna at the affected residence.</li> <li>- Relocating the antenna to a less affected position.</li> <li>- The installation of a digital set top box (and UHF antenna if required).</li> <li>- The installation of cable/satellite TV at the affected residences.</li> <li>- Installation of a TV relay station.</li> </ul> <p>In the event that digital TV does not provide an acceptable amelioration option, satellite television represents another potential option.</p>

Sector	Issue	Commitment
	Potential interferences to proposed future NSW RFS P2P link	100. Further consultation with NSW RFS will be undertaken to confirm whether interferences to the proposed future NSW RFS P2P link will occur, and whether the tower or interfering turbines should be relocated.
Fire	Increased risk of fire ignition or spread	101. As part of the OEMP, a <b>Fire Management Plan</b> will be prepared in consultation with State and local rural fire services, and DoPI, and in accordance with <i>Planning for Bushfire Protection 2006</i> . This would address safety, communication, site access and emergency response protocols. .
		102. The proponent will consult with the RFS during periods of high fire danger, and generally to ensure the RFS are familiar with the development.
		103. The proponent will consult with the RFS in regard to the adequacy of bushfire prevention measures to be implemented on site during construction, operation and decommissioning.
		104. Consultation with the NSW PWS on the management of bushfires in the adjacent National Park.
		105. Consult with the RFS during periods of high fire danger.
		106. Inform RFS and any aerial agriculture operators on the location of the wind turbines, transmission lines and monitoring masts.
		107. Development of workplace health and safety protocols to minimise the risk of fire for workers during construction and during maintenance in the control room and amenities.
		108. On-site vegetation management during construction and operation to minimise potential sources of fuel.
		109. Re-organisation of construction activities during periods of high fire danger, including ceasing use of explosives, and management of hot work activities such as welding or cutting.
		110. Use of materials and equipment during operation that minimise the likelihood of fire.
		111. Maintenance of vehicles to minimise sparking from exhaust systems.
		112. Automatic shutdown of any overheating turbine mechanism.
		113. Shut down of turbines during a bush fire in the area.
		114. Lightning protection on each turbine.
		115. Under-grounding of electrical and communication cables where practicable.
		116. Access to adequate water supply, with water access points be located in safe, easily identifiable areas and accessible in

Sector	Issue	Commitment
		all weather conditions by equipment up to 15 tonnes.
		117. A turning circle with a minimum radius of 10 metres will be provided for fire appliances at all water access points.
		118. The location and number of tanks or other water supply points will be determined in consultation with the NSW RFS.
		119. Careful storage and handling of flammable materials and ignition sources brought onto the site, as per manufacturer's instructions.
		120. Storage of appropriate fire fighting equipment onsite during the construction phase, ensuring that a minimum of one person on site is trained in its use.
		121. Periodical inspection of overhead transmission easements to monitor any regrowth of encroaching vegetation.
		122. Vehicle turn-around facilities to be provided at every turbine tower site.
		123. 5-metres wide internal access tracks to be provided that are driveable and permanently clear of vegetation for heavy fire-fighting equipment up to 15 tonnes.
		124. Provision of wind turbine access tracks that continue onto adjacent paddocks and are not dead-ended.
		125. Implementing a wide fuel break in accordance with RFS, Council and State Government recommendations to slow the spread of fire.
		126. Any vegetation plantings to have low fire resistance.
<b>Shadow Flicker</b>	Impacts on persons / dwellings	127. Screening structures or planting of trees to block shadows cast by the turbines will be installed where needed.
		128. Use of non-reflective paint on turbine blades.
		129. Turbine control strategies which shut down turbines as necessary will be used.
<b>Heritage</b>	Impact on heritage items	130. A comprehensive Cultural Heritage Management Plan will be prepared in consultation and collaboration with the Registered Aboriginal Parties to reduce and mitigate the impacts of the project on any artefacts which may be detected within disturbance zones. If it is not practicable to locate infrastructure so as avoid objects / artefacts then cooperation with the Registered Aboriginal Parties will be undertaken to determine the management option for these objects / artefacts (i.e. collection for education purposes or moving the objects / artefacts slightly to outside the zone of disturbance).  The movement of identified objects is considered to be a suitable mitigation measure in most cases as the distances involved would not be significant, and many of the objects may have been moved in the past via water movement, erosion or vehicle/tractor movements such as road grading

Sector	Issue	Commitment
		<p>and cultivation of the ground.</p> <p>131. The Cultural Heritage Management Plan will also outline management strategies for the management of any potential unrecorded sites which are identified within the site during construction of the project. In accordance with the Draft NSW Wind Farm Planning Guidelines, the construction program control measures will include provision to temporarily halt the excavation of a specific site in the event that a previously unidentified Aboriginal object(s) and historic relic is uncovered. All works likely to affect the object/relic would cease and the OEH officers and the Registered Aboriginal Parties notified. Works will not recommence at the specific site until an appropriate strategy for managing the object/relic has been determined in consultation with OEH and the Aboriginal stakeholders and a permit or written authorisation has been obtained from OEH.</p> <p>132. Avoid, as far as practicable, impacts on the known archaeological sites. If impacts to any further sites which are identified cannot be avoided then further investigation would be required in consultation with the Registered Aboriginal Parties and OEH. This would include sub-surface digs and analysis</p> <p>133. As the detailed design of the proposed access tracks and electrical connections were not available at the time the field surveys were conducted, potential deviations to the surveyed routes may be made during detailed design to reduce impact(s) on the land.</p> <p>134. Once the proposed access track locations and other disturbance areas are pegged on the ground, additional targeted surveys of these areas will be undertaken. Where these additional targeted surveys identify any further sites, test pits will be undertaken in order to determine the extent of significance of any sites which would be potentially impacted.</p> <p>135. The final micro-siting of the proposed infrastructure will be undertaken in consideration of utilising and upgrading as much as possible the existing farm access tracks where possible to achieve an overall site plan which minimises unnecessary new soil disturbance.</p> <p>136. A minimum distance or separation buffer of 100 meters will be maintained from any turbine and site P8. If the separation distance is not practical, then a sub-surface investigation should be undertaken for any turbine proposed within 100m of site P8.</p>
<b>Land Resources and Geotechnical</b>	Soil loss and stability of landform	<p>137. The <b>Soil and Water Management Plan</b>, will be prepared as part of the CEMP and will detail the measures and techniques to preserve soil resources.</p> <p>138. Further detailed subsurface geotechnical investigation and analysis will be conducted to provide information for the detailed design of footings, access road, slope stability, and other associated infrastructure.</p>

Sector	Issue	Commitment
		139. Access roads will be designed to stay on the ridge crests and remain clear of potential land slips.
		140. If crossing a potential land slip is required then the road formation will be designed to remove any potentially unstable material and found on stable bedrock.
		141. Site works, including excavation and filling, will be planned accordingly to reduce the risk of high concentrated surface water runoff.
		142. Remove any soft, wet, and highly compressible material or topsoil material and organics.
		143. Assess moisture contents of the bulk excavated soils and weathered rock. For compaction of any materials other than free draining sands, the moisture content will be in range OMC +/-2% (wet/dry), where OMC is the optimum moisture content at Standard Compaction.
		144. The complete surface of the sub-grade will be test rolled in order to detect the presence of any soft or loose zones, which will be excavated out and replaced with approved filling. Test rolling will be carried out with a smooth drum roller with a minimum static weight of 8 tonne.
		145. For pavements, the natural foundation soil will be compacted to a minimum dry density ratio of 98% Standard for clay soils or a minimum density index of 75% for sand soils.
		146. For pavements, approved filling excavated from site, will be placed in layers not exceeding 250mm loose thickness, with each layer compacted to a minimum dry density ratio of 98% Standard or a minimum density index of 75% for filling greater than 0.5m below top of finished subgrade level. The final upper 0.5m of filling sub-grade will be compacted to a minimum dry density ratio of 100% Standard or 80% density index. Where filling has a clay content, moisture content within the filling will be maintained within OMC -2% (dry) to OMC +2% (wet) during and after compaction.
		147. All filling beneath structures and footings will be compacted to a dry density ratio of at least 100% Standard or relative density index of at least 80%. This compaction will apply to all filling extending from a nominal horizontal distance of 2m at the edge of each structure with a nominal zone of influence of 1H:1V down and away from the proposed sub-grade level.
		148. Any compaction of silty or sandy clay foundation soils at or close to footing formation level will be sealed or covered as soon as practicable, to reduce the opportunity for occurrence of desiccation and cracking.
		149. Level 1 testing and supervision of filling, in accordance with AS3798, is recommended where the filling is to be used for support of structural loads, within the 2m horizontal distance and spread from structures as outlined above.

Sector	Issue	Commitment
		150. All weathered rock, excavated from site for re-use beneath structures and as pavement sub-grade filling, will be processed so that individual particles are in the order of 100mm or less.
		151. All weathered rock, excavated from site for re-use beneath structures and as pavement sub-grade filling, will be processed so that individual particles are in the order of 100mm or less.
		152. Approved rock filling excavated from site will be placed in layers not exceeding 300mm loose thickness with care taken to minimise the occurrence of voids. Fine sands and dispersive clays will not be included in the fill due to the susceptibility to erosion.
		153. Where pavements are proposed over bulk rock filling, it is recommended that the rock fill will be covered with a non-woven, needle punched, continuous filament polyester geofabric of sufficient strength to avoid punching failure.
		154. Place a minimum 0.5m thick cover of granular bridging on the geofabric in two layers of 250mm loose thickness, to provide sub-grade support for the pavement. The bridging layers will be compacted to a minimum dry density ratio of 100% Standard or 80% density index.
		155. Granular bridging or sub-grade filling will comprise engineered fill material.
<b>Hydrology</b>	Deterioration of water quality	156. A detailed <b>Soil and Water Management Plan (SWMP)</b> will be prepared prior to construction commencing. The SWMP will be prepared by a suitably qualified person, such as a soil conservationist.
		157. Progressive Erosion and Sediment Control Plans will be prepared as the project progresses to address management requirements at individual work sites.
		158. The wind farm and transmission line will be designed and constructed to minimise land disturbance and therefore reduce the erosion hazard.
		159. The construction activities will be staged to minimise the duration and extent of land disturbance.
		160. Topsoil resources will be managed to minimise the risk of erosion and sedimentation, and maximise reuse of topsoil during rehabilitation.
		161. Upslope (clean) stormwater will be diverted around the disturbed site capture sediment-laden runoff from within the disturbed site for diversion to sediment control devices.
		162. The site will be promptly and progressively rehabilitated as works progress.
		163. Erosion and sediment control devices will be inspected and maintained for the duration of the project.

Sector	Issue	Commitment
		164. The construction of new vehicle watercourse crossings will be avoided.
		165. Any water crossings would be designed to minimise impacts on existing banks, water flow, animal passage and on the movement of flows.
		166. Land disturbance within 20 m of minor streams (first and second order watercourses) and 40 m of third order or higher watercourses will be avoided.
		167. Appropriate procedures will be in place for the transport, storage and handling of fuels, oils and other hazardous substances, including availability of spill cleanup kits.
		168. Disturbance during transmission line construction will be minimised by using existing access tracks and roads, and avoiding construction of a permanent access track along the transmission line easement.
		169. Appropriate stormwater, collection, treatment and recycling at the concrete batch plant will occur in accordance with relevant best practice guidelines and any requirements of the NSW Office of Environment and Heritage.
	Water extraction	170. Water will be reused where possible to reduce water consumption (as detailed in the Water Management Plans to be included in the CEMP and OEMP).
		171. Over-extraction of surface water or groundwater will be avoided to prevent adverse impacts on environmental flows and water availability for existing licensed users.
		172. Any necessary water access licenses will be obtained.
	<b>Resource Impacts</b>	Waste generation
174. During decommissioning, all materials will be removed from the site and recycled appropriately.		
Building Materials		175. The existing 60m monitoring masts will be removed and reused elsewhere once the construction phase is complete.
		176. Where possible, the existing footings, access tracks and other infrastructure would be reused for any replacement turbine(s) during the operation phase.
<b>Decommissioning and Rehabilitation</b>	Responsibility for decommissioning	177. The proponent is responsible for the decommissioning of the wind farm infrastructure, and the landowner is not liable for this obligation (this is demonstrated in the land lease agreements with each of the wind farm participating landowners as shown in the Decommissioning and Rehabilitation Plan (DRP)).
		178. The DRP will be reviewed and revised as required every 5 years for the duration of the project. During each review, the effectiveness of the plan will be re-assessed against its objectives, and cost estimates

Sector	Issue	Commitment
		<p>and funding arrangements will also be reviewed by an independent consultant.</p> <p>179. The proponent commits to undertaking all decommissioning and rehabilitation works outlined in the DRP within the 18 months after the end of the wind farm's operational life (including any replacement of the turbines as contemplated by commitment 108 below).</p> <p>180. During the operational life of the project, any turbine that cannot be repaired and is deemed permanently unworkable (due to environmental, social, economic or other unforeseen issues) will be decommissioned and dismantled, and its location rehabilitated within 18 months.</p>
	Landscape impacts resulting from decommissioning	<p>181. At the completion of the wind farm's operating life, the turbines will either be replaced or the land will be rehabilitated to its previous or better condition.</p>
		<p>182. Tracks considered surplus to the farmers' requirements will be rehabilitated and revegetated by introducing soil, mulch and grass seeds or local provenance.</p>
	Recycling	<p>183. During decommissioning, all materials will be removed from the site and recycled appropriately.</p>



**UNION FENOSA**  
WIND AUSTRALIA



PALING YARDS WIND FARM  
CHAPTER 25

## **CONCLUSION**



## 25 Conclusion

This Environmental Assessment has detailed and assessed a proposal by Union Fenosa Wind Australia Pty Ltd, the proponent, and its successors and assigns to develop a wind farm with up to 55 turbines, known as the Paling Yards Wind Farm project.

The EA has found that the project would have a range of negative and positive impacts on the site and region, and that, with appropriate conditions and mitigations measures detailed, the negative impacts can be minimised.

In relation to the positive impacts, the EA found that if approved the wind farm would:

- generate 65 full time positions during construction, and 11 full time ongoing positions during the operation;
- invest \$287 million in the economy;
- generate up to 550,833 Megawatt hours (MWh) of clean, renewable energy per year, enough to power up to 85,344 households; and
- displace 535,961 tonnes of greenhouse gases or the equivalent of taking 123,778 cars off the road.

Most notably, the project would make a small but important contribution to reducing the dangerous impacts of anthropogenic climate change, such as droughts, floods, extreme weather events and sea level rise.

In relation to the negative impacts, the EA found that the wind farm has the potential to have a low to moderate impact on landscape values, have a limited impact on local communications facilities, increase noise for some receivers, and result in the clearing of non-significant vegetation.

These risks can be minimised by the extensive range of management plans that would be prepared before construction, further study, and ongoing monitoring on the compliance of the wind farm when constructed to established standards. These commitments are detailed in **Chapter 24 – Statement of Commitments**.

The EA also found that the project is compatible with the existing land uses of the area and complies with relevant planning and environmental controls applicable to the site. As a result, it is regarded that the project is in the public interest.



**UNION FENOSA**  
WIND AUSTRALIA



PALING YARDS WIND FARM  
CHAPTER 26

## REFERENCES



## 26 References

- Australian Government Bureau of Meteorology (BOM), 2010, *Climate Change*, accessed online: <http://www.bom.gov.au/climate/change/>
- Australian Government Bureau of Meteorology (BOM), 2011, *Climate statistics for Australian locations*, access online: [http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p\\_nccObsCode=136&p\\_display\\_type=dailyDataFile&p\\_startYear=2008&p\\_c=-801885820&p\\_stn\\_num=063033](http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=136&p_display_type=dailyDataFile&p_startYear=2008&p_c=-801885820&p_stn_num=063033)
- Australian Bureau of Agricultural and Resource Economics (ABARE) 2009, *Energy in Australia*, Department of Resources Energy and Tourism, accessed online on 24 October 2009: [http://www.abareconomics.com/publications\\_html/energy/energy\\_09/auEnergy09.pdf](http://www.abareconomics.com/publications_html/energy/energy_09/auEnergy09.pdf)
- Australian Bureau of Agricultural and Resource Economics (ABARE) research report, March 2010, *Australian energy projections to 2029-30*, Commonwealth of Australia
- Australian Wind Energy Association (AusWind) 2003, *Wind Farms and Tourism*, accessed online on 32 May 2009, <http://www.windri.org/survey/references/tourism.pdf>
- Australian Wind Energy Association (AusWind) 2006, *Best Practice Guidelines: for Implementation of Wind Energy Projects in Australia*, accessed online on 2 May 2009, [http://cleanenergycouncil.org.au/cec/resourcecentre/reports/Past-Reports/mainColumnParagraphs/0/text\\_files/file21/bestpracguidelines06.pdf](http://cleanenergycouncil.org.au/cec/resourcecentre/reports/Past-Reports/mainColumnParagraphs/0/text_files/file21/bestpracguidelines06.pdf)
- AWEA (American Wind Energy Association), *IEC Wind Turbine Standards*, accessed online in July 2012: [http://www.awea.org/learnabout/awea\\_standards\\_program/international\\_standards/index.cfm](http://www.awea.org/learnabout/awea_standards_program/international_standards/index.cfm).
- Baerwald E.F., D'Amours G.H., Klug B.J., Barclay R.MR, (2008). *Barotrauma is a significant cause of bat fatalities at wind turbines*. *Current Biology* Volume 18, Issue 16, Pages R695-R696.
- Branco C., Rodriguez E., 1999 'The vibroacoustic disease: An emerging pathology', *Aviation, space, and environmental medicine*, URL: cat.inist.fr.
- British Wind Energy Association, July 2004, *Benefits of Wind Energy*.
- Chapman, Simon et al, 2013, *Spatio-temporal differences in the history of health and noise complaints about Australian wind farms: evidence for the psychogenic, "communicated disease" hypothesis*, University of Sydney, accessed online: <http://hdl.handle.net/2123/8977>
- Civil Aviation Safety Authority (CASA), *Obstacle Marking and Lighting of Wind Farms (CASA Advisory Circular AC139-18(0))*.
- Clean Energy Council (CEC) 2009, *Technologies*, accessed online on 29 September 2009: <http://cleanenergycouncil.org.au/cec/technologies/bioenergy.html>
- Clean Energy Council (CEC) 2009, *There's power in wind: national snapshot*, accessed online on 7 September 2011, <http://www.cleanenergycouncil.org.au/cec/misc/powerinwind>
- Clean Energy Council (CEC) 2011, *There's Power In Wind: National Snapshot*, 1 July 2011.
- Clean Energy Council (CEC), 2012 *Wind*, accessed online on 2 February 2012: <http://www.cleanenergycouncil.org.au/cec/technologies/wind.html> .

Clean Energy Council, 2013, Technologies, Wind Energy, accessed online on 6 January 2014: <http://www.cleanenergycouncil.org.au/technologies/wind-energy.html>

Clean Energy Regulator, the Australian Government, About the Renewable Energy Target, April 2012, accessed online on 6 January 2013: <http://ret.cleanenergyregulator.gov.au/About-the-Schemes/Large-scale-Renewable-Energy-Target--LRET-/about-lret>

Commonwealth of Australia, Department of the Environment, The Renewable Energy Target (RET) scheme, accessed online on 7 January 2013: <http://www.environment.gov.au/node/35043>

Commonwealth Department of Climate Change, Renewable Energy (Electricity) Amendment Bill 2008 Exposure Draft –Commentary, December 2008, p 1.

Community Affairs References Committee 2011, *The Social and Economic Impacts of Rural Wind Farms*, for the Commonwealth of Australia.

Country Fire Authority, CFA Publications, accessed 16 March 2012, URL: <http://www.cfa.vic.gov.au/publications/windfarms.htm>

Crichton et al, March 2013, *Can Expectations Produce Symptoms From Infrasound Associated With Wind Turbines?*, <http://www.scribd.com/doc/130279155/Can-Expectations-Produce-Symptoms-From-Infrasound-Associated-With-Wind-Turbines>

CSIRO Science into Society Group 2012, Exploring community acceptance of rural wind farms in Australia: a snapshot, CSIRO. URL: <http://www.csiro.au/Organisation-Structure/Flagships/Energy-Transformed-Flagship/Exploring-community-acceptance-of-rural-wind-farms-in-Australia.aspx>

Department of Climate Change (DCC) 2009, *RET scheme legislation*, DCC, Australian Government: Canberra, viewed 24 October 2009, <http://www.climatechange.gov.au/government/initiatives/renewable-target/progress/legislation.aspx>

Department of Climate Change 2009, *RET scheme progress website*, Australian Government: Canberra, viewed 24 October 2009, <http://www.climatechange.gov.au/en/government/initiatives/renewable-target/progress.aspx>

Department of Climate Change and Energy Efficiency (DCCEE) 2010, *Enhanced Renewable Energy Target – fact sheet*.

Department of the Environment, Water, Heritage and the Arts (DEWHA) 2009, *Renewable Energy Atlas of Australia*, DEWHA, Australian Government: Canberra, viewed 18 May 2009, <http://www.environment.gov.au/settlements/renewable/atlas/maps.html>

Department of Industry and Investment 2009, *Wind power*, NSW Government, viewed 30 September 2009, <http://www.industry.nsw.gov.au/energy/sustainable/renewable/wind>

Department of Planning and Infrastructure and Community Development (DPCD), *Oaklands Hill Wind Farm, Panel Report* 2008. Accessed 17 July 2012 from website, at: [http://www.dpcd.vic.gov.au/\\_data/assets/pdf\\_file/0004/34294/Oaklands\\_Hill\\_Wind\\_Farm\\_Panel\\_Report.pdf](http://www.dpcd.vic.gov.au/_data/assets/pdf_file/0004/34294/Oaklands_Hill_Wind_Farm_Panel_Report.pdf)

Department of Planning and Infrastructure and Community Development (DPCD), *Bald Hills Wind Farm, Panel Report* 2004. Accessed 17 July 2012 from website, at:



[http://www.dpcd.vic.gov.au/\\_data/assets/pdf\\_file/0020/34292/Bald\\_Hills\\_Windfarm\\_ES\\_Panel\\_Report\\_-\\_Body.pdf](http://www.dpcd.vic.gov.au/_data/assets/pdf_file/0020/34292/Bald_Hills_Windfarm_ES_Panel_Report_-_Body.pdf)

Department of Resources, Energy and Tourism, Geoscience Australia, (2010) Australian Energy Resource Assessment, URL:

[http://www.abare.gov.au/publications\\_html/energy/energy\\_10/ga\\_aera.html](http://www.abare.gov.au/publications_html/energy/energy_10/ga_aera.html)

Diesendorf, M 2006, 'Wind Power in Australia', *International Journal of Environmental Studies*, vol. 63, no. 6, pp. 765-776.

Diesendorf, M 2007a, 'The Base Load Fallacy', *Energy Science: Briefing Paper*, viewed 9 May 2009, <http://www.energyscience.org.au/BP16%20BaseLoad.pdf>

Diesendorf, M 2007b, *Greenhouse Solutions with Sustainable Energy*, University of New South Wales, Sydney.

Diesendorf M, *Bluff and Bluster: The campaign against wind power*, 23 February 2005, p 1, accessed 7 July 2009, [www.onlineopinion.com.au/view.asp?article=3057](http://www.onlineopinion.com.au/view.asp?article=3057)

Elsevier, Renewable Energy Focus, 10 June 2010, *Wind energy industry foresees 250,000 new jobs in Europe by 2020*, URL:

<http://www.renewableenergyfocus.com/view/10119/wind-energy-industry-foresees-250000-new-jobs-in-europe-by-2020-/>

Energy Information Administration (EIA) (U.S.) (IEO), 2010, *International Energy Outlook 2010*, URL: <http://www.eia.doe.gov/oiaf/ieo/pdf/highlights.pdf>

European Wind Energy Association (EWEA) 2012, *Wind turbines not a threat to human health, another study finds*, published 24 May 2012, URL:

<http://blog.ewea.org/2012/05/wind-turbines-not-a-threat-to-human-health-another-study-finds/>

Fenwick, R. 2005, Expert retained by Union Fenosa Wind Aust P/L for proposed Berrybank Wind Farm, Victoria, URL:

[http://www.unionfenosa.com.au/BB\\_EWS\\_Reports/Berrybank\\_WF\\_Bushfire\\_Expert\\_Witness\\_Statement\\_Report.pdf](http://www.unionfenosa.com.au/BB_EWS_Reports/Berrybank_WF_Bushfire_Expert_Witness_Statement_Report.pdf)

Garnaut, 2008, *The Garnaut Climate Change Review: Final Report*, Cambridge University Press, Cambridge, viewed online 24 March 2009,

<http://www.garnautreview.org.au>

Garnaut, 2011, *The Garnaut Review 2011, Australia in the global Response to Climate Change*, Cambridge University Press, Cambridge, viewed online March 19 2012,

<http://www.garnautreview.org.au/update-2011/garnaut-review-2011.html>

Greenhouse Gas Reduction Scheme (GGAS) 2010 *Fact Sheet The NSW Pool Coefficient* <http://www.greenhousegas.nsw.gov.au>

Global Wind Energy Council (GWEC), *Wind is a global power source*, accessed 26 July 2010, [www.gwec.net/index.php?id=13](http://www.gwec.net/index.php?id=13)

Global Wind Energy Council (GWEC), *Wind energy must be key climate change solution*, accessed 2 February 2012, [www.gwec.net/index.php?id=13](http://www.gwec.net/index.php?id=13)

Hamilton, *Noise protesters howling about windfarms*, thestar.com, May 11, 2009.

House of Representatives Standing Committee on Industry and Resources, September 2007, p xviii.

Infigen Energy, June 2012, *Can Wind Power Rescue the RET?*, access online 8 January 2014: <http://www.infigenenergy.com/about-us/news/can-wind-power-rescue-the-ret.html>

International Energy Agency, Renewable Energy, accessed 10 November 2009, [www.iea.org/subjectqueries/keyresult.asp?KEYWORD\\_ID=4116](http://www.iea.org/subjectqueries/keyresult.asp?KEYWORD_ID=4116).

Layton J., 2009 *Do wind turbines cause health problems?* How Stuff Works, URL accessed March 2009: <http://science.howstuffworks.com/wind-turbines-health.htm/printable>. [Home](#) > [Science](#) > [Earth Science](#) > [Green Science](#)

Massachusetts Department of Environmental Protection & Massachusetts Department of Public Health (MDEP & MDPH) Independent Expert Panel, January 2012, *Wind Turbine Health Impact Study*.

Minister for Climate Change, Energy Efficiency and Water, Media Release 25 June 2010, *Australia Moves to Clean Energy Future*, Parliament House, Canberra ACT.

National Health and Medical Research Council (NHMRC), 2010, *Wind Turbines and Health*, July 2010, Australian Government.

National Pollutant Inventory 2010, URL: [www.npi.gov.au](http://www.npi.gov.au)

New South Wales (NSW) Government, Department of Energy, Utilities and Sustainability, 2006, *NSW Renewable Energy Target Explanatory Paper*, November 2006.

New South Wales (NSW) Government Department of Environment, Climate Change & Water (DECCW), *Climate Change*, April 2010, URL: <http://www.environment.nsw.gov.au/climatechange/index.htm>

New South Wales (NSW) Government Department of Environment, Climate Change & Water (DECCW), *Climate Change Impacts Profile*, June 2010, URL: <http://www.environment.nsw.gov.au/resources/climatechange/10171climateimpactprof.pdf>

New South Wales (NSW) Government, Department of Industry and Investment, 2010a, *Wind*, accessed 23 July 2010, URL: <http://www.industry.nsw.gov.au/energy/sustainable/renewable/wind>

New South Wales (NSW) Government, Department of Industry and Investment, 2010b, *Greenhouse gas*, accessed 27 July 2010, URL: <http://www.industry.nsw.gov.au/energy/sustainable/greenhouse-gas>

New South Wales (NSW) Government Department of Industry and Investment, 2010c, *Wind power*, accessed 27 July 2010, <http://www.industry.nsw.gov.au/energy/sustainable/renewable/wind>

New South Wales (NSW) Government, Department of Primary Industries, Trade & Investment, Resources & Energy division, TASMap (<http://www.minerals.nsw.gov.au/tasmap/>)

New South Wales (NSW) Legislative Council 2009, *Rural wind farms / General Purpose Standing Committee No. 5*, Sydney, N.S.W, December 2009- XXIV, Report no. 31.

New South Wales (NSW) Government Planning Assessment Commission, 2013a, *NSW Planning Assessment Commission Determination Report – Bodangora Wind Farm Project*, Wellington LGA, Commission Secretariat, NSW

New South Wales (NSW) Government Planning Assessment Commission, 2013b, *NSW Planning Assessment Commission Determination Report – Collector Wind Farm Project*, Upper Lachlan Shire LGA, Commission Secretariat, NSW

New York State Energy Research Development Authority (NYSERDA) 2005, *Public Health and Safety*. Accessed on 10 July 2012:

[http://www.powernaturally.org/Programs/Wind/toolkit/18\\_publichealthandsafety.pdf](http://www.powernaturally.org/Programs/Wind/toolkit/18_publichealthandsafety.pdf).

Offor Sharp & Associates, 2003 on behalf of NSW Department of Lands, NSW Valuer General, Preliminary Assessment of the Impact of Wind Farms on Surrounding Land Values in Australia, August 2009.

Origin Energy, 2013, Renewable Energy Target, accessed online 8 January 2014: <http://www.originenergy.com.au/4244/Renewable-Energy-Target>

NGH Environmental, 2009, *Environmental Assessment: Proposed Wind Farm, Gullen Range NSW*, p.69. URL: <http://majorprojects.planning.nsw.gov.au/>

Organisation for Economic Co-operation and Development (OECD) 2009, *OECD Factbook: Economic, Environmental and Social Statistics, Paris: Organisation for Economic Co-operation and Development*.

Ohio Department of Health (ODH) 2008, 'Literature search on the potential health impacts associated with wind-to-energy turbine operations' *Health Assessment Section*, March, 2008.

Office the Renewable Energy Regulator, *Register of accredited power stations*, November 2009, [www.rec-registry.gov.au/searchAccreditedPowerStations.shtml](http://www.rec-registry.gov.au/searchAccreditedPowerStations.shtml)

Pacific Hydro, Infrasound Measurements from wind farms and other sources, 2010, URL: [http://www.pacifichydro.com.au/media/192017/infrasound\\_report.pdf](http://www.pacifichydro.com.au/media/192017/infrasound_report.pdf)

Pierpont, Dr. Nina 2006, *Health Effects of Wind Turbine Noise*. <http://www.ninapeirpont.com>

Pike Research 2011a, Global Wind Power Capacity to Triple by 2017 <http://www.pikeresearch.com/newsroom/global-wind-power-capacity-to-triple-by-2017>, July 12, 2011.

Pike Research 2011b, Global Wind Power Investment to Total \$820 Billion from 2011 to 2017, <http://www.pikeresearch.com/newsroom/global-wind-power-investment-to-total-820-billion-from-2011-to-2017>, November 9, 2011.

Public Health Association of Australia (PHAA), 2011, *Position Statement: Human Health Effects of Wind Turbines*, adopted in December 2011 as part of the 2011 policy development and review process.

RenewableUK, 2010, Top Myths About Wind Energy, accessed 26 July 2010, URL: <http://www.bwea.com/energy/myths.html>

Rural Fire Service, New South Wales, URL: <http://www.rfs.nsw.gov.au/>

Rural Fire Service, New South Wales, *Planning for Bushfire Protection* 2006, URL: [http://www.rfs.nsw.gov.au/dsp\\_content.cfm?cat\\_id=900](http://www.rfs.nsw.gov.au/dsp_content.cfm?cat_id=900)

Sustainability Victoria, 2010, <http://www.sustainability.vic.gov.au/www/html/2111-wind.asp>.

Sustainable Energy Development Authority of NSW (SEDA), 2001, *NSW Wind Energy Handbook 2002*.

Sydney Morning Herald (SMH), April 21 2006, *Dam dries up for first time in 25 years*, David Braithwaite, accessed 17 February, 2011, URL: <http://www.smh.com.au/news/national/dam-dries-up-for-first-time-in-25-years/2006/04/21/1145344266879.html?page=2>

Sydney Morning Herald (SMH), March 25, 2011, *Turbines take their turn*, Ben Cubby. Accessed, 6 February 2012, URL: <http://www.smh.com.au/environment/earth-hour/turbines-take-their-turn-20110325-1c9ex.html>

Sydney Morning Herald (SMH), December 2013, Carbon tax repeal hits Senate roadblock, accessed online on 20 December, 2013: <http://news.smh.com.au/breaking-news-national/carbon-tax-repeal-hits-senate-roadblock-20131210-2z2xe.html>

United Nations 2006, *World Population Prospects: the 2006 Revision – Highlights* , viewed 24 October 2009, [http://www.un.org/esa/population/publications/wpp2006/WPP2006\\_Highlights\\_rev.pdf](http://www.un.org/esa/population/publications/wpp2006/WPP2006_Highlights_rev.pdf)

United Nations 2009a, *Summit on Climate Change: Opening Remarks to the United Nations Climate Change Summit Plenary 22 September 2009*, accessed 28 September 2009, [http://www.un.org/apps/news/infocus/sgspeeches/statments\\_full.asp?statID=582](http://www.un.org/apps/news/infocus/sgspeeches/statments_full.asp?statID=582)

United Nations Climate Change Conference (UNCCC) 2009, Official Website view 5 September 2009, <http://en.cop15.dk/>

United Nations Conference on Environment and Development, Rio, 1992 (the 'Rio Declaration').

University of Melbourne and Beyond Zero Emissions, 2010, *Zero Carbon Australia Stationary Energy Plan Australian*, Parkville, Victoria. Report accessed from: <http://beyondzeroemissions.org/zero-carbon-australia-2020>

Van den Berg, G. P., 2003 'Effects of the wind profile at night on wind turbine sound', *Journal of Sound and Vibration*, Netherlands. URL: [www.elsevier.com/locate/jsvi](http://www.elsevier.com/locate/jsvi)

Vestas Wind Systems, 0026-0656 January 2012, v1 turbine engineering report – Classification: Unpublished.

Wind Energy & Solar Power Australia, 2005, Energy Matters, URL: <http://www.energymatters.com.au/faqs/renewable-energy-faq.php>

Windlab 2011, *Values*, URL accessed 10 July 2012: <http://www.windlab.com/landowners/values>

World Health Organization (WHO) (2004): *Energy, sustainable development and health*. Background document for the Fourth Ministerial Conference on Environment and Health, 23-25 June 2004, Geneva.

World Meteorological Organisation (WMO), Press Release 906: 2010 equals record for world's warmest year, January 20 2011, URL: [http://www.wmo.int/pages/mediacentre/press\\_releases/pr\\_906\\_en.html](http://www.wmo.int/pages/mediacentre/press_releases/pr_906_en.html)

World Wind Energy Association (WWEA) 2009, *World Wind Energy Report 2008*, viewed 2 April 2009, URL: [http://www.wwindea.org/home/images/stories/worldwindenergyreport2008\\_s.pdf](http://www.wwindea.org/home/images/stories/worldwindenergyreport2008_s.pdf)

World Wind Energy Association (WWEA) 2011, *Half-Year Report 2011*, viewed 3 February 2012, published August 2011, Germany. URL: <http://www.wwindea.org/home/index.php>