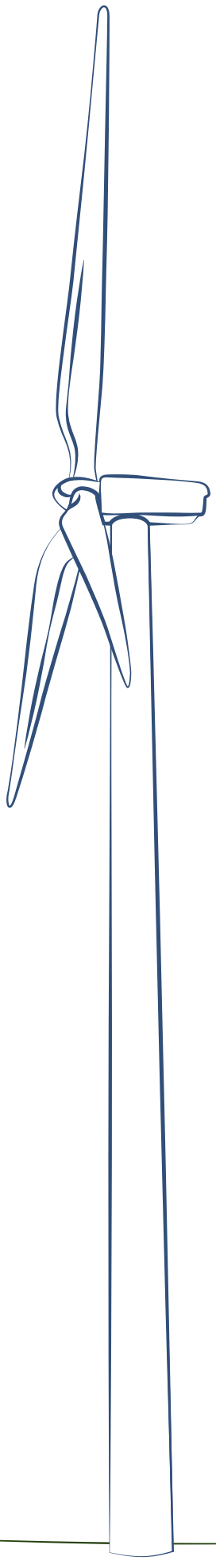

Chapter 5

Approvals

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CHAPTER 5 – APPROVALS

5.0 INTRODUCTION

This chapter describes the required assessment and approvals process relevant to the proposed construction and operation of the Bodangora Wind Farm. Specifically, this chapter of the EA provides the following, as per the Director-General's requirements (DGRs):

Director-General's Requirements:

> *"Consideration of any relevant statutory provisions including the consistency of the project with the objects of the Environmental Planning and Assessment Act 1979 and any relevant development control plans. Consideration should be given to the Central West Catchment Action Plan.*

Legislation as relevant to the assessment of this project as discussed within this chapter is listed below:

- Section 5.1: Environmental Planning and Assessment Act 1979
- Section 5.2: Federal Instruments:
  - Renewable Energy (Electricity) Act 2000;
  - Environment Protection and Biodiversity Conservation Act 1999;
  - Civil Aviation Safety Regulations 1998; and
  - Radiocommunications Act 1992;
- Section 5.3: NSW Legislation:
  - Protection of the Environment Operations Act 1997;
  - National Parks and Wildlife Act 1974;
  - Threatened Species Conservation Act 1995;
  - NSW Fisheries Management Act 1994;
  - Native Vegetation Act 2003;
  - Roads Act 1993;
  - Surveying and Spatial Information Act 2002;
  - Water Management Act 2000;
  - Water Act 1912; and
  - Catchment Management Authorities Act 2003;
- Section 5.4: Environmental Impact Assessment Guidelines; and
- Section 5.5: additional approvals not already identified.

5.1 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) provides the framework for development assessment in New South Wales. The Department of Planning is the responsible NSW Government authority for the assessment of any development where the Minister is the approval authority.

The EP&A Act and its Regulations provide the requirements for the preparation of local environmental plans, matters to be addressed by environmental impact assessments, the process for lodging project applications, notification and exhibition requirements, the process for assessment and other related matters.

On 16 June 2011, the NSW Government introduced the *Environmental Planning and Assessment Act (Part 3A) Bill 2011*, which will change the framework for assessment for similar projects, whereby major projects are now 'called in' for classification by the Minister and the Planning Assessment Commission as State Significant Development, where:

- projects specifically deliver significant public benefits for the State or regional communities;
- where the project is complex, contentious or environmentally hazardous; and/or
- where the project crosses over multiple local government areas and requires coordinated assessment.

Notwithstanding, as the Bodangora wind farm project was declared a major project on 3 August 2010, and given the project has not otherwise been revoked, Part 3A of the EP&A Act applies. The assessment of the project has been provided upon the now superseded Part 3A of the EP&A Act.

5.1.1 Draft NSW Wind Farm Planning Guidelines

The *Draft NSW Wind Farm Planning Guidelines* were exhibited from 23 December 2011 to 14 March 2012. The Guidelines are intended to provide a regulatory framework to guide investment in wind farms across NSW while minimising potential impacts on local communities.

On 18 April 2012, correspondence from the Director-General was received which outlines further requirements for the project pursuant to the Draft NSW Wind Farm Planning Guidelines (refer **Attachment B**).

An assessment has been made of the key provisions of the Guidelines which need to be adopted in applications for which the Director-General's Requirements have been issued but where the project has not yet been exhibited. This is provided in **Attachment C**.

5.1.2 Classification of Major Project

The project was initially identified as a major project with a capital value of greater than $30 million, where the State Environmental Planning Policy (Major Projects) 2005 defines this type of development as available for assessment under Part 3A. Section 6 specifically states:

> *"Development that, in the opinion of the Minister, is development of a kind that is described in Schedule 1 or 2 is declared to be a project to which Part 3A of the Act applies".*

In respect of wind farm developments, Schedule 1, Part 24 specifies

> *"Developments for the purpose of a facility for generation of electricity, including wind power, which has either a capital investment value of more than $30 million, or has a capital investment value of $5 million and is located in an environmentally sensitive area of State Significance" as being subject to Part 3A of the Act."*

As the Bodangora Wind Farm has been declared a major project, the project is subject to determination by the NSW Minister for Planning under Part 3A of the EP&A Act. The Department of Planning supports the Minister in this process, and the Director-General of the Department of Planning sets the requirements for the matters to be addressed in the Environmental Assessment.

Confirmation was received that the Bodangora Wind Farm is a project to which Part 3A of the *EP&A Act 1979* applies. On 30 August 2010, the Director – Infrastructure Projects (as delegate for the Minister) formed the opinion that the proposal meets the requirements of Part 3A of the EP&A Act. A copy of this correspondence is provided within **Attachment A**.

In accordance with Part 3A, a project application together with a Preliminary Environmental Assessment was submitted to the Department of Planning in October 2010.

5.1.3 Preparation of Environmental Assessment

This Environmental Assessment (EA) has been produced in accordance with statutory requirements of the EP&A Act prior to the revoking of Part 3A major project developments. Specifically, EA has addressed the Director-General's requirements in relation to assessment of the potential impacts arising from the proposed development. The Director-General's requirements for the project were provided on 12 November 2010, and supplementary Director-General's requirements provided on 16 August 2011. Both Director-General's requirements are provided in **Attachment A** of this EA.

Under Section 75U of the EP&A Act separate approvals for the following are not required for the Bodangora Wind Farm:

- an approval under Part 4, or an excavation permit under Section 139, of the *Heritage Act 1977*;

- an Aboriginal Heritage Impact Permit under Section 90 of the *National Parks and Wildlife Act 1974*;
- an authorisation referred to in Section 12 of the *Native Vegetation Act 2003* (or under any Act to be repealed by that Act) to clear native vegetation or State protected land;
- a bush fire safety authority under Section 100B of the *Rural Fires Act 1997*; and
- a water use approval under Section 89, a water management work approval under Section 90 or an activity approval under Section 91 of the *Water Management Act 2000*.

Following submission of the EA to the Department of Planning will:

- refer the Project Application to relevant agencies;
- make the Environmental Assessment publicly available and advertise and notify the community of the exhibition period and opportunity to make submissions on the project; and
- give consideration to agency and public responses in the review of the proposal and formulation of its recommendations to the Minister for determination of the Project Application and where relevant, conditions of approval.

The assessment of the relevant provisions of the EP&A Act is provided in Chapter 7 of this EA.

5.2 FEDERAL STATUTORY CONTROLS

5.2.1 Renewable Energy (Electricity) Act 2000

The *Renewable Energy (Electricity) Act 2000* aims to encourage additional electricity generation from renewable energy sources, to reduce emissions of greenhouse gases in the electricity sector, and to ensure that renewable energy sources are ecologically sustainable.

The Act implements the Australian Government's mandated Renewable Energy Target (RET); a scheme which has been established to encourage additional generation of electricity from renewable energy sources to achieve a commitment of a 20 percent share of renewables in Australia's electricity supply by 2020. The RET places a legal liability on wholesale purchases of electricity (eg electricity retailers) to proportionally contribute to an additional 45,000 gigawatt hours (GWh) of renewable energy each year. In June 2010, the RET was further enhanced, with the legislation dividing the RET into one target for large scale projects like wind farms, and another for residential and small scale technologies.

The Bodangora Wind Farm proposal will assist in the provision of the renewable energy targets as required by the *Renewable Energy (Electricity) Act 2000*, and an application will be made to register the wind farm once operational as an accredited Renewable Energy Generator.

5.2.2 Environmental Protection and Biodiversity Conservation (EPBC) Act 1999

The EPBC Act provides for the protection of heritage and the environment, particularly for aspects which are identified as matters of national environmental significance.

A bilateral agreement between the New South Wales and Commonwealth Government allows the NSW Government to assess any 'actions' that may have an impact on matters of environmental significance, in accordance with Section 45 of the EPBC Act.

Technical assessment components of this EA have considered whether an EPBC referral is required under Section 68 of the EPBC Act. The following assessments have been undertaken:

- A Flora and Fauna Assessment, undertaken by ecological consultant, Kevin Mills and Associates, dated August 2011. The report is provided in **Appendix D** and summarised in Chapter 9.
- An Bat Fauna Assessment, undertaken by Greg Richards and Associates Pty Ltd, dated March 2011. The report is provided **Appendix E** and summarised in Chapter 9.
- A European and Aboriginal Cultural Heritage Assessment, undertaken by NSW Archaeology Pty Ltd, dated September 2011. This assessment is provided in **Appendix F** and summarised in Chapter 10.

All three assessments have concluded that the construction and operation of the proposed wind farm is unlikely to have significant impact on any matters of national environmental significance. Each of the above assessments have recommended that there is no requirements for a referral to the Commonwealth Minister for the Bodangora Wind Farm project.

5.2.3 Civil Aviation Safety Regulations 1998

Pursuant to Section 139E of the Civil Aviation Safety Regulations, the intention, height and location of proposed structures greater than 110 metres above ground level, must be reported to the Civil Aviation Safety Authority.

Correspondence was prepared in accordance with the Civil Aviation Safety Regulations, and confirmation from CASA has been received in recognition of the project. Further commentary is provided in Chapter 15 of this EA with no issues identified.

5.2.4 Radiocommunications Act 1992

The *Radiocommunications Act 1992* provides for the management of radio frequencies in Australia, including protection measures for potential radiocommunications interference. An assessment has been undertaken by Lawrence Derrick and Associates on the possible impacts upon broadcasting and radiocommunications services was part of the Bodangora Wind Farm.

The investigations have considered that the proposal is unlikely to have an undue interfere to radio, mobile or television in the locality. Mitigation measures have been proposed should any interference problems occur, although the actual measures will depend on the nature of the interference and the circumstances of the receiver. This assessment has been provided in Chapter 13 of this EA.

5.3 NSW LEGISLATION

5.3.1 Protection of the Environment Operations Act 1997

The *Protection of the Environmental Operations (PEO) Act 1997* aims to protect, restore, and enhance the quality of the environment in New South Wales, having regard to ecologically sustainable development. Schedule 1 of the PEO Act provides the list of 'Scheduled Activities' which require an Environmental Protection Licence.

Pursuant to Schedule 1 of the PEO Act, wind farms are not classified as 'Scheduled Activities', and accordingly the wind farm will not require an Environment Protection Licence by the Environmental Protection Authority.

Notwithstanding, the proposal is required to comply with the Project Approval Conditions and relevant requirements of the Protection of the Environment Operations (PEO) Act. The Appropriate Regulatory Authority in respect of the Project Approval will be the Department of Planning, while for environment protection issues subject to provisions of the PEO Act, Wellington Shire Council is the Appropriate Regulatory Authority pursuant to Part 6(2) of the PEO Act. This may include for matters such as traffic management, erosion and sediment control, and management and containment of fuels and oil on-site.

5.3.2 National Parks and Wildlife (NPW) Act 1974

The *National Parks and Wildlife (NPW) Act 1974* governs the establishment, management and preservation of parks, conservation areas, and any endangered, rare or threatened species, and Aboriginal heritage and historic sites.

Detailed flora and fauna investigations by Kevin Mills and Associates and Greg Richards and Associates have considered the assessment of the proposal in context to conserved areas by the NPW Act, refer to Chapter 9 of this EA. A comprehensive archaeological assessment was undertaken by New South Wales Archaeology Pty Ltd in accordance with the requirements of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010), refer to Chapter 10.

The Major Projects Application is likely to be referred to the Department of Environment, Climate Change and Water for consideration of the acceptability of the project's impacts against the NPW Act.

5.3.3 Threatened Species Conservation Act 1995

The *Threatened Species Conservation (TSC) Act 1995* provides for the conservation of threatened species, populations and ecological communities. The Act identifies matters for consideration in assessment of the effect of a proposal on threatened species, populations and ecological communities, or their habitats.

Targeted assessments have been undertaken against the criteria of Schedules in the TSC Act, of which the findings are presented within Chapter 9 of this EA. This has included flora and fauna, and bat species to confirm the status of specific individual species within the project area, and if threatened species are likely to be found.

5.3.4 NSW Fisheries Management Act 1994

The object of the *NSW Fisheries Management (FM) Act 1994* is to conserve threatened species, habitats and population and ecological communities. Of particular relevance is Part 7A of the *FM Act 1994*, relating to Threatened Species Conservation.

The flora and fauna investigations has not identified any threatened species, habitats, populations or ecological communities which occur or may occur within the project area which are fish species.

The majority of works for the proposal are located along ridges, and works are not expected to affect threatened aquatic species which may be present within the project area. Management and mitigation measures to prevent soil erosion and sediment movements will be provided within the Construction and Environmental Management Plan for the project, which will be developed prior to construction. This will be relevant particularly to the development of access tracks which will be located at lower elevations and will involve site preparation works.

5.3.5 Native Vegetation Act 2003

The *Native Vegetation Act 2003* provides protection for native vegetation across New South Wales and provides requirements in respect to proposed clearing areas of native vegetation.

An assessment of the flora which exists at the site has been undertaken by Kevin Mills and Associates, and a summary of which is provided in Chapter 9 of this EA. The majority of vegetation in the project area is exotic grassland, with remnant woodland and occasional grassland in specific locations.

The majority of sites where infrastructure is proposed, including at turbine foundations, the substation site, access tracks and underground cable trenches have been previously cleared and are subject to grazing. Vegetated areas will be avoided wherever possible through the selective design of access track and cable locations, however some locations may require pruning and/or clearing works. All pruning/clearing works will be undertaken in accordance with the appropriate management and mitigation measures provided by Kevin Mills and Associates, as represented in Chapter 9.

Management works will be provided in the Construction and Environmental Management Plan, to be prepared prior to construction.

As part of the assessment, the Department of Planning will review the project assessment, the identified potential impacts on native vegetation and the proposed controls and where necessary apply conditions to ensure appropriate protection.

5.3.6 Roads Act 1993

The *Roads Act 1993* regulates the classification and use of roads, and provides the functions of the Roads and Traffic Authority.

Permits may be required under Section 138 of the *Roads Act 1993* for underground cabling that would pass underneath local roads nearby and within the project site. Permits will also be required for new proposed connections and upgraded connections between private and classified roads.

Preliminary consultation has occurred with the Roads and Traffic Authority and the Wellington Council and will continue to occur as the project progress with regard to all proposed road construction and required approvals. Site access details and the use of local roads has been discussed with Wellington Shire Council is described in Chapter 12 of this EA.

5.3.7 Surveying and Spatial Information Act 2002

The *Surveying and Spatial Information Act 2002* provides for the maintenance of a State cadastre, the coordination of surveys, and for the registration of licensed quality land surveyors. Pursuant to Clause 24 (1) of the Act, "*a person must not remove, damage, destroy, displace, obliterate or deface any survey mark unless authorised to do so by the Surveyor-General*".

Correspondence received from the Land and Property Information division has identified survey marks along Goolma Road, and Trigonometric Station TS5115 'Lincoln' at the peak of Mount Bodangora. The Surveyor General has not identified any objection to the proposal. This correspondence is enclosed at **Attachment E**, and detailed in Chapter 4 of this EA.

Measures will be incorporated in the project Construction and Environmental Management Plan to ensure that survey marks and the Trigonometric Station is not affected.

5.3.8 Water Management Act 2000

The *Water Management Act 2000* governs for the sustainable and integrated management of water resources in NSW, including for the protection of water resources, ecology, managing water sharing and water use, drainage, floodplain management and controlled activities.

Provision will be incorporated with the Construction and Environmental Management Plan to ensure all measures are undertaken to reduce the potential impact of the proposal on nearby creeks and watercourses. Particularly, this will relate to sediment control during native vegetation clearance and site works. Such environmental controls will be subject to assessment by the Department of Planning as part of the assessment process.

The laying of cables underneath/across a watercourse also requires approval under the *Water Management Act* where necessary.

5.3.9 Water Act 1912

The *Water Act 1912* still governs the issue of new water licenses and the trade of water licenses and allocations. Water licenses are required for the extraction of water from a water body via a pump, the capture of surface water (ie damming), and for the extraction of groundwater.

As detailed in Chapter 3 of this EA, water supply for the construction stages of the project is most likely to be local water supplies, acquired from the Wellington Shire Council. Water will also be captured in rainwater tanks for domestic purposes inside proposed maintenance buildings. The proponent will work with the Wellington Shire Council in obtaining the necessary licensing as required under the Water Act.

5.3.10 Catchment Management Authorities Act 2003

The Catchment Management Authorities Act provides the framework for the Catchment Management Authority (CMA) to manage natural resources on a catchment level. The Bodangora Wind Farm is situated within the Central West Catchment and lies in a region covered by the Central West Catchment Management Authority, which covers the Castlereagh, Bogan and Macquarie River valleys.

The Central West Catchment Management Authority has been consulted as part of the Part 3A consultation process, and the outcomes of this consultation process identified in Chapter 6.

The Central West Catchment Action Plan (2007) as established by the Central West CMA outlines a number of catchment and management targets for the improvement of the natural assets in the region. Key themes include salinity, water, vegetation, biodiversity, soils, community and Aboriginal and non-Aboriginal heritage. The Construction and Environmental Management Plan which will be prepared prior to construction will assist in the management of a range of potential soil, erosion, waste, emission, extraction, and water use elements. Flora and Fauna and Heritage Assessments have identified that there are unlikely to be any issues associated with the construction and operation of the wind farm which cannot be appropriately managed through design.

5.4 RELEVANT ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

5.4.1 National Wind Farm Development Guidelines

Wind energy has the potential to deliver a significant proportion of Australia's future electricity needs and contribute to national greenhouse gas abatement objectives. In light of the expected increase in wind farm developments in coming years, the Environment Protection and Heritage Council (EPHC) has prepared a set of draft National Wind Farm Development Guidelines which aim to outline best practice for industry and planning authorities in areas including, heritage, threatened species and turbine noise.

EPHC advised in mid 2010 that the draft Guidelines are being released for a period of 12 months to allow further consultation with relevant stakeholders. It is not the intention of these guidelines to be mandatory or change existing jurisdictional statutory processes, but to provide a basis for further consultation and consideration of the role of national guidelines in existing state approval processes.

5.4.2 Environmental Impact Assessment Guidelines for Wind Energy Facilities

The NSW Department of Planning has issued draft Guidelines for Environmental Impact Assessment for Wind Energy Facilities. The draft Guidelines are dated June 2002 and set out considerations for assessment of wind energy facilities. The Guidelines were referenced by the Director-General's requirements for the Environmental Assessment and have been referred to in the preparation of this Environmental Assessment. It is understood that the guidelines are currently under review.

5.4.3 EIS Guidelines – Network Electricity Systems and Related Facilities (Draft 2002)

The project will be connected to an existing 132kV overhead transmission line. Technical design considerations and environmental impact assessment has been undertaken in developing the 132kV switching station arrangement.

5.4.4 South Australian EPA, Wind Farm – Environmental Noise Guidelines

The Director-General's requirements (DGRs) for the Environmental Assessment state that it must include a comprehensive assessment of the predicted noise impacts resulting from the construction and operation of the proposal. In relation to the wind turbines, the noise assessment must be undertaken in accordance with The South Australian Environment Protection Authority's Wind Farms – Environmental Noise Guidelines, 2003. These Guidelines have been referred to by Vipac in the conduct of the Noise Impact Assessment (**Appendix G**). A summary of the assessment is provided in Chapter 11. The SA Noise Guidelines were updated in 2009; however, the proponent has not been directed to follow or to apply the updated guidelines as yet.

5.4.5 NSW Industrial Noise Policy

The DGRs also specify that the noise assessment for the proposal in respect of structures other than the wind turbines is required to be conducted in accordance with the NSW EPA Industrial Noise Policy, January 2000. The substation will include various electrical equipment including two 132 kV/33 kV transformers. Such transformers can be associated with noise emissions and the assessment of such equipment as provided in **Appendix G**, references the NSW Industrial Noise Policy.

5.4.6 Environmental Noise Control Manual (NSW EPA, 2004)

In regard to noise impacts associated with the construction aspects of this proposal, the Director-General's requirements for the Environmental Assessment require the noise assessment to be in accordance with Chapter 171 of the Environmental Noise Control Manual (EPA, 2004).

5.4.7 Best Practice Guidelines (Australian Wind Energy Association, Auswind) 2006

The Australian Wind Energy Association has developed the 'Best Practice Guidelines' to support the development of wind energy projects that are appropriately sited, sensitively developed and operated from an environmental and community perspective. The Guidelines are not intended to replace existing energy or environmental planning legislation, policy or regulations at Local, State or Federal Government levels. They also acknowledge that each wind energy development will be unique and require assessment on its individual merits.

5.4.8 NSW Renewable Energy Precincts

The NSW Government is positioning NSW to take advantage of the predicted increase in investment in renewable energy that will result from the Federal Government's national renewable energy target (RET) that has now been expanded to a target of 20 percent renewable energy by 2020.

The NSW Government is rolling out a wide suite of reforms to promote renewable energy, ranging from planning and regulatory reforms for cost-effective technologies through to incentives and grants for technologies that are further from commercial viability. Initially it is expected that most of the new renewable energy supply will be met by wind energy developments.

One of the key components of the NSW Government's renewable energy agenda is the establishment of six renewable energy precincts in the New England Tablelands, Upper Hunter, Central Tablelands, NSW/ACT Cross Border Region, Snowy-Monaro and the South Coast. The six precincts are shown in Figure 5.2. Precinct 3 – Central Tablelands includes the local government areas of Bathurst, Blayney, Cabonne, Cowra, Lithgow, Mid-Western Regional, Oberon, Orange and Wellington and is applicable to the Bodangora Wind Farm proposal.

The precincts are a community partnership initiative in areas where significant future renewable energy development is expected, especially wind farms and have been formed to give local communities a voice and a stake in renewable energy development. Dedicated renewable energy staff have been put in place to help drive regional initiatives and lead stakeholder engagement to enhance knowledge, understanding and uptake of renewable energy.

A range of initiatives have been implemented to assist the communities understanding of the issues associated with increased renewable energy development.

5.4.9 Infrastructure Proposals on Rural Lands Guidelines

The *Infrastructure Proposals on Rural Lands Guidelines* (Department of Industry and Investment, 2010) identifies criteria for assessment for infrastructure proposals, with the aim to minimise the impact to agricultural resources, including through resource loss and fragmentation, through appropriate management of weed species and consideration of impact to livestock, for site rehabilitation, and consultation with all relevant Government authorities during the construction and operation of the project as necessary.

Consideration of all agricultural factors as listed within the Guidelines has been provided in relevant chapters, including Chapters 7, 14 and 15 in particular.

5.4.10 Why do Fish Need to Cross the Road

The *Why do Fish Need to Cross the Road; Fish Passage; Requirements for Waterway Crossings* document (Fairfull and Witheridge, 2003) provides a requirement for the construction of culverts of pipes underneath new roadways to ensure that the natural drainage of the watercourse is not impacted and to minimise the impacts on fish passage and general aquatic wildlife.

Measures for culverts can include aligning the culvert with downstream flow to minimise erosion, ensuring a minimum water depth, the use of debris deflector walls to reduce the impact of debris blockages on the fish passage, maximising light penetration by maximising height and diameter, and through the use of rock protection areas or a stabilised energy dissipation pool. An assessment of project area drainage and the identified locations for road upgrades at creek crossings within the project area is situated in Section 14.3.1 of this EA.

5.5 ADDITIONAL APPROVALS

Table 5.1 provides a list of additional approvals that may be required for Bodangora Wind Farm, as not already described within this chapter. Additional approvals beyond those listed below may also be required as a result of the Project Approval Conditions.

Table 5.1 – List of approvals for the Bodangora Wind Farm

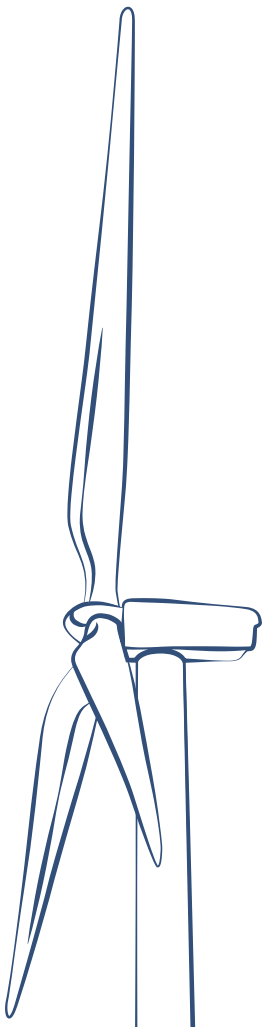
ORGANISATION/INDIVIDUAL	APPROVAL REQUIRED
Respective land owners	Consent has been granted to seek planning approval.
Department of Planning/Approved Certifier	Construction Certificate and certification of specific aspects of design.
Country Energy	Connection Agreement for connection to existing Wellington to Beryl 132kV transmission line.
Department of Planning 'Protected Lands'	Aspects relating to works within 40 metres of a watercourse that have previously required a Permit under Part 3A of the Rivers and Foreshores *Improvement Act 1948*.
Wellington Shire Council	If required, written approval of Council for: • removal of any trees; • arrangements for use of local roads; • use of gravel quarries or other extractive methods; • movements of Restricted Access Vehicles (RAVs) on local roads for the transport of turbine and substation parts to the wind farm site; and • maintenance of any local roads used by construction vehicles.
Roads and Traffic Authority	Approval for movements of RAVs on State Highways.
Local Traffic Management Committee	Approval of the Traffic Management Plan, the transport of over-mass and over-size loads to the site (Local Traffic Management Committee may include RTA, Council and NSW Police).
Department of Lands	Agreement to traverse small holdings of crown land, primarily road reserves, with cables and/or access tracks

Additional approvals may be determined once Project Approval has been obtained, a project contractor has been appointed and designs and work methods have been confirmed.

Depending on the nature of the issue there will be requirements to ensure that certain approvals have been obtained by specific project milestones, particularly for commencement of construction and commencement of operation.

Chapter 6

Consultation



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CHAPTER 6 - CONSULTATION

6.0 INTRODUCTION

Bodangora Wind Farm Pty Ltd is aware of the necessity for an effective and genuine consultation process, in which the community and stakeholders are actively engaged. It is important for sufficient information to be provided to ensure community members are aware of all factors of the development, and where opportunity is provided to make representations enabling community members to make fully informed comment.

The consultation process which this chapter outlines has been undertaken in accordance with the Supplementary Director-General's Requirements, issued on 12 November 2010 and 16 August 2011. Specifically, this chapter of the EA provides the following details, as per the Director-General's Requirements (DGR's):

Director-General's Requirements:

"The proponent must undertake a consultation programme as part of the environmental assessment process, including consultation with, but not necessarily limit to, the following parties:

- *Wellington Shire Council;*
- *Department of Environment, Climate Change and Water;*
- *NSW Office of Water;*
- *Industry and Investment NSW;*
- *NSW Roads and Traffic Authority;*
- *NSW Rural Fire Service;*
- *Land and Property Management Authority;*
- *Central West CMA;*
- *TransGrid;*
- *Country Energy (now Essential Energy);*
- *Commonwealth Department of Defence;*
- *Civil Aviation Safety Authority;*
- *Airservices Australia;*
- *Aerial Agricultural Society of Australia;*
- *relevant mineral stakeholders (including exploration and mining title holders); and*

- *the local community and land owners.*

The consultation process shall include measures for disseminating information to increase awareness of the project as well as methods for actively engaging stakeholders on issues that would be of interest/concern to them. The EA must:

- *demonstrate effective consultation with stakeholders, and that the level of consultation with each stakeholder is commensurate with their degree of interest/concern or likely impact;*
- *clearly describe the consultation process undertaken for each stakeholder/group including details of the dates of consultation and copies of any information disseminated as part of the consultation process (subject to confidentiality); and*
- *describe the issues raised during consultation and how and where these have been addressed in the EA.*

Supplementary Director-General's Requirements:

"A comprehensive, detailed and genuine community consultation and engagement process must be undertaken. This process must ensure that the community is both informed of the proposal and is actively engaged in issues of concern to them, and is given ample opportunity to provide its views of the proposal. Sufficient information must be provided to the community so that it has a good understanding of what is being proposed and of the impacts. There should be a particular focus on those non wind farm associated community members who live in proximity to the site.

The EA must clearly document and provide details and evidence of the consultation process and who was consulted with.

All issues raised during the consultation process must be clearly identified and tabulated in the EA.

The EA must state how the identified issues have been addressed, and how they have informed the proposal as presented in the EA. In particular, the EA must state how the communities issues have been responded to.

6.1 PROCESS

Table 6.1 sets out the stakeholders identified and consulted as part of the Bodangora Wind Farm project. Key stakeholders in the project include land owners within the project area, State and Local Government and other agencies. Also identified as key stakeholders are neighbouring land owners within 3.0 kilometres of the wind farm. All stakeholders identified within the Director-General's Requirements have been consulted.

Table 6.1 – Government and Agency Stakeholder Identification

STAKEHOLDER GROUP	STAKEHOLDERS
Local Government and Community	• Wellington Council. • Members and representatives of the broader community, including members of the public targeted via local media, local businesses and political representatives. • Land owners of properties within the project area which are proposed for development. • Land owners of properties within the immediate vicinity of the wind farm (dwelling occupants and land owners within a 4.0 kilometre radius of the project area were identified as far as possible for one-on-one consultation). • Representatives of local Aboriginal Stakeholders identified during heritage consultation, including: - as represented by various State and Federal departments (as listed below); - the Native Title Services Corporation Limited; - individuals including: a) Mr Neville Williams; b) Mr Peter Peckham; c) Mr Robert Clegg on behalf of the Wiradjuri Council of Elders; d) Ms Violet Carr and Mr Neville Brown, Aboriginal Reference Group, Central West Catchment Management Authority; and e) three other individuals/parties who did not wish their details to be generally disclosed, and whose details have been forwarded to OEH (DECCW) in correspondence dated 13 October 2011. • Local media providers including the Wellington Times, and Daily Liberal (Dubbo), plus electronic media.
NSW Government	• Department of Planning. • Department of Environment, Climate Change and Water (DECCW). • Roads and Traffic Authority (RTA). • NSW Aboriginal Land Council: Wellington Local Office. • Wellington Office of Environment and Heritage ECP Dubbo Office. • Office of the Registrar (Aboriginal Land Rights Act 1983). • Land and Property Management Authority (LPMA). • NSW Rural Fire Service (RFS). • Department of Primary Industries (Investment and Industry NSW). • Department of Industry and Investment (Forestry, Mining and Agriculture). • NSW Office of Water.

STAKEHOLDER GROUP	STAKEHOLDERS
	• Industry Capability Network. • TransGrid. • Essential Energy (previously Country Energy). • Central West Catchment Management Authority (CMA).
Federal Government	• Office of Renewable Energy Regulator. • Department of Sustainability, Environment, Water, Population and Communities. • Civil Aviation Safety Authority (CASA). • National Native Title Tribunal. • Air Services Australia. • Department of Defence (Land Planning and Spatial Information).
Other Stakeholders	• Aerial Agricultural Association of Australia (AAAA). • Alkane Resources. • Copper Strike Limited. • Windora Exploration Pty Ltd. • Clancy Exploration Ltd. • Somerset Minerals Ltd.

The timing of the consultation has related to the availability of project details, as the progress of planning and wind farm design continued. Consultation will continue to occur during final project design, construction, and operation.

The consultation process conducted is outlined below:

- Early consultation and project scoping:
  - early consultation for the project was primarily aimed towards project scoping, and identification of planning and land owner constraints;
  - identification of land owners, and preliminary telephone conversations and email in the early phases of the project;
  - meetings with land owners to discuss property access and agreement to the project;
  - communication of project to occupants of neighbouring dwellings and land owners to the wind farm, generally within a 4.0 kilometre radius of the wind farm. This included the provision of preliminary information about the wind farm to neighbours and contact details for the proponent, enabling the neighbouring land owners to advise the proponent of any interest/objection/comment to the project;
  - meetings held with the Department of Planning and the Wellington Council; and
  - no Planning Focus Meeting was required for the project.
- During ongoing project design:
  - approaches to the broader community, including members and representatives of the broader community; members of the public targeted via local media, local businesses and political representatives once a preliminary project scope and turbines envelopes were available;
  - neighbouring residences were progressively visited by the proponent to ensure an open communication process and opportunity for information sharing and questions;

- a total of 37 neighbouring dwellings to the project placed on a mail-out register for project details and information;
- land owners added to the project as more wind data became available; and
- articles in the Wellington Times and the Daily Liberal.

- Government, agency and other stakeholder consultation:

  - a combination of phone conversations, one-on-one meetings and correspondence were issued to the identified stakeholders once the proposed turbine layout was finalised.

- Community information days at Comobella Hall, nearby to the wind farm project area on 2 and 3 September:

  - neighbours within 5.0 kilometres of the project invited by direct mail;
  - advertisements placed in the Wellington Times and the Daily Liberal to advise wider community on information days;
  - local C-W ABC radio contacted and encouraged to provide details of the project on air;
  - provision of quality and in depth project information, including proponent details, project justification, turbine, track and electrical layout, photomontages, noise contour map, and additional general information on wind farms as produced by reputable and Government sources;
  - survey forms were available and completed by a number of attendees; and
  - media interviews by the proponent.

Information which was provided publically, and the survey form available at the community information day is enclosed at **Attachment E**.

6.2 SUMMARY OF FINDINGS

Close to 50 people attended the information sessions, including neighbours, local business owners, contractors, and land owners. A total of 26 individuals completed an optional survey on the project. A summary of the results of the optional survey are provided in Table 6.2.

Table 6.2 – Summary of 'Option' of Project as According to Optional Survey

OPINION	NUMBER OF RESPONSES
Strongly Oppose	1
Oppose	3
Neutral	9
Support	5
Strongly Support	8
Total	**26**

As identified, a larger proportion of the community have identified neutral to strong support for the project. Only three persons opposed the development, and only one strongly opposes the development. An outline of the specific design changes as a direct result of the community and stakeholder consultation is provided in Chapter 2 of this EA.

A range of issues have been raised during the consultation and stakeholder consultation process. The primary issues are identified below, including the response to each issue.

Table 6.3 – Issues raised and responses

STAKEHOLDER	KEY ISSUE RAISED	RESPONSE
Project land owners	Lease arrangements, project design, noise and visual impact, remediation	Negotiation and lease agreements
Neighbours	Visual impact	The removal of Turbines 8, 9, 28 and 47. Photomontages prepared for community information days. Discussion of 'subjective' nature of wind turbines in a landscape.
	Noise impact	Provision of Sonus findings identifying proposal complies with relevant standards for operational noise, and communication that construction noise is to be appropriately mitigated, and communicated in advance.
	Aerial agriculture impact	Communication that the wind farm should not affect aerial fertilising for neighbouring properties.
	Traffic impact	Traffic Management Plan to be prepared to address traffic movements.
	Road degradation	Communication that improvements will be made to the local road network within the project area, and that further assessments for upgrading roads in the wider area will be undertaken.
Wellington Council	Project Scoping	Initiation meetings, considerable consultation to various sections of Council,
	Traffic and road safety issues	Continuing discussions with Wellington Council and Roads and Transport Authority to resolve issues.
	Ensure local contractor involvement	Local contractor reference list to be developed and major contractors to have regard.
	Ensure effective community consultation	Consultation undertaken as per this chapter and DGR's.
NSW Department of Planning	Part 3A EP&A Act process	Project contact, DGR's, update meetings, review and assessment.
NSW DECCW	Impacts to Aboriginal Cultural Heritage, flora and fauna (particularly birds), drainage and water quality, and mitigation measures.	Investigations have been incorporated in addition to the DGR's as requested.
RTA	Traffic and road safety issues	Continuing discussions with RTA and Wellington Council.
LPMA	Impacts to trig stations and survey points	Review of trig station and survey mark locations has determined no expected impact.
NSW RFS	Have regard to *Planning for Bushfire Protection 2006* and *Standards for Asset Protection Zones*. Incorporate a 20 metre inner protection area surrounding wind turbines. RFS have requested that at the commencement of building works and	Request for comment issued. Proposal has considered *Planning for Bushfire Protection 2006* Guidelines, and that a bushfire mitigation plan will be developed prior to construction. A 20 metre inner protection area will be

STAKEHOLDER	KEY ISSUE RAISED	RESPONSE
	in perpetuity, the property around the wind turbines to a distance of 20 metres shall be maintained as an inner protection area.	incorporated around wind turbines.
Department of Primary Industries	Impact of wind farm on mining leases and mineral prospectivity.	Meetings held and investigations determined that wind farm will not affect future mineral extraction.
Department of Industry and Investment	Support for viable renewable projects	Meetings have been held and project justification and viability discussed.
NSW Office of Water	-	Request for comment issued.
Industry Capability Network	-	Discussions to maximise local contractor involvement.
TransGrid	Project electrical design and connection	Connection enquiry lodged. Ongoing liaison.
Central West CMA	Native vegetation, cultural heritage and rural amenity (ie noise, visual, health, bushfire) impacts.	Addressed as per DGR's.
Department of Sustainability, Environment, Water, Population and Communities	Impacts on issues of national significance.	Flora and fauna investigations undertaken and no issues of national significance identified.
CASA	Consultation requirements identified.	Consultation undertaken as requested with Wellington Council, Airservices Australia, and AAAA.
Airservices Australia	-	Request for comment issued.
Department of Defence	-	Request for comment issued.
AAAA	-	Request for comment issued.
Alkane Resources	Impact on mineral resources	Consultation has identified that no impact is expected.
Copper Strike Limited	Impact on mineral resources	Consultation has identified that no impact is expected.
Windora Exploration Pty Ltd	Impact on mineral resources	Consultation has identified that no impact is expected.
Clancy Exploration Ltd	Impact on mineral resources	Consultation has identified that no impact is expected.
Somerset Minerals Ltd	Impact on mineral resources	Consultation has identified that no impact is expected.

6.3 FUTURE CONSULTATION PROPOSED

Following the submission of the EA, and after a period of review, the future stages of community consultation are briefly summarised below:

- ongoing face to face meetings with neighbours and other community stakeholders;
- public exhibition of Environmental Assessment, enabling review by stakeholders, public submissions, and review, assessment and determination by the Department of Planning;
- updates on process of planning to local media providers, and periodic update newsletters circulated in local paper;
- notices to local community and neighbours advising of construction works timing; and
- liaison with Wellington Council to determine project resources (eg water) and transport/infrastructure requirements.

A Community Consultation Committee will be formed to assist with future stages of community consultation for the project. Infigen have advertised and sought nominations from the local community, and a number of representatives have been nominated, including:

- Frank Barker, Mid Macquarie Landcare Group;
- Lyn Jarvis, neighbour;
- Bob Sewell, local publican;
- Simon Barton, land owner;
- Peter James, neighbour;
- Frank Boland, proponent; and
- Grant Christopherson, Regional Co-ordinator of Central West Renewable Energy Precincts.

The Department of Planning will assist in the appointment of an independent committee chair and in the selection of members. Once a chair is appointed and the committee structure agreed, then the committee can proceed.

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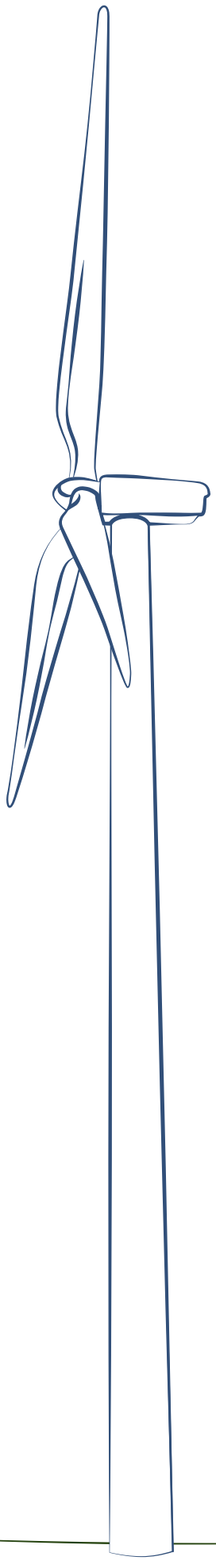

Chapter 7

Planning Context

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CHAPTER 7 - PLANNING CONTEXT

7.0 INTRODUCTION

This chapter provides an assessment against the statutory planning documents relevant to the proposed construction and operation of the Bodangora Wind Farm. The most relevant planning legislation and policy to the assessment of this project, is Part 3A of the NSW Environmental Planning and Assessment Act 1979, State Environmental Planning Policies, the Wellington Local Environmental Plan, and Wellington Development Control Plans.

Information available on the Department of Planning's website indicates that no Regional Environmental Plan (REP) applies to the land in which the project will be located.

7.1 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) provides the framework for development assessment in New South Wales. The Department of Planning is the responsible NSW Government authority for the assessment of any development where the Minister is the approval authority. Chapter 5 of this EA has provided the context for assessment under the EP&A Act, including classification of the Bodangora Wind Farm as a 'major project', and the submission of this Environmental Assessment.

The following provides an assessment of the relevant provisions of the EP&A Act. The Objects of the EP&A Act, as identified in Section 5 of the EP&A Act are assessed in Table 7.1.

Table 7.1 - EP&A Act Objects, Section 5 EP&A Act

EP&A ACT OBJECTS	COMMENTARY
(a) to encourage: (i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment;	This EA provides a comprehensive assessment of all relevant issues to the Bodangora wind farm. Environmental management and mitigation measures are proposed to ensure no undue effect to any identified environmental and amenity effects. The proposal will increase the supply of clean energy to the national electricity grid.
(ii) the promotion and co-ordination of the orderly and economic use and development of land;	The wind farm will not significantly affect the existing use of the land for grazing and cropping purposes within the development site. Further, the wind farm will result in economic benefits for property owners and the local community through direct (ie property owners) and indirect opportunities (ie employment and contract opportunities).
(iii) the protection, provision and co-ordination of communication and utility services;	Utility provision within the development site has been designed for efficiency purposes. Further, the proposal will increase the supply of clean energy within the district, reducing the requirement for importing other sources of coal-fired energy. Chapter 13 of this EA has assessed the impact of the proposal on communication services. Mitigation measures have been identified where necessary, although no major issues with communication provision have been identified and in the majority sufficient setbacks have been provided.
(iv) the provision of land for public purposes;	The development is located entirely on private land and as such will not impact on the usability of public land.
(v) the provision and co-ordination of community services and facilities;	Upgrades to the local road network will be undertaken in consultation with relevant authorities as required.
(vi) the protection of the environment, including the protection and conservation of native animals and plants, including	This EA has included an extensive assessment of the existing flora and fauna environment, and identification of where potential risks are evident. The investigations

EP&A ACT OBJECTS			COMMENTARY
		threatened species, populations and ecological communities, and their habitats;	have demonstrated that the proposal will not have an ecologically significant impact on any protected species. Mitigation measures as required are identified in Chapter 9 of this EA. Overall, the proposal will assist in reducing carbon consumption.
	(vii)	ecologically sustainable development;	The proposal will generate large quantities of electricity from a sustainable and renewable resource. All environmental impacts have been identified and mitigation measures proposed, where necessary. There are no fatal ecological outcomes as a result of this project. The project creates a positive contribution to sustainability.
	(viii)	the provision and maintenance of affordable housing;	The provision of affordable housing is not applicable to this development.
(b)	to promote the sharing of the responsibility for environmental planning between the different levels of government in the State; and		The development is being assessed under Part 3A of the NSW EP&A Act, with the Department of Planning as the approval authority. The Wellington Shire Council, as well as relevant state and federal agencies and departments, have been consulted as part of the assessment process for this proposal as outlined in Chapter 5 of this EA.
(c)	to provide increased opportunity for public involvement and participation in environmental planning and assessment.		Significant efforts have been made to establish community inclusion in this project, with the consultation process for this assessment is outlined in further detail in Chapter 6 of this EA. The consultation has included one-on-one meetings with neighbours to the project, Community Open Days on 2-3 September 2011. Details of the outcomes of these meetings is provided in Chapter 6. Significant changes to the project layout have been made based on the feedback from members of the community, as detailed in Chapter 2. The Environmental Assessment will be made available for public comment pursuant to Section 75H of the EP&A Act.

7.1.1 Section 94 Contributions

Pursuant to Section 94 of the EP&A Act, planning authorities can levy developers requiring a monetary contribution at the development application stage to help pay for additional community facilities and/or infrastructure.

The proponent expects that as planning advances and details are confirmed, negotiation will occur with the Department of Planning and/or the Wellington Shire Council to define any necessary Section 94 contributions in respect of this development.

7.2 STATE ENVIRONMENTAL PLANNING POLICIES

State Environmental Planning Policies (SEPPs) provide provisions for assessment for Part 3A of the EP&A Act: Critical Infrastructure (now superseded).

Section 75J of the EP&A Act states that "*the Minister may (but is not required to) take into account the provisions of any environmental planning instrument that would not (because of section 75R) apply to the project if approved*". Accordingly, an assessment of the relevant SEPP has been provided below.

7.2.1 SEPP (Major Development) 2005

The SEPP (Major Development) specifies development to which Part 3A of the EP&A Act applies (now superseded). As identified Chapter 5 of this EA, Clause 24 of Schedule 1 of the SEPP identifies an electricity generation facility using any wind power as an energy source with a capital investment value of more than $30 million, as a project to which Part 3A applies.

Correspondence received from the Department of Planning (**Attachment A**) confirms that the project has been accepted as a Major Project to which Part 3A of the EP&A Act applies.

7.2.2 SEPP (Infrastructure) 2007

The purpose of SEPP (Infrastructure) 2007 is to facilitate the effective delivery of infrastructure across New South Wales by improving certainty, flexibility, assessment processes and consultation methods.

The Infrastructure SEPP addresses all components of electricity infrastructure holistically and provides development assessment provisions which apply across the State. It outlines the planning processes for infrastructure projects under Part 3A (to which this project applies, although now superseded), Part 4, Part 5 and exempt development. The SEPP also includes consultation requirements.

The Infrastructure SEPP takes precedence over most other environmental planning instruments in the event of inconsistencies, with the exceptions of SEPP (Major Projects) 2005, SEPP 14 (Coastal Wetlands) and SEPP 26 (Littoral Rainforests). In accordance with Part 8(2)(c) of the SEPP (Infrastructure) 2007, the SEPP (Major Projects) 2005 prevails over the Infrastructure SEPP in matters of inconsistency.

Pursuant to Clause 39 (2)(a) of the SEPP (Infrastructure) 2007, wind monitoring masts, as proposed as part of the Bodangora Wind Farm, are exempt development. Up to two to three new masts will be installed as permanent wind monitoring stations, these locations will be determined in conjunction with the successful turbine supplier. Additional temporary masts may be located at the proposed turbine sites prior to turbine construction.

7.2.3 SEPP (Rural Lands) 2008

The purpose of the SEPP (Rural Lands) 2008 policy is to facilitate the orderly and economic use of rural land, in the identification of state significant agricultural land, and to reduce the potential for land use conflicts. On the whole, the proposal incorporates only a small component of land within the total project area, and is largely compatible with the existing land uses. The existing grazing and cropping land use activities can continue on the remaining land unaffected by the proposal.

The SEPP provides a series of rural planning principles, in relation to rural subdivision and dwellings, which are not directly relevant to the proposal.

7.3 WELLINGTON LOCAL ENVIRONMENTAL PLAN

The Bodangora Wind Farm project is located wholly within the Wellington Council to which the Wellington Local Environmental Plan (LEP) applies. Figure 1.2 provides the location of the Bodangora Wind Farm in the context of the Wellington Shire LGA, and Figure 7.1 provides the zone boundaries in the wider locality. Council has responsibility for some local roads and represents the interests of the Wellington community. Nearby Council areas to the project area include Dubbo City Council to the north-west, the Mid-Western Regional Council to the east, and Cabonne Council to the south.

The project area is significantly separated from the adjoining council areas including Dubbo, Mid-Western Regional and Warrumbungle Shire, with the project area located a minimum of approximately 2.0 kilometres from the respective council boundaries. It is unlikely that adjoining councils will be directly affected by the proposal, with the exception of some changes in traffic movements during the construction phase of the project as described in Chapter 12 of this EA.

Whilst an assessment of the project against the most relevant provisions of the Wellington LEP is not fundamental to the Part 3A process, this chapter's assessment will provide an assessment of zoning and envisaged forms of development. The relevant provisions of the Wellington LEP are discussed below.

The Aims of the Wellington LEP are set out in Clause 2 of the LEP are:

> *"(a) to rationalise, and to consolidate into a single instrument, the various environmental planning controls previously applicable to the Wellington Council area by:*
>
> *(i) correcting zoning anomalies, and*
>
> *(ii) removing redundant provisions and replacing them with provisions that are now standard, and*
>
> *(b) to widen the scope of permissible land uses so as to reduce the necessity for preparation of amending local environmental plans with respect to individual development proposals, and*
>
> *(c) to maintain the opportunity for public involvement and participation in environmental planning and assessment, by providing a framework to support development control plans which will regulate development in any land use zone by:*
>
> *(i) restricting the carrying out of a kind of development to a specified area within the zone, or*

(ii) fixing standards or specifying requirements in respect of any aspect of that development,

to supplement the broad controls in this plan."

In addition to the provisions relating to the rationalisation and consolidation of the LEP, the LEP seeks to maintain the opportunity for public involvement and participation in environmental planning and assessment. In this regard, the Bodangora Wind Farm has undertaken extensive community and stakeholder engagement in accordance with the Director-General's requirements. The consultation process is described further in Chapter 6 of this EA.

7.3.1 Assessment of Council-Wide Objectives

The most relevant Objectives of the Wellington LEP are set out in Clause 3 of the LEP are:

"(a) COMMERCE -to contribute to the continued economic productivity and further development of the Wellington Council area,

(b) AGRICULTURE -to support and maintain the continued viability of agricultural development in rural areas by protecting or preserving prime crop and pasture land, and by encouraging diversity within the industry,

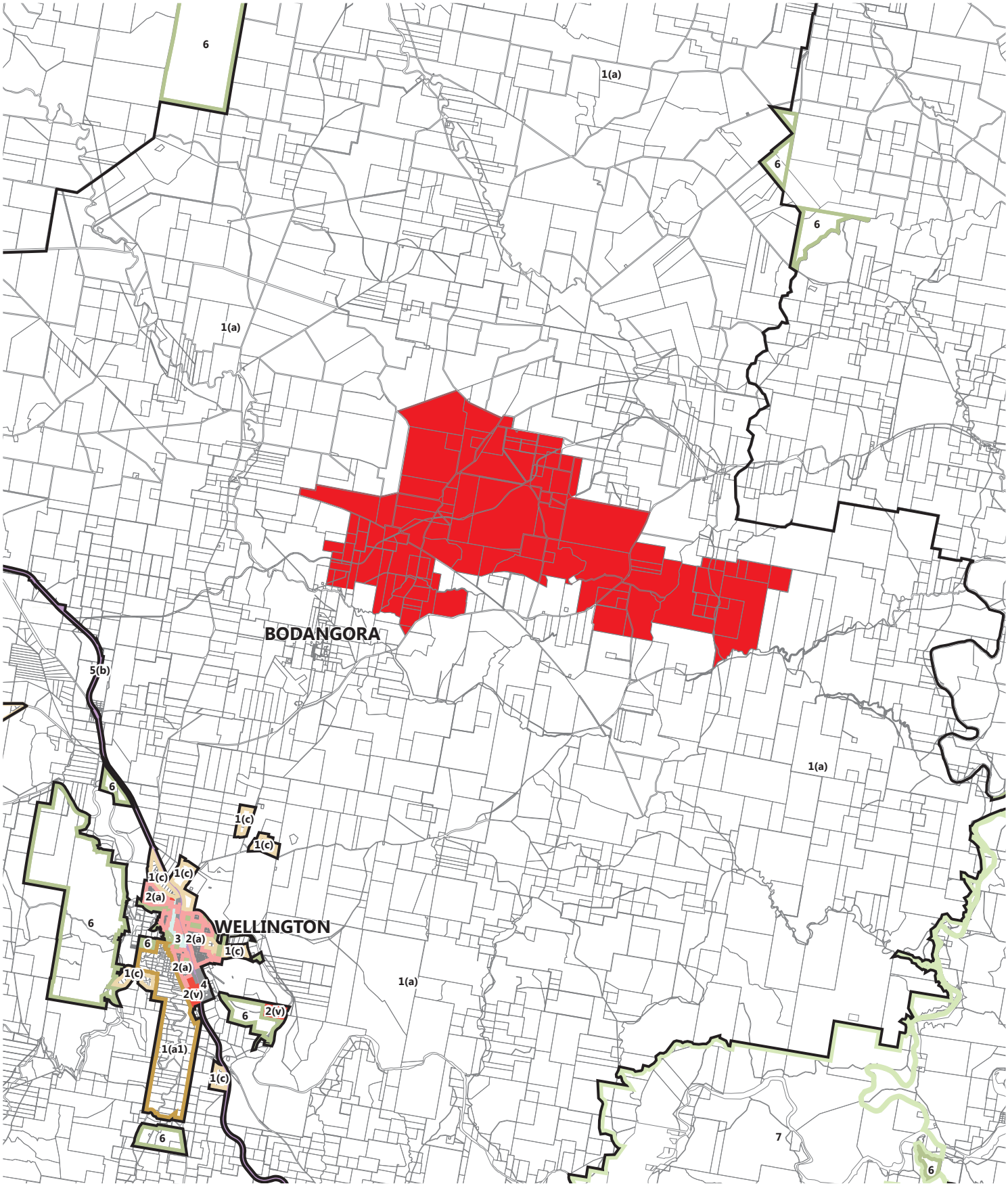
(c) TRANSPORT -to maintain the arterial road system and railway and airport to provide an efficient traffic network for the movement of goods and people,

(d) TOURISM -to encourage tourism as a contributor to the economy of the Wellington Council area,

(e) INDUSTRY -to increase employment opportunities,

(i) SCENIC PROTECTION -to promote a high standard of visual amenity in all of the Wellington Council area by imposing environmental controls,

(j) CONSERVATION -to recognise the value of heritage items and natural elements of the environment and to protect the environment from degradation by unnecessary demolition or unsympathetic development".



ZONING

- Project Area
- 1(a) - Rural
- 1(a1) - Intensive Agriculture
- 1(c) - Rural Small Holdings
- 2(a) - Residential
- 2(v) - Village
- 3 - Business
- 4 - Industrial
- 5(a) - Special Uses - Public Purposes
- 5(b) - Special Uses - Railway
- 6 - Open Space
- 7 - Environmental Protection

Figure 7.1
Zoning

BODANGORA WIND FARM

0 10Km

www.masterplan.com.au
plan@masterplan.com.au
Oct 2011 DS:12992_1.0

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In accordance with the objectives as above, the proposal will assist in the continued economic development and productivity of the Wellington Council area, and will produce clean energy through harnessing the natural resources of wind energy for supply to the national electricity grid. The project will provide for additional employment opportunities, during construction and operation. Given the limited number of wind farms in the region, the wind farm may assist in encouraging tourism and thus enhance the local economy.

The project will provide improvements to the local road system to enable construction of the wind farm to occur, which will benefit the wider locality through improvements to the existing road infrastructure. The transport related effects of the project are considered further in Chapter 12 of this EA.

An assessment on the visual effects of the project is provided in Chapter 8 of this EA. In summary, the assessments have found that there is expected to be a limited visual impact to the wider field of view. Where protected species have been identified, mitigation measures are proposed and the proposal is not expected to cause any undue effect to the local environment at this location as a whole.

7.3.2 Assessment of Zone Provisions

The land on which the proposed wind farm and substation will be located is Zoned 1(a) (General Rural) under the Wellington LEP, 1995. Pursuant to Clause 10 of the LEP, the development of a wind farm is a form of development that requires the consent of the Council. The provisions of Part 3A of the EP&A Act raise the approval authority determination to the Minister for Planning, however this reference requires this EA to have regard to the relevant provisions of the Wellington LEP.

The objectives applicable to Zone 1(a) (Rural) of the Wellington LEP, pursuant to Clause 10 are assessed in Table 7.2 below. While the objectives have been framed broadly and were not necessarily formulated with wind farm projects in mind, the development is not inconsistent with the general intent of the zone objectives nor does the establishment of the wind farm on land within the zone prejudice the continued attainment of the zone objectives.

Table 7.2 – Assessment of Wellington Zone 1(a) (Rural) Objectives

WELLINGTON LEP 1995 ZONE 1(A) RURAL OBJECTIVES	COMMENT
(a) to enable the continuation of traditional forms of rural land use and occupation	The development is a non-agricultural land use that fulfils a need to supply more electricity from renewable energy sources as a means to reduce the carbon intensity of electricity generation. It is compatible with the existing rural land use and provides additional income to the owners of the properties affected by the development. Parts of the wind farm site may reduce the potential for additional rural occupation due to proximity to turbines however typically; the area is sparsely settled due to the nature of the primary production activities. The relative size of the respective wind turbine pad sites and associated access tracks represents a small proportion of the land currently used for rural production purposes and accordingly continued use of these properties for sustainable rural production will not be prejudiced. In fact the supplementary income afforded to property owners through the establishment of wind turbines on their land, facilitates the opportunity for investment in the rural activities on the land that may not otherwise have been available. The rural residential development potential of neighbouring lands will be unaffected except if residences are proposed in the future at locations very close to turbine sites.
(b) to maintain land having potential for agricultural production in units which are suitable for a range and variety of agricultural land uses	Despite the relatively large project area within which turbines will be located, the actual turbines, footings and access tracks comprise only a very small footprint of less than three percent of the project land area. The existing grazing and cropping activities can continue on the remaining land unaffected by the operation of the wind farm. The proposal will not detract from the future potential of pastoral activities at the site.
(c) to encourage other forms of development which are associated with rural activity, or which support the tourism objective listed in Clause 3	Whilst not associated with rural activity, the wind farm will not detract from the existing land uses at Bodangora and the proposal may have some tourism effect given there are no existing wind farms in the wider region of Wellington.
(d) to ensure that the type and intensity of development is appropriate in relation to the characteristics of the land, the rural environment and the costs of providing public services and amenities	Assessments have been undertaken to determine the suitability of the subject land in relation to the proposed development. The subject land is capable of supporting the proposed development from a geological, structural, soil, and hydrological perspective. The development is a significant project that will support the State's infrastructural requirements, and which will provide benefits to the local community; the proponent will consult with Wellington Shire Council to determine the scope for supportive improvements to some segments of

WELLINGTON LEP 1995 ZONE 1(A) RURAL OBJECTIVES	COMMENT
	local roads in accordance with Section 94 of the EP&A Act. There is unlikely to be any cost to the public as a result of the development.
(e) to conserve prime crop and pasture land by ensuring that: (i) it is not used for non-agricultural purposes	Despite the relatively large project area within which turbines will be located, the actual turbines, footings and access tracks comprise only a very small footprint of less than three percent of the project land area. Although the wind farm is a non-agricultural land use, the existing grazing and cropping activities can continue on the remaining land unaffected by the operation of the wind farm. Pastoral activities will be unaffected on neighbouring lands.
(ii) any allotment created for agricultural purposes is suitable for that purpose	No subdivision of land is expected to be required for the wind farm project; rather, long term lease arrangements will apply. Depending on final arrangements for grid connection with the network service provider, it is possible that the land for the 132kV substation within the wind farm project area may need to be subdivided from its current parcel of land. It is consistent with most utility facilities to be separated either by the creation of separate allotment or easement.
(f) to protect or conserve: (i) soil stability by controlling the location of development in accordance with soil capability	The areas of soil disturbance will be limited to access track works, turbine hardstands, substation and meteorological mast footings and trenching for underground cables. The Construction and Environmental Management Plan will be developed prior to construction works and will outline measures to protect the land from erosion occurring.
(ii) forests of commercial value for timber production	No commercial forests will be impacted by the construction of the wind farm.
(iii) valuable deposits of mineral, coal, petroleum and extractive materials by controlling the location of development to enable efficient extraction of these deposits	Mineral exploration titles exist across a portion of the project area, indicating the potential for a valuable resource. As described in Chapter 4 of this EA, consultation with owners of the exploration titles covering the project area has been undertaken, and it is generally agreed that the proposed wind farm will not significantly hinder continued exploration in the area.
(iv) vegetation in environmentally sensitive areas where the conservation of the vegetation is likely to reduce land degradation	An assessment of conservation values of the site has been prepared and measures will be incorporated to mitigate any impacts of the construction works. Appropriate measures will be taken to ensure that minimal clearing is undertaken and to prevent soil erosion and land degradation through the preparation and implementation of a Soil and Water Management Plan (SWMP) which will form part of the Construction Environmental Management Plan (CEMP).
(v) water resources for use in	The project area is located within the Central West Catchment Management

WELLINGTON LEP 1995 ZONE 1(A) RURAL OBJECTIVES		COMMENT
	the public interest	Authority region, and more specifically within the Macquarie-Bogan River Catchment area. Drainage of the project area is via a number of smaller, unregulated creeks which subsequently drain to the Talbragar River. There is unlikely to be any significant impact on water resources within the catchment as there are no major waterways occurring within or near to the project area. Notwithstanding, soil and water erosion control measures will be implemented as part of the CEMP for the development to prevent sediment discharge. Compliance may also be periodically monitored by the Department of Planning or Wellington Council. The operating wind farm will only have a small annual water requirement. A small short term requirement for water is expected during construction.
(vi)	areas of significance for nature conservation, including areas of rare plants, wetlands and significant habitat	A detailed assessment of the site's flora and fauna has been undertaken and constraints identified. No permanent watercourses will be affected by the development and no wetlands are present on, or adjacent to the site. Measures to mitigate the project's impacts on flora and fauna are listed in Chapter 9 and the project's Statement of Commitments.
(vii)	places and buildings of archaeological or heritage significance, including Aboriginal relics and places, and	Places of heritage significance have been identified in the heritage assessment by New South Wales Archaeology, and are described in Chapter 10 of this EA. There are no identified impacts to non-Aboriginal heritage places within the project area. Whilst two Aboriginal sites have been identified by field survey, there are no records of previously identified Aboriginal heritage places within the project area. Both sites can be avoided by turbine and infrastructure layout and if any additional sites are identified, measures to avoid or mitigate impacts are included in Chapter 10 and the project's Statement of Commitments at Chapter 19.
(g)	to facilitate farm adjustments	Farm adjustment refers to the process of subdivision resulting in a re-distribution of allotments so as to facilitate agricultural production without the creation of either additional allotments or additional dwellings. The project will not adversely affect the continued use of the land or farm adjustments for its existing use of grazing.

In summary, the proposed wind farm will not prevent or prejudice the continuation of existing rural production land uses at the subject site. Furthermore, it can assist the maintenance of the rural properties in their current form by providing additional income that can be reinvested back into improved rural production on the land, thereby reducing the likelihood for the further subdivision of land or other alternative measures to gain additional revenue from the land.

Whilst not specifically a 'rural' land use in the primary production sense, the proposal does not prejudice the continued attainment of the Objectives of Zone 1(a) (Rural).

7.3.3 Special Provisions of the Wellington LEP

This section addresses the relevant special provisions of the Wellington LEP which may be considered by the Minister in the determination of a planning application. These provisions are additional to those Objectives of Zone 1(a) (Rural) as previously discussed. Relevant clauses containing particular provisions and controls are identified below.

Clause 11: Heads of Consideration

This clause addresses present and potential land use, agricultural potential, native vegetation conservation, timber production, water resources, soil resources, mineral deposits and other valuable extractive materials, heritage significance, provision of services, future expansion of settlements, and infrastructure provision associated with a proposed development.

This clause states that Council shall not consent to development within Zone 1(a) until such time that an assessment has been made on the impact of carrying out that development on the present and future land use.

The assessment of matters relevant to these potential impacts is provided in Chapters 3 to 17 of this EA. The Statement of Commitments (Chapter 19) outlines the measures to be adopted to manage the potential impacts arising from the development. This information provides a basis for the Approval Authority to form an opinion about the nature of the proposed development, the likely effect and the proponent's stated commitments to ensure mitigation of any potential effect.

Clauses 12 - 13: Subdivision

The project does not require any subdivision of land, rather long-term lease arrangements will be utilised.

There is the potential for subdivision purely for the site of any substation, depending on final arrangements with regard to the grid connection. This will be subject to a separate application, and will be subject to an assessment against the provisions of Clause 13 of the Wellington LEP.

Clause 19: Development on classified roads

This Clause refers to the restrictions to development along and access to classified roads. A classified road is any road which is listed under Sections 46, 47, 50 or 51 of the *Roads Act 1993* that have a legal class of Highway, Main Road, Secondary Road or Tourist Road.

Specifically, Clause 19 restricts development which has direct vehicular access to a classified road, which relies on a classified road for its sole means of access, or which has access to another road which intersects with a classified road, whereby the point of access is within 90 metres, unless the Council is satisfied that:

- the development by its nature or intensity, or the volume and type of traffic likely to be generated is unlikely to constitute a traffic hazard or to materially reduce the capacity or efficiency of the classified or other road; and
- access points, wherever possible, are provided to a public road which is not a classified road.

Identified Classified Roads in the immediate proximity of the wind farm site include Goolma Road, Montefiores-Eong Road (both regional roads) and the Mitchell Highway (Auslink road). Regard has been given to the classified roads in the Traffic and Transport assessment (Chapter 12).

Infigen Energy have discussed traffic and access issues with Wellington Shire Council and will work with Council and the Roads Traffic Authority as required to achieve safe and responsible use of local roads.

Restricted vehicle access to the project area for turbine and infrastructure delivery is likely to be provided by the following roads (provided the delivery port is Newcastle):

- Bourke Street / Cowper Street / Hannell Street / Industrial Drive / Pacific Highway / New England Highway / Golden Highway / Wheelers Lane / Mitchell Highway / Goolma Road / Gillinghall Road.

As indicated in Chapter 12, this will be subject to further consultation with Wellington Council and the Road Transport Authority.

A Traffic Management Plan (TMP) will be prepared by the project contractor prior to the commencement of construction works and will form part of the Construction and Environmental Management Plan (CEMP). It is expected that the Approval Conditions will require that the CEMP is submitted to the Department of Planning for approval and that construction works not commence until that occurs.

Clause 20: Clearing

Clause 20 lists provisions for the assessment of vegetation clearance. Pursuant to Clause 20, Council should not grant consent to the clearing of land unless it is satisfied that the clearing will not cause visual and scenic impact, the risk of soil erosion and water pollution, and the destruction of important vegetation systems and natural wildlife habitats, or where the clearing is necessary for the reasonable and economic use of the land for the provision of utility services.

As outlined in Chapters 3 and 9, the turbine and access track layout is proposed to minimise the requirement for vegetation clearance. Where vegetation clearance is unavoidable, clearance will be undertaken in accordance with the measures outlined in the Construction and Environmental Management Plan to reduce the risk for erosion or effect to significant vegetation or habitats.

On balance, the project may require small areas of clearing, but clearing which is necessary for the reasonable and economic use of the land and in the provision of utility services, in accordance with Clause 20(b). In accordance with Section 75U of the EP&A Act, a separate authorisation under Section 12 of the *Native Vegetation Act 2003* to clear native vegetation is not required.

Clause 21: Environmental Protection Areas

This clause prevents consent to development where land is considered within an environmental protection area, if in the opinion of the Council the carrying out of development will degrade the environment by way of likely denudation of the land, generating uncontrolled flow of water across the land, generating uncontrolled disposal of animal, vegetable or chemical waste products on the land, or soil erosion and sedimentation.

The subject land is entirely located within Zone 1(a) Rural and is not within an identified environmental protection area of the Wellington LEP. Flora and fauna assessments as per Chapter 9 of this EA have determined that wind turbine and infrastructure layout should avoid areas of woodland, creeks and rocky hollows, and where tree clearing is required that trees with hollows are given particular priority in layout design to preserve threatened species habitat. A Construction and Environmental Management Plan will be prepared for the Bodangora Wind Farm which will assist in the management of erosion and run-off as a result of the project. Minimal waste is expected to be generated as a result of the development, and any wastes will be appropriately disposed by a licensed contractor.

Clause 22: Flood liable land

This Clause states that consent shall not be granted to develop on flood liable land or land within a floodway, if the development is likely to impede the flow of flood waters on the land, imperil the safety of persons on the land in the event of the land being inundated with flood waters, to aggravate the consequences of floodwaters flowing on the land with regard to erosion, siltation and the destruction of vegetation, to have an adverse effect on the water table of the land or of land in its immediate vicinity, to result in the event of a flood, in damage to buildings or works resulting from carrying out the development, or to aggravate the consequences of flooding on other properties.

The majority of the wind farm works are located on elevated ridge lines to facilitate access to the available wind resources, which are not subject to flooding. In a few locations within the project area, access tracks will be required to cross watercourses. Works will be undertaken in accordance with a Construction and Environmental Management Plan to be prepared prior to construction to reduce risks associated with erosion.

The bulk of the wind farm project is located on elevated ridge lines that are well drained and not subject to flooding. In some locations, access roads may cross lower lying land where temporary flood hazards may occur during heavy rainfall events. The majority of creeks within the project area are ephemeral in nature. Access tracks have been designed to minimise the number of ephemeral creek crossings to reduce the impacts during heavy rainfall events. It is considered that the project will not exacerbate the potential for or extent of flooding on lands surrounding the wind farm and given the elevated nature of the site and the topography of the area will not be exposed to significant flood hazard.

Clause 23: Land subject to bushfire hazards

This Clause states that consent shall not be granted to the erection of a building on land that is subject to bush fire hazards unless: adequate provision is made for access for fire fighting vehicles; where buildings have been sited to reduce bushfire hazard and have fireproof building materials, enable access for fire-fighting vehicles, and where fire protection measures including fire radiation zones and hazard protection are appropriately maintained.

The only permanent buildings included in the project other than at the turbines are the buildings at the substation. As these buildings will not be used as dwellings the requirements relating to bushfire hazard are not directly applicable. The substation compound will also be free of vegetation and setback from remnant woodland. Gravel will be placed on the ground below many of the electrical structures.

Regarding access for fire fighting vehicles, all access tracks servicing the turbine locations and substation will be prepared to allow access by oversize and over-mass RAVs and post commissioning will be maintained to a standard suitable to allow access of service and maintenance vehicles. As such the access tracks will also be suitable for the passage of fire fighting vehicles improving fire fighting accessibility to the area of land within the project area.

The EA addresses water supplies in Chapter 3 and bushfire management issues in Chapter 15.

Clause 24: Protection of heritage items, heritage conservation areas and relics

Clause 24 requires consent for development which has the potential to affect heritage places and heritage conservation areas. The Consent Authority must be of the opinion that the proposed development would not adversely affect the heritage significance of any heritage item or heritage conservation area.

As outlined in Chapter 10, a heritage assessment for the proposed Bodangora wind farm has been undertaken by New South Wales Archaeology Pty Ltd, and considers both Aboriginal and non-Aboriginal heritage. The assessment has identified that there are no records of previously identified Aboriginal heritage items within the project area. One heritage site of stone artefacts and another of stone procurement have been identified, although both are assessed to be of low cultural heritage significance. Based on an assessment of the environmental and archaeological context of the project area, if any additional sites are identified, it is likely that they will also be of low heritage and archaeological value. A range of mitigation and management procedures have been identified to protect any further heritage items if they are identified during the construction phase of the project.

Non-Aboriginal heritage items near the project area have been identified, with two heritage items at the township of Bodangora being the Bodangora Gold Mine Former Remains – Chimney, Shaft and Engine Footings and St Paul's Catholic Church. These items are located outside of the project area and their settings are considered unlikely to be affected by the project. One heritage item being the Sandy Hollow to Maryvale Railway Line is currently used as an access track and traverses the wind farm area. This is currently used as a track and is proposed to be formalised for use as an access road within the wind farm site. The proposed impact to the heritage value of the railway is expected to be negligible in that the alignment of the former railway line and track will be maintained and there will be no significant cutting or filling of the land associated with the new upgraded access track. Accordingly, the proposal is consider to accord with Clause 24 of the Wellington LEP.

Clause 25: Conservation incentives

Clause 25 of the Wellington LEP relates to the use of a building which is a heritage item or is within a heritage conservation area, and the erection of a building located on land upon which a heritage item is located or on land which is located within a heritage conservation area. The proposal does not incorporate the use of any heritage buildings or the erection of a building within a heritage conservation area, and accordingly Clause 25 is not relevant.

Clause 27: Applications that must be advertised

Advertising of the Project Application is required and will be arranged by the Department of Planning in accordance with the EP&A Act.

Clause 29: Access

Clause 29 relates to the provision of access to an existing public road (not including classified roads) where visibility should be at least 150 metres in either direction for road safety purposes. The project has been designed to comply with 150 metres of visibility in both directions in this regard.

Internal site access roads will be created to allow access to the turbine sites and substation that will intersect public roads. The location of all access tracks will form part of the Traffic Management Plan which will be created by the proponent and contractor in consultation with Wellington Shire Council. All entry points will be designed for safety, practicality and with suitable drainage.

7.4 WELLINGTON DEVELOPMENT CONTROL PLANS

Wellington Development Control Plans (DCP) provide comprehensive guidelines and planning controls for individual types of development and/or for particular locations in the Wellington Council area.

DCP are prepared pursuant to Division 6 of Part 3 of the EP&A Act. A relevant authority may prepare a DCP for the purposes of making a detailed provision with respect to development to achieve the purpose of an environmental planning instrument, to identify development as advertised development (additional to those requirements as imposed by the regulations), to provide for public or particular advertising or notification requirements, to identify additional criteria to be considered in determination, and to make provision for anything permitted by the EP&A Act to be prescribed by a DCP.

Wellington Council has six DCP's which are considered below.

7.4.1 DCP No.1 Exempt and Complying Development, 2006

The aim of DCP No.1 is to identify development that is exempt development, to identify development that is complying and to specify conditions to which complying developments certificates are applicable. The lists of exempt and complying development relate to a range of structures, none of which are directly applicable to the proposed Bodangora Wind Farm.

7.4.2 DCP No.2 Urban and Public Lands, 2006

The objectives of the DCP No.2 is to provide future detail in support zone objectives outlined in the *Wellington Local Environmental Plan 1995*, including relating to land capability, cultural heritage, ecology, salinity, subdivision standards, residential development, parking, outdoor advertising, tree preservation, utilities and recreation.

The DCP No.2 relates specifically to all land within the Wellington Council with the exception of land Zoned 1(a) Rural and 1(a1) Intensive Agriculture. The site of the Bodangora Wind Farm is wholly located within Zone 1(a) Rural and accordingly is not subject to DCP No.2.

7.4.3 DCP No.3 Primary Industry Zones, 2006

The objectives of the of the DCP No.3 are to provide additional detail and administration in support of the Zones 1(a) Rural and 1(a1) Intensive Agriculture of the *Wellington Local Environmental Plan 1995*, to provide guidance on the administration of Clause 13 of the Wellington LEP (subdivision of 1(a) Zoned land), and to incorporate contemporary standards applying to natural hazards.

A summary of the objectives of Zone 1(a) and Zone 1(a1) as provided in the DCP No. 3 are as follows:

> *"1. To maintain "traditional" forms of land use,*

2. *To maintain holding sizes in viable production units,*

3. *To encourage other forms of related development, on land that is not agriculturally productive, including tourism,*

4. *To ensure that development is in keeping with the characteristics of the land,*

5. *To ensure that the subdivision of prime land is for a suitable agricultural purpose,*

6. *To protect soils, timber, minerals, vegetation, water, and places of natural and cultural significance.*

7. *To facilitate farm adjustments,*

8. *To conserve prime crop and pasture land,*

9. *To ensure that development on land that is subject to natural hazards is carried out in a manner appropriate to the hazard (fire, flood and karst etc.).*"

The most relevant objectives to Zone 1(a) as listed above are 1 – 7, with Objectives 8 – 9 relating specifically to objectives of 1(a1) Zone. An assessment of the relevant zone provisions as listed above is provided in Section 7.3.2 of this EA.

Additional provisions are provided for a range of developments incorporating or affecting airports or landing grounds, bed and breakfast accommodation, dams, duel occupancy, extractive industries, advertising, poultry farms, sewerage treatment, and transportable dwellings. Additional provisions also relate to flood liable land, karst (usually limestone), subdivision, and roadside vegetation.

The Bodangora Wind Farm is expected to be compliant with the following relevant provisions:

- the proposal is not expected to affect or be affected by low lying or flood liable land;
- a geotechnical assessment will be undertaken prior to the installation of turbines to identify the suitability of the land, including consideration of an assessment where areas of karst have been identified;

- the minimum allotment size in Zone 1(a) is 400 hectares:

  - long term lease arrangements will apply to associated land which does not conflict with the minimum allotment size;
  - depending on final arrangements for grid connection with the network service provided it is possible that the land for the 132kV substation may need to be subdivided from its current parcel of land, consistent with most utility facilities to be separated either by the creation of a separate allotment or easement;
  - where a subdivision is proposed, the subdivision will need to be in accordance with the provisions of Part 30 of the DCP No.3;

- the consent of the Wellington Council will be required for the erection of signage, including for traffic management and at a viewing platform;

- requirements for roads, including:

  - new entrances to roads are required to have a sight distance of 150 metres in either direction along the access road;
  - new entrances will be setback into the property to allow a single axle truck to park outside the gate with the tray of the truck 3.0 metres clear of the traffic lane; and
  - new entrances will be sealed from the edge of the bitumen to the property line and any drainage swale will be fitted with a driveway crossover or pipe culvert and wingwalls, to Council's specifications (Drawing No. ST998);

- requirements for roadside vegetation, including:

  - minimal grading of roadside swales to maintain topsoil, and culverts to be installed with an invert of such a grade as to allow sediment transport to pass through and past the culvert, so as to minimise the maintenance;
  - the disposal of waste material, including fill from road construction activities and contaminated material from industrial activities on road reserves is not permitted;
  - the planting of trees within 12 metres of a road formation or within 150 metres of a road intersection is not supported, unless in accordance with a development consent;
  - native grasses within the road reserve will not be disturbed unless in accordance with a consent. Wherever possible temporary work sites, trenching for communications will be chosen to avoid stands of native grasses;

- all new buildings within a 1(a) Rural Zone will have a 150 metre setback from a portion boundary;

- in relation to building pads:

  - building pads will be graded at a fall of 1.0 percent to drain water away from the footings for a distance of at least 1.0 metre;
  - building pads that are cut and fill batters of at least 1 in 3 or retaining walls will to be a certified design;

- water moving downwards will be diverted around the development site by diversion banks, located at the top and toe of any upslope batters. On the upslope site of any building pad, between the floor level and toe of the batter, a waterway area of 1.0 square metre must be provided, with the grade of the diversion bank invert as flat as possible, but not flatter than 1.0 percent;
- driveways, pedestrian routes and service areas will be profiled to discharge run-off, with minimum grades for pavements and drainage lines at 1.0 percent;
- drainage swales, culverts and wingwalls at building pad sites will be adequately sized and installed at the developers cost; pipe classes will be chosen to bear the weight of heavy vehicles and the pipes will be laid to the specifications of the manufacturer;

• trees that are scarred or marked are likely to be of Aboriginal cultural significance and are protected under the *National Parks and Wildlife Act, 1974*.

7.4.4 DCP No.4 Section 94 Contributions, 2006

The objectives of the DCP No. 4 is to set out developer contributions towards the public cost of servicing developments, and prescribes the standards for accountability in respect of Council's handling of those contributions. The plan seeks to discipline the rollout of infrastructure and to minimise the unit cost of capital required to provide community owned infrastructure. The plan also seeks to deliver equity to existing users by requiring that new users also contribute to the unit cost of existing and proposed infrastructure.

The provisions of Section 94 of the EP&A Act are also outline in Section 7.1.1 of this EA.

The method for calculating the contributions required is identified in Part 10 of DCP No.4.

7.4.5 DCP No.5 Heritage, 2006

The objectives of the Wellington Heritage DCP are to conserve heritage significance, to ensure that new development is sympathetic to heritage, to provide guidance in achieving sympathetic development in relation to heritage items and conservation areas, to provide appropriate and expert consideration, to promote awareness and appreciation, to provide incentives for owners of properties which are listed as heritage items and to facilitate the implementation of the objectives and provisions relating to heritage conservation of the *Wellington Local Environmental Plan 1995.*

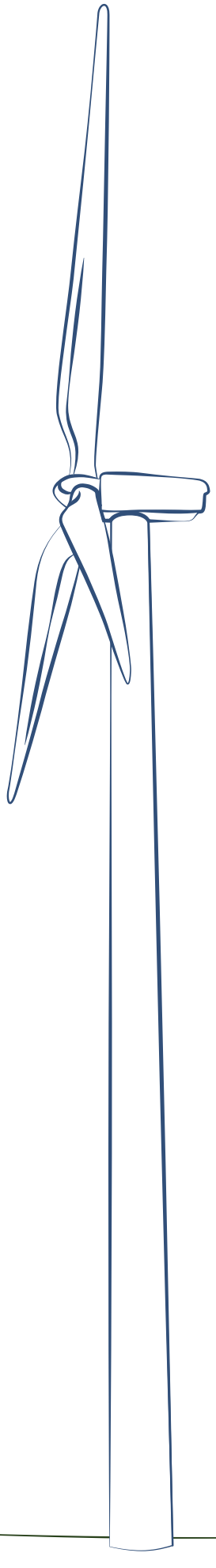
Essentially, the DCP No.5 has been designed to supplement and elaborate on the provisions of the *Wellington Local Environmental Plan 1995* to assist the Wellington Council in its assessment of matters affecting heritage assets, as required by the provisions of Section 79C (Matters for Consideration) of the EP&A Act.

The investigations conducted by NSW Archaeology Pty Ltd and enclosed in Chapter 10 of this EA are considered to adequately assess the heritage aspects of the Bodangora Wind Farm in accordance with the relevant state and national legislation and policy documents.

7.4.6 DCP No.6 Nanima Village

The Nanima Village DCP allows for the planning for the future development and expansion of Nanima Village, to provide guidelines for the management of the Village environment and infrastructure, to protect and enhance the Village character, and to provide a framework to the revitalisation of services commensurate with the expansion of the Village.

The Nanima Village is not located in proximity to the Bodangora Wind Farm and accordingly the proposal is not expected to be affected by DCP No.6.



Chapter 8

Visual Assessment

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CHAPTER 8 – VISUAL ASSESSMENT

8.0 INTRODUCTION

This chapter of the Environmental Assessment provides an assessment of the visual elements of the proposed Bodangora Wind Farm, including a comprehensive assessment of the existing landscape character and scenic values, the likely visual impact of the project including the potential effect of shadow 'flicker' and blade 'glint', and mitigation and management measures for the wind farm.

Specifically, this chapter of the EA provides the following details, as per the Director-General's requirements (DGRs):

Director-General's Requirements:

> *"Provide a comprehensive assessment of the landscape character and values and any scenic of significant vistas of the area potentially affected by the project, including both the wind farm and the transmission line. This should describe community and stakeholder values of the local and regional visual amenity and quality, and perceptions of the project based on surveys and consultation.*
>
> *Assess the impact of shadow 'flicker', blade 'glint', and night lighting form the wind farm.*
>
> *Identify the zone of visual influence of the wind farm (no less than 10 kilometres) and assess the visual impact of all project components on this landscape.*
>
> *Include an assessment of the visual impacts associated with the transmission line, including impacts on local and regional views. Alternate pole designs should be presented and assessed and the potential for undergrounding in sensitive locations should be assessed.*
>
> *Include photomontages of the project taken from potentially affected residences (including approved but not yet developed dwellings or subdivisions with residential rights), settlements and significant public view points, and provide a clear description of proposed visual amenity mitigation and management measures for both the wind farm and the transmission line.*
>
> *Provide an assessment of the feasibility, effectiveness and reliability of proposed mitigation measures and any residual impacts after those measures have been implemented.*

A Landscape and Visual Impact Assessment of the proposed Bodangora Wind Farm has been prepared by Moir Landscape Architecture, and is enclosed in **Attachment F** of this EA. This

assessment has been prepared according to the requirements set by the Director-General, dated 12 November 2010. Survey work for the assessment was undertaken between 8 and 11 August 2011, using key viewpoints and locations with potential views towards the project area. In addition to the proposed wind turbines, the ancillary works associated with the wind farm (such as access tracks, transmission lines and a substation) have also been assessed.

Whilst there are no formal visual guidelines for the assessment of wind farms in NSW, the assessment has been undertaken in accordance with the provisions of the Best Practice Guidelines for Wind Energy Development (British National Wind Energy Association, 1994), Wind Farms and Landscape Values National Assessment Framework (Australian Council of National Trusts and the Australian Wind Energy Association, 2008), the draft National Wind Farm Development Guidelines (Environment Protection and Heritage Council, 2010), Wellington Shire Council provisions, and the Road and Traffic Authority and Civil Aviation Safety Authority Guidelines.

The full methodology undertaken for the assessment of the visual effects of the wind farm is provided in Section 3.0 of **Attachment F**.

It is important to note that a small number of turbines have been deleted since the completion of the Landscape and Visual Impact Assessment undertaken by Moir Landscape Architects, and that the assessment provides a 'worst case scenario' in this regard. The final wind turbine layout is illustrated in Figure 3.1 of this EA.

8.1 LANDSCAPE CONTEXT

Moir Landscape Architecture has provided an assessment of the regional landscape character of the surrounding region. The project area is located within the South Western Slopes Bioregion, which is a large area of foothills and ranges comprising the western fall of the Great Dividing Range. The topography of the region is gently undulating to undulating. Within the project area, the most obvious landscape feature is Mount Bodangora at a height of 743 metres which is visible from most points within the project area.

Major roads in the district including the Mitchell Highway as a major travel corridor between Wellington and Dubbo, Mudgee/Goolma Road passing to the south-east of the project area, Gollan Road and Montefiores Nr Elong Elong Road, which are used primarily for heavy transport vehicles, residents and tourists. Local roads within the project area include Bodangora Road, Comobella Road, Gillinghall Road and Forestvale Road which provide access to farmsteads. A number of unsealed roads also exist within the region.

The land in the region is used primarily for the purposes of cropping and animal grazing purposes, with a number of isolated homesteads servicing the agricultural industry. Typically, the region is predominately cleared, open grazing land with scattered groupings of remnant vegetation, particularly in steep areas, along the ridges and creeks and along the property boundaries.

Moir Landscape Architecture have undertaken an assessment of the prevailing character elements of the region, and can determine the following as according to the regions identified in Figure 7 of **Attachment F** to this EA, as summarised in Table 8.1.

Table 8.1 – Summary of Landscape Character Values

NAME OF LANDSCAPE CHARACTER UNIT	LANDSCAPE QUALITY RATING
Mount Bodangora	**Moderate**
The area surrounding Mount Bodangora in which the majority of turbines are located is considered of 'moderate' landscape quality, and is characterised by a moderately vegetated landscape.	
	
Bodangora	**Moderate**
The area to the west of Mount Bodangora as far west as Montefiores Nr Elong Elong Road in which most western turbines are located is classified as 'moderate' levels of landscape quality, and is generally characterised by generally cleared and undulating land, the Bodangora township and airport.	
	
Spicers Creek	**Moderate**
The area to the north-east of the wind farm has been rated as 'moderate' and incorporates gently undulating land with improved pasture and red/brown soils.	
	
Comobella	**Low-Moderate**
The area further west of Montefiores Nr Elong Elong Road has been rated as 'low-moderate', generally this land is low undulating hills, dominated by grazing land uses.	

NAME OF LANDSCAPE CHARACTER UNIT	LANDSCAPE QUALITY RATING
	
Wellington	**High**
The area to the south-west of Mount Bodangora has been rated with a 'high' landscape quality given it incorporates the township of Wellington, and the steep vegetated ranges associated with Mount Arthur to the west of Wellington, and the Macquarie River as a prominent water body running through the Wellington Valley and draining to Lake Burrendgong to the south-east.	
	

Source: Moir Landscape Architecture, 2011

The landscapes at Bodangora and in the surrounding region are not recognised under the Wellington Local Environmental Plan or any heritage register as a zone of special visual interest or landscape significance.

8.2 VISUAL CHARACTERISTICS OF WIND FARMS

The proposed Bodangora Wind Farm consists of up to 33 wind turbine generators, each to a maximum height of 150 metres to blade tip and with three blades, as illustrated in Figure 3.1 and described in detail in Chapter 3 of this EA.

The wind turbines are proposed to be an off-white matt finish, constructed from non-reflective materials, and the same colour for the blades, nacelle and tower to provide a simplistic turbine design to assist in a visual consistency across the landscape. A local generator transformer may be located at the base of each turbine, also in a muted colour.

The wind turbines are to be sited in an irregular pattern along two ridges to the north and north-west of Mount Bodangora on land between 400 and 700 metres above sea level, with the distances between turbines being between 300 and 1,300 metres.

Upgrades are proposed to a number of existing access tracks to minimise the number of new roads required for construction, and where new roads are required, the road layout has been designed to minimise cut and fill, and to avoid the loss of vegetation.

The other major ancillary component of the wind farm is a new substation and a combination of underground and overhead 33kV transmission lines to provide connection of the wind farm to the electricity network. Underground transmission cables will be utilised through the majority of the wind farm where possible, and the substation located away from sensitive receivers as far as possible.

8.3 ASSESSMENT OF VISUAL IMPACT

This Section provides a summary and context for the visual assessment of the wind farm. Please refer to the Landscape and Visual Impact Assessment for all figures and photomontages which have been prepared by Moir Landscape Architects.

A small number of turbines have been deleted since the completion of the Landscape and Visual Impact Assessment, which was undertaken by Moir Landscape Architects. The assessment provides a 'worst case scenario', with the final wind turbine layout illustrated in Figure 3.1 of this EA.

8.3.1 Zone of Visual Influence

Analysis of the Zone of Visual Influence (ZVI) of the project has been undertaken to identify the areas of surrounding land from which the wind farm may be partially or completely visible, determined through the use of digital topographic information and 3D modelling. This assessment is based purely on topographic information and a turbine height of 150 metres above ground level, and does not consider the height and location of vegetation and structures on the landscape which in reality would provide screening.

Figure 10 of **Attachment F** displays the ZVI results of the investigations, which can be summarised as the following:

- the ZVI extends through a large portion of the landscape surrounding the proposed wind farm;
- the highest visual impact will be received within 2.0 kilometres of the proposed turbines;
- a larger percentage of wind turbines will be visible from the north-east of the project area; and
- the south-east of the project area has significantly lower visual impact, and views will be generally obstructed by the undulating topography in this location.

In reality, the project will have a much lower visual catchment and the ZVI should not be considered to be an accurate portrayal of the actual visual impact of the Bodangora Wind Farm. In this regard, the ZVI has been undertaken largely to demonstrate the methodology used in the selection of the viewpoints for analysis.

8.3.2 Viewpoint and Photomontage Analysis

Viewpoint analysis has been prepared to assess the likely impact that the development will have on the existing landscape and character. Viewpoints have been selected to present a range of landscape types, areas of high landscape/scenic value, representative of dwelling and roadside locations, providing a variety of visual compositions (e.g. simple or complex landscape character), a range of distances, and varying aspects, elevations and extents of visibility.

The viewpoint locations were determined from the results of the ZVI analysis, to represent the 'worst case scenario' of views. A total of 35 viewpoints were analysed, with 30 of the most prominent viewpoints selected and documented within the Landscape and Visual Impact Assessment.

The viewpoint analysis assessment is provided on pages 24 to 53 of the Landscape and Visual Impact Assessment, with a summarising Chapter provided in Table 13 of **Attachment F**.

The analysis has identified the following of the Bodangora Wind Farm:

- wind turbines would be visible from 26 of the 30 viewpoints taken. Of the 26 viewpoints where wind turbines are visible:
  - 14 viewpoints have been assessed as having a low impact;
  - seven viewpoints have been assessed as having a moderate impact; and
  - five viewpoints have been assessed as having a high impact;
- of the five viewpoints which are expected to have a high impact, three were nearby to dwellings with a financial interest in the project, and two were nearby to neighbours to the project;
- generally, the further the viewpoint is from the proposed development, the more wind turbines would be visible, however as the viewer distance increases the scale and therefore the visual impact of the wind turbine decreases; and
- viewpoints located close to the wind farm have a large vertical angle of visibility, however generally a smaller number of turbines are visible due to obstruction by topography and existing vegetation.

A Photomontage Analysis is provided on pages 57 to 66 of the Landscape and Visual Impact Assessment. This information has been duplicated and is provided as Figures 8.1 to 8.9 on the following pages.

The Photomontage Analysis locations were selected to provide a variety of views, distances and perceived impacts, and to convey the 'final visual image' of the proposed wind farm from typical vantage points. The photomontages indicates the 'worst case scenario' as they do not incorporate any of the proposed mitigation measures which are identified in Tables 8.2 and 8.3 below.

Photomontage locations were identified to represent the views of the closest affected neighbours to the wind farm, and to identify locations where high visual impact is expected. Identification of the photomontage viewpoint locations is provided spatially in Figure 14 of **Attachment F**.

Of the photomontages presented in Figures 8.1 – 8.9, consider the following (prior to the installation of proposed mitigation measures):

- Figure 8.1 provides an indication of a low level of visual impact to the north of the project area, as viewed south from Forestvale Road, given the distance of around 3.5 kilometres to the nearest turbine.
- Figure 8.2 provides an indication of a similar view of the general locality of neighbouring Dwellings 24 and 25, to the west of the project area. A moderate visual impact is expected, notwithstanding dwellings will have a range of local influences which have not been identified within the photomontage.
- Figures 8.3 and 8.4 provide a photomontage of the expected visual impact from the township of Bodangora. A moderate - high level of visual impact is expected given the proximity of the proposed turbines to the township.
- Figure 8.5 provides an indication of a moderate visual impact expected close to Dwelling 12 (nee 11), a neighbouring property to the wind farm. Please note that since the finalisation of the Landscape and Visual Impact Assessment, WTG 40 has been removed from the project which will substantially reduce the visual impact from this Dwelling.
- Figure 8.6 provides a photomontage of the likely view from Driel Creek Road nearby to Dwelling 10, which is an associated dwelling. It is expected that Dwelling 10 will receive a high level of visual impact.
- Figure 8.7 provides a photomontage of the visual impact of the wind farm nearby to Dwelling 4, and associated land owner to the wind farm. The expected visual impact at this location is moderate.
- Figure 8.8 provides an indication of a moderate visual impact nearby to neighbouring Dwelling 16, along Mudgee Road. The expected visual impact to Dwelling 16 is nil-low as indicated in Table 8.2.

- Figure 8.9 indicates a low visual impact from nearby to Dwelling 6, an associated dwelling to the wind farm. A low visual impact is expected given the topographical features at this immediate location.

The following provides specific details of the expected impact to dwellings with agreements with the proponent and neighbouring dwellings, and of views from public roads within the locality.

Visual Impact to Dwellings

Table 8.2 provides an overview of the expected visual impacts to both dwellings with agreements with the proponent and neighbouring dwellings to the wind farm, and where mitigation measures are proposed to reduce expected impacts. This information is extracted from Table 16 of **Attachment F**.

The assessment of potential visual impact has been recommended in the professional opinion of Moir Landscape Architecture based upon a combination of the visual sensitivity, distance, view field angle, number of visible turbines, and local influences such as existing vegetation and structures.

PHOTOMONTAGE 8.1A
Existing view from Forrestvale Road

PHOTOMONTAGE 8.1B
Proposed view from Forrestvale Road

PHOTOMONTAGE 8.1C
Proposed view zoomed & cropped from Photomontage 8.1B

PHOTOMONTAGE 8.1D
Comparison of backgrounds

Figure 8.1

Photomontage 1
Forrestvale Road

BODANGORA
WIND FARM

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Figure 8.2

Photomontage 2
Unsealed Local Road

BODANGORA
WIND FARM

PHOTOMONTAGE 8.2A
Existing view from unsealed road off Montefiores near Elong Elong Road

PHOTOMONTAGE 8.2B
Proposed view from unsealed road off Montefiores near Elong Elong Road

PHOTOMONTAGE 8.2C
Proposed view zoomed & cropped from Photomontage 8.2B

PHOTOMONTAGE 8.2D
Comparison of backgrounds

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Figure 8.3

Photomontage 3
Bodangora Road

BODANGORA
WIND FARM

PHOTOMONTAGE 8.3A
Existing view from Bodangora Road

PHOTOMONTAGE 8.3B
Proposed view from Bodangora Road

PHOTOMONTAGE 8.3C
Proposed view zoomed & cropped from Photomontage 8.3B

PHOTOMONTAGE 8.3D
Comparison of backgrounds

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Figure 8.4

Photomontage 4
Driel Creek Road

BODANGORA
WIND FARM

PHOTOMONTAGE 8.4A
Existing view from Driel Creek Road

PHOTOMONTAGE 8.4B
Proposed view from Driel Creek Road

PHOTOMONTAGE 8.4C
Proposed view zoomed & cropped from Photomontage 8.4B

PHOTOMONTAGE 8.4D
Comparison of backgrounds

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PHOTOMONTAGE 8.5A
Existing view from 'Westview'

PHOTOMONTAGE 8.5B
Proposed view from 'Westview'

PHOTOMONTAGE 8.5C
Proposed view zoomed & cropped from Photomontage 8.5B

PHOTOMONTAGE 8.5D
Comparison of backgrounds

Figure 8.5

Photomontage 5
'Westview'

BODANGORA
WIND FARM

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Figure 8.6

Photomontage 6
Driel Creek Road

BODANGORA
WIND FARM

PHOTOMONTAGE 8.6A
Existing view from Driel Creek Road

PHOTOMONTAGE 8.6B
Proposed view from Driel Creek Road

PHOTOMONTAGE 8.6C
Proposed view zoomed & cropped from Photomontage 8.6B

PHOTOMONTAGE 8.6D
Comparison of backgrounds

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PHOTOMONTAGE 8.7A
Existing view from Wandrona Lane

PHOTOMONTAGE 8.7B
Proposed view from Wandrona Lane

PHOTOMONTAGE 8.7C
Proposed view zoomed & cropped from Photomontage 8.7B

PHOTOMONTAGE 8.7D
Comparison of backgrounds

Figure 8.7

Photomontage 7
Wandrona Lane

BODANGORA
WIND FARM

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Figure 8.8

Photomontage 8
Mudgee Road

BODANGORA
WIND FARM

PHOTOMONTAGE 8.8A
Existing view from Mudgee Road

PHOTOMONTAGE 8.8B
Proposed view from Mudgee Road

PHOTOMONTAGE 8.8C
Proposed view zoomed & cropped from Photomontage 8.8B

PHOTOMONTAGE 8.8D
Comparison of backgrounds

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PHOTOMONTAGE 8.9A
Existing view from Mudgee Road

PHOTOMONTAGE 8.9B
Proposed view from Mudgee Road

PHOTOMONTAGE 8.9C
Proposed view zoomed & cropped from Photomontage 8.9B

PHOTOMONTAGE 8.9D
Comparison of backgrounds

Figure 8.9

Photomontage 9
Mudgee Road

BODANGORA
WIND FARM

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The highest visual impact of the proposed development is expected within a 2.0 kilometre radius of the wind farm. All dwellings located within a 2.0 kilometre radius of any turbine are associated land owners.

WTG 40 has been removed from the project as it was previously located within 2.0 kilometres from non-associated Dwelling 11. The removal of WTG 40 will substantially reduce the expected visual effect to Dwelling 11. Since the dwelling is orientated to the west, views of the wind farm have been assessed as minimal. A slight rise in topography to the south-east of the homestead and an extensive area of native vegetation will reduce views of the proposal to filtered glimpses. The visual impact to this dwelling has been assessed as 'low to moderate', however it is likely that with proposed mitigation measures, including the removal of WTG 40, the likely visual impact will be further reduced and the resulting impact would be 'low'.

Views of turbines from neighbouring dwellings 13, 13A, 14 and 15 are generally screened by a combination of low rises in topography and screen planting.

Views of turbines from dwellings to the south of Mudgee Road, including dwellings 16, 20 and 21 will generally be contained by the undulating topography typical of the area, and given this area remains generally uncleared, vegetation will further assist in screening views. Retained vegetation is a character of the landscape in this area, and when vegetation is located in the foreground of the viewing location, views are screened.

There are no expected views of the substation from dwelling locations, and views of the overhead 33kV transmission line are expected to be obstructed by topography and native vegetation.

Nearby Roads

The topography surrounding the wind farm significantly alters the visibility of the turbines from many vantage points. Assessment of the visual impact from views along major and minor roads in the locality has been undertaken. Table 8.3 provides a summary of the expected impact to the roads in the locality and where mitigation measures are recommended to reduce visibility.

Moir Landscape Architecture has determined that there are limited areas within the local area from which the proposed wind farm can be viewed at a short range in its entirety. As the viewing distance is increased, the visibility of the wind farm increases, however the turbines become smaller in scale and a less significant element within the landscape.

At locations along Mudgee Road and Monte Fiores Nr Elong Elong Road, the wind farm will be visible due to the close proximity, however given the speed of travel, the direction of travel and local influences including roadside vegetation, the predicted visual impact is 'very low'.

Local roads in the district have a low frequency of use and are generally utilised by local residents and agricultural vehicles. Gillinghall Road has been identified as a likely 'moderate' visual impact, given this road dissects the project area and is within close proximity to turbines.

Unsealed minor roads have a low frequency of use, a short view period, and are unlikely to be visible for periods due to travel directions, topography and existing roadside and native vegetation. Accordingly, the expected impact to roads including Spicers Creek Road, Oakey Creek Road, Driel Creek Road, Old Station Road and Gunnegalderie Road is predominately minimal.

Mitigation measures to reduce the visual impact from roads within the locality are proposed within Section 10.5.

Table 8.2 – Expected Impacts to Dwellings with Agreements with the Land Owner and Neighbouring Dwellings

DWELLING NUMBER	DWELLING WITH AGREEMENT/ NEIGHBOUR	DISTANCE TO NEAREST TURBINE (METRES)	NUMBER OF VISIBLE WIND TURBINES[3]	EXPECTED VISUAL IMPACT	COMMENT	SCREEN PLANTING PROPOSED
1	Agreement	470	40%	Low	Views contained by rise to north. Due to proximity, 40% of turbines are visible.	Screen planting to surround the dwelling.
2	Agreement	820	100%	Low	Dense screen planting surrounds the property will impede views.	-
3	Agreement	1,390	100%	Moderate	Roadside and screening vegetation will impede views.	Isolated planting to north, south and east.
4	Agreement	670	60%	Low	Orientated to north away from turbines. Dense screen planting to east and south will impede views.	-
5	Agreement	1,100	80%	Moderate	Screen planting and ancillary buildings to south-east impede views. Turbines will be visible to west of dwelling.	Planting at western edge of dwelling.
6	Agreement	1,100	40%	Low	Views contained by screen planting and native vegetation.	-
7	Agreement	4,630	-	-	Views contained by native vegetation. Filtered views of 33kV overhead transmission line will be visible.	-
8	Agreement	4,530	-	-	Views contained by topography and native vegetation. Views to 33kV overhead transmission line may be visible.	-
9	Agreement	4,550	-	-	Views contained by rise to east of property.	Planting to south-west will screen views of 33kV overhead transmission line.

[3] This figure has been based on topography.

DWELLING NUMBER	DWELLING WITH AGREEMENT/ NEIGHBOUR	DISTANCE TO NEAREST TURBINE (METRES)	NUMBER OF VISIBLE WIND TURBINES[3]	EXPECTED VISUAL IMPACT	COMMENT	SCREEN PLANTING PROPOSED
10	Agreement	870	80%	Nil-Low	Extensive screen planting contains views. It is unlikely any turbines will be visible.	-
11	Neighbour	1,630	80%	Low	Dwelling orientated away from turbines and screened by vegetation to the east. WTG 40 has been removed from the project and will substantially reduce the expected visual impact.	-
12	Neighbour	2,270	20%	Nil-Low	Views south are concealed by rise and native vegetation. No significant visual impact expected.	-
13	Neighbour	2,410	-	-	Views north contained by sloping topography and dense screen planting surrounding the property. No visual impact expected.	-
13B	Neighbour	2,270	20	Nil-Low	Turbines will be less visible due to native vegetation in the foreground to the east. A local rise to the north-east obstructs most views.	-
14	Neighbour	3,890	-	-	Dense screen planting and native vegetation dominates local rise to the east containing views.	-
15	Neighbour	3,710	-	-	Native vegetation and topography surrounding dwellings will result in no visual impact to dwelling.	-
16	Neighbour	2,760	80%	Nil-Low	Views are significant obstructed by native vegetation. Some filtered views of the turbines may be visible to the north, but turbines will not be noticeable for the most part.	-
17	Neighbour	6,300	-	-	Views are contained by rise to east. No visual impact expected.	-
19	Agreement	1,000	20%	Nil-Low	Topography and native vegetation screens views to the majority of turbines.	-
20	Neighbour	5,370	20%	Nil-Low	Dwellings orientated away from turbines, and views are obstructed by screening vegetation. Some filtered views may be available.	-

DWELLING NUMBER	DWELLING WITH AGREEMENT/ NEIGHBOUR	DISTANCE TO NEAREST TURBINE (METRES)	NUMBER OF VISIBLE WIND TURBINES[3]	EXPECTED VISUAL IMPACT	COMMENT	SCREEN PLANTING PROPOSED
21	Neighbour	5,060	80%	Low	A number of filtered views to the north, however due to the distances the turbines will form only a small visual element in the landscape.	-
22	Neighbour	5,460	-	-	Views are obstructed by topography and native vegetation. No visual impact expected.	-
23	Neighbour	5,850	-	-	A large rise screens views west towards the turbines. No visual impact expected.	-
26	Neighbour	4,500	20%	Nil-Low	Dwelling oriented away from turbines, and views are obstructed by screening vegetation. Some filtered views may be available.	-

Table 8.3 –Expected Impacts to Roads

MAJOR TRAVEL CORRIDORS	DISTANCE TO NEAREST TURBINE (METRES)	PERIOD OF VIEW	EXPECTED VISUAL IMPACT	COMMENT	SCREEN PLANTING PROPOSED
Mudgee Road/ Goolma Road	660	Very Short Term	Low	Dense roadside vegetation, topography and direction of travel will screen views from the majority of Mudgee Road/Goolma Road. Impact reduced due to speed to travel. Glimpses will be largely out of drivers' sight.	Increase screen planting along the northern side of Mudgee Road/ Goolma Road.
Mitchell Highway	11,880	-	-	Unlikely that views will be noticeable from Mitchell Highway due to distance, speed of travel and direction of travel.	-
Gollan Road	13,200	-	-	Dense roadside vegetation will screen views.	-
Montefiores Nr Elong Elong Road	4,270	Very Short Term	Nil-Low	Glimpses may be visible however short term and largely unnoticeable to motorists.	-
Bodangora Road	2,490	Short Term	Low	Turbines will be visible travelling south-east beyond topography to the east. The short distance of travel combined with roadside planting results in a short term view period. Low impact expected.	-
Comobella Road	5,300	Very Short Term	Nil-Low	Glimpses of the wind farm will be visible when travelling east towards the project area, limited by dense vegetation.	-
Gillinghall Road	450	Short Term	Moderate	The period of view for the turbines along this road running through the centre of the project area is short term due to the short distance. The expected impact is moderate.	-
Forestvale Road	5,480	Very Short Term	Nil-Low	The speed of travel, direction of travel and period of view results in minimal impact.	-
Spicers Creek Road	4,790	Short Term	Low	Views of the turbines limited to glimpses due to distance and the direction of travel. Riparian vegetation along Spicers Creek towards the southern end of the road screens views. Road is used intermittently by local residents and farm vehicles.	-
Oakey Creek	8,420	Very Short Term	Nil-Low	Turbines will not be visible due to distance and roadside	-

MAJOR TRAVEL CORRIDORS	DISTANCE TO NEAREST TURBINE (METRES)	PERIOD OF VIEW	EXPECTED VISUAL IMPACT	COMMENT	SCREEN PLANTING PROPOSED
Road				vegetation. This road is isolated and used infrequently.	
Driel Creek Road	150	Short Term	Moderate	This road is used intermittently by local residents. The turbines are located as close as 150 metres from the road, however the period of view from the road would be short term. Existing vegetation will obstruct some views.	Additional screen planting along eastern side of Driel Creek Road.
Old Station Road	7,220	Very Short Term	Nil-Low	Unlikely that views will be visible from Old Station Road due to dense roadside vegetation, direction of travel and distance from site.	-
Gunnegalderie Road	1,570	Very Short Term	Nil-Low	Glimpses of turbines will be visible travelling in a northern direction, however impact is expected to be minimal given a combination of roadside vegetation and a short view period.	-

8.3.3 Cumulative Visual Impact

An assessment has been provided on the cumulative landscape and visual effects of the development, in association with other planned developments in the locality of the proposed wind farm, and according to the way a landscape is experienced. The cumulative impact of the wind farm can generally be assessed through the determination of the distance of the proposal to other developments. The Environment Protection and Heritage Council defines the potential cumulative visual impact as high visual impact within 3.0 kilometres, medium visual impact around 6.0 kilometres, and low visual impact at more than 12 kilometres.

Other proposed and approved developments in the locality include the following:

- the proposed Uungula Wind Farm, located to the south-east of the Bodangora Wind Farm:
  - an application for the Uungula Wind Farm was submitted to the Department of Planning and the Director-General's requirements for the project were issued in April 2011;
  - the wind farm is for a proposed 330 wind turbines, which would potentially be located within 12 kilometres of the Bodangora Wind Farm;
  - despite being located within 12 kilometres at the closest point, it is unlikely that receptors will view both developments in combination; and
  - there may be some perceived cumulative visual impact where the two wind farm developments are viewed in succession as travellers move through the landscape;
- the approved Wellington Gas-Fired Power Station, located adjacent to the existing Wellington Substation, located along Goolma Road towards Wellington:
  - the cumulative impact of the gas-fired power station is likely to be insignificant given the separation distances from the Bodangora Wind Farm project area and the existing infrastructure located in the vicinity;
- gas pipelines connecting Young and Wellington (approved), and Narrabri to Wellington (Director-Generals Requirements issued):
  - the cumulative visual impact of the natural gas supply to the project is expected to be insignificant given the majority of infrastructure will be located underground;
- the existing Wellington Correctional Centre, which is located along Goolma Road towards Wellington:
  - the Bodangora Wind Farm is not likely to cause any additional cumulative impact to the landscape nearby the Wellington Correctional Centre, given the distance from the proposed wind farm.

With regard to further wind farm development in particular, whilst it is conceivable that if other wind farms in the local area became more prevalent, and the spatial and landscape separation between the wind farms decreases, there may be limitations for continued development on visual amenity grounds.

Moir Landscape Architecture have identified that further wind farm development in the locality beyond what is currently proposed may be constrained on the basis of topography, Lake Burrendgong as an area of regional significance, National Parks, and town centres and associated developed areas.

8.3.4 Summary

Moir Landscape Architecture provides the following concluding statements regarding the wind farm and its expected visual impact:

> *"Considering the character of existing and proposed development in the region in addition to the suggested mitigation methods, the visual landscape of the region has the capacity to absorb the proposed development…*
>
> *It is the professional opinion of Moir Landscape Architecture that considering the extent of quantified impact and community response the social, economic and environmental benefits significantly outweigh any visual impact that may result from the proposal."*

Mitigation methods for the project are proposed in Section 8.5.

8.4 ASSESSMENT OF VISUAL EFFECTS

8.4.1 Shadow Flicker

Shadow flicker is the result of shadows across turbines, whereby the rotating blades of the turbine momentarily block the sun's path and a moving shadow is caused.

The effect of shadow flicker is diminished as the distance between the viewpoint and the turbine is increased, and accordingly generally affects those closest dwellings to the wind farm. Other variations in the effect of shadow flicker are the direction of the residence, the turbine height and rotor diameter, the time of year, the proportion of daylight hours, the frequency of bright sunlight, the prevailing wind direction, and local influences such as screen planting.

An assessment of shadow flicker has been undertaken for the project, and the results illustrated in Figure 17 of **Attachment F**. It is necessary to note the shadow flicker assessment is a 'worst case scenario' and does not provide any representation of vegetation or structures which may reduce the effect of shadow flicker.

Five dwellings have been identified in proximity to the wind farm which are likely to experience the effects of shadow flicker as a result of the Bodangora Wind Farm. All five dwellings are commercial land owners involved with the project. Table 8.5 provides a summary of the expected effects.

Table 8.4 – Summary of Effects to Dwellings Effected by Shadow Flicker

DWELLING NUMBER	SHADOW DURATION (HOURS PER YEAR)	SHADOW OCCURRENCE (DAYS PER YEAR)	MAXIMUM DAILY SHADOW DURATION (MINS PER DAY)
1	32.3	78	43
2	30.7	103	30
4	2.6	20	11
5	4.7	24	16
19	11.5	34	26

Moir Landscape Architects have assessed that of the five dwellings, dwellings 1 and 2 are at risk of experiencing shadow flicker which may be beyond an acceptable limit, whilst dwellings 4, 5 and 19 will experience a lower level of shadow flicker.

Higher levels of shadow flicker are generally more acceptable to land owners who are involved in the project. Notwithstanding, mitigation measures are proposed in Section 8.5 of this EA to assist in relieving the effects of shadow flicker for the dwellings associated within the wind farm.

A number of roads through the project area may be affected by shadow flicker; in particular Driel Creek Road and Gillinghall Road have been identified, in addition to a small section of Mudgee Road to the north-east of Mount Bodangora.

Moir Landscape Architecture provides that there is a negligible risk associated with the distraction of motorists who experience shadow flicker, likening the experience to a vehicle passing by a static objective for example a tree-lined road.

Accordingly, it is expected that the effects of shadow flicker will be negligible to non-existent for the majority of dwellings and local roads in the region, with the effects of shadow flicker to dwellings with agreements with the proponent being appropriately mitigated.

8.4.2 Blade Glint

Blade glint refers to the regular reflection of sunlight from one or more rotating blades, which can be a temporary effect at any given location. Blade glint impacts are most common above the turbine hub, and accordingly are not as prevalent at ground level.

Blade glint is identified as a potential aspect which could cause distraction to drivers, where roads are aligned to turbines, and particularly where the road is located at a higher altitude to a turbine hub. While the effect may be noticeable at a distance, the impact is regarded as transient and therefore the expected impact is minimal.

The Victorian Wind Farm Guidelines provides two mitigation measures for the management of blade glint, being the turbines finished with a surface treatment of low reflectivity, and through the use of matt coatings. These mitigation measures are provided in Section 8.5.

8.4.3 Night Lighting

Night lighting of times could potentially result in the alteration of the night time landscape character of the region.

The Civil Aviation Safety Authority has been consulted as part of the proposed Bodangora Wind Farm project in accordance with Civil Aviation Safety Regulations, who has identified that night time obstacle light is not required for the wind turbines.

Low intensity security lighting will be provided to the base of the wind turbines and at the substation, however Moir Landscape Architecture have identified that night time security lighting is not perceived to be a visual issue for this development.

8.5 MANAGMENT AND MITIGATION MEASURES

As discussed in Chapter 3 of this EA, the wind farm layout has been adjusted to provide for both a successful electricity generation whilst minimising the impact of the project to the locality. The following management measures will be undertaken to achieve a better visual integration of the wind farm, and the retention of the existing landscape character.

The turbines will be a matt white finish and a three bladed design, which is generally accepted as being the most visually acceptable turbine. Whilst the turbines will be located in prominent locations along ridge lines and will be visible within the wider locality and at some distance from the project area; topography and existing vegetation will assist in obstructing views of the wind farm to some degree.

Underground cabling will be used throughout the wind farm wherever practical; and areas of existing native vegetation preserved as far as possible for environmental and amenity purposes. Access roads have been minimised and locations selected according to the pattern of existing tracks within the project area to reduce visual impact.

Community consultation is a critical element in the success and acceptance of a wind farm. The results of the community consultation which has been undertaken and to date and future strategies for consultation are identified in Chapter 6 of this EA. The majority of consultation undertaken to date has been largely positive.

In addition to the design factors of the wind farm and community consultation, the following management and mitigation measures are proposed to reduce the visual impacts of the Bodangora Wind Farm:

- visual screen planting to be undertaken to reduce the views of the wind turbines in the following areas of high visual sensitivity:

  - along the northern side of Mudgee Road, as indicated on Figure 23 of **Attachment F**;
  - along the eastern and southern sides of Driel Creek Road, as indicated on Figure 23 of **Attachment F**;
  - along the southern side of Wadrona Lane, as indicated on Figure 23 of **Attachment F**;

  The locations selected for screen planting have avoided screening areas where views are visible of the broader landscape. It is expected that planting will be in keeping with the existing landscape character as there are various existing wind break screen planting along property boundaries, surrounding dwellings and along roadsides;

- screen planting can be undertaken in additional locations subject to landowner and neighbour's requests;

- visual screen planting will:

- use species selection typical of the local area;
- avoid the clearing of existing areas of native vegetation; and
- be undertaken in consultation with landowners to ensure that screen planting does not erode desirable views in the effort to mitigate views of the turbines.

A viewing area will be constructed along Mudgee or Gillinghall Road to provide for the provision of educational information about the wind farm. This will allow visitors to safely view the wind farm and provide insight into the function, output and benefits of large scale wind farms. The viewing platform will form part of a separate development application to the Wellington Council.

In addition, the following measures will assist in reducing the visual impact of the wind farm during the construction phase of the project:

- earthworks will be restored as soon as practical following the completion of construction, including reducing the width of the access tracks for soil stability and amenity purposes;
- the use of overhead transmission lines will be minimised where possible and mainly limited to the connection of the wind farm between WTG 18 and the substation, and where necessary for creek crossings; and
- cable trenches will be backfilled as soon as practical to limit visual impact.

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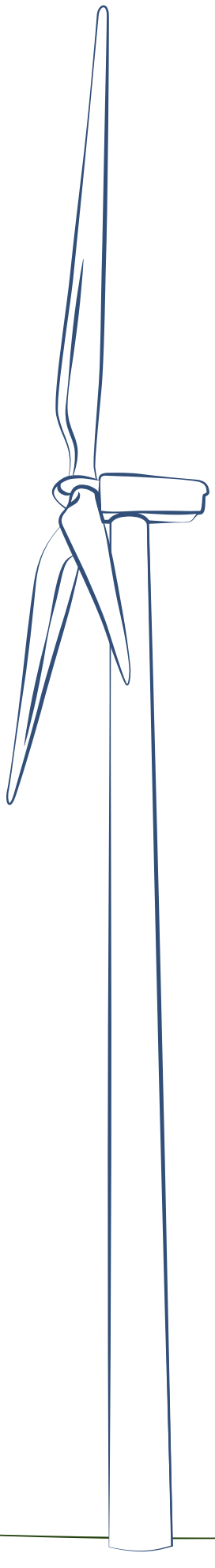

Chapter 9

Flora & Fauna

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CHAPTER 9 - FLORA AND FAUNA

9.1 INTRODUCTION

This chapter provides an assessment of the Bodangora Wind Farm project including the existing site conditions, an assessment of project components against threatened species and communities listed under Commonwealth and State legislation; and details of the management of flora and fauna impacts during construction and operation, including identification of measures to avoid, mitigate and offset impacts where necessary.

Specifically, this chapter of the EA provides the following details, as per the Director-General's requirements (DGRs):

Director-General's Requirements:

"Include an assessment of all project components on flora and fauna (both terrestrial and aquatic, as relevant) and their habitat consistent with the Draft Guidelines for Threatened Species Assessment (DEC, 2005), including details on the existing site conditions and likelihood of disturbance (including quantifying the worst case extent of impact on the basis of vegetation type and the total native vegetation disturbed (hectares of clearing)).

The EA must specifically consider impacts on threatened species and communities listed under both State and Commonwealth legislation that have been recorded on the site and surrounding land, impacts to riparian and/or instream habitat in the case of disturbance of waterway, and to biodiversity corridors. In addition, the impact of the project on birds and bats from blade strikes, low air pressure zones at the blade tips (barotrauma, including the potential nature/extent of impacts, significance of such impacts on threatened species and mitigation measures), and alternation to movement patterns/flight paths resulting from the turbines must be assessed, including demonstration of how the project has been sited to avoid and/or minimise such impacts. The EA must also consider flight paths, roosting and nesting sites for aerial species. if any of the bat and bird species likely to be impacted by the wind turbines are also listed species under State and Commonwealth legislation, then the significance assessment for each of these species must consider impacts from the wind turbines as well as impacts from habitat loss.

Details of how flora and fauna impacts would be managed during construction and operation including adaptive management and maintenance protocols (including the mitigation and/or management of weed).

Measures to avoid, mitigate or offset impacts consistent with 'improve or maintain' principles. Sufficient details must be provided to demonstrate the availability of viable and achievable options to offset the impacts of the project (including in relation to water quality, salinity, soils and biodiversity)."

Kevin Mills and Associates were engaged to undertake an assessment of the flora and fauna conservation issues associated with the wind farm site, in accordance with the Director-Generals Requirements dated 12 November 2010. Field surveys for the project were undertaken in early October 2010 (spring) and July 2011 (winter). The second field survey in July 2011 was undertaken once the preliminary layout of the wind farm had been determined. The assessment is provided in **Attachment G**.

A separate bat fauna assessment was undertaken by Greg Richards and Associates Pty Ltd, as enclosed within **Attachment H**. Bat fauna field surveys were undertaken in January 2009.

This chapter has been prepared to identify the key findings of both reports.

9.2 EXISTING ENVIRONMENT

9.2.1 Flora

The majority of the project area comprises exotic pasture land used for cropping or grazing, where little native ground cover or native shrubs occur. This is typical of the rural landscape associated with the tablelands and western slopes of New South Wales.

The project area supports some stands of modified woodland and scattered paddock trees, although the understory and groundcover to almost all woodland areas is exotic grassland or a mix of native and exotic plants, with the exception of some areas including along roadsides (including Gillinghall Road) and on poorer soils where pasture has not occurred.

Almost all of the remnant trees, patches of trees and the occasional patches of native grassland in the lower areas are part of the White Box – Yellow Bow – Blakely's Red Gum Woodland, which is found extensively across central-western New South Wales.

At higher elevations where sedimentary rocks and granite are evident, the woodland contains other species additional to the Box-Gum Woodland community. Additional communities include:

- in the central and southern regions of the project area, supported woodland with a high proportion of White Cypress Pine *Callitris glaucophylla* in addition to associated trees and shrubs, with a mix of native and exotic species;
- the White Box Woodland at low-lying areas and extending into higher elevations except where poor soils are evident, comprising the White Box *Eucalyptus albens*, Blakely's Red Gum *Eucalyptus blakelyi*, Yellow Box *Eucalyptus melliodora*;
- on the ridges, whilst there is almost no native grassland understory remaining, tussocky native grasses are found in a few paddocks, sometimes dominated by species of Speargrass *Austrostipa* spp. and/or Redleg Grass *Bothriochloa macra*; and
- where poor, stony soils are located on sedimentary rocks, woodland to forest is evident, containing Red Stringybark *Eucalyptus macrorhyncha*, Tumbledown Gum *Eucalyptus dealbata,* Long-leaved Box *Eucalyptus nortonii* and Red Box *Eucalyptus polyanthemos*. This is the most common vegetation community to the north of Mount Bodangora.

A total of 122 indigenous and 102 exotic species were recorded within the project area, with the full species list provided at Appendix 1 of **Attachment G**.

Seven of the exotic species found within the project area are identified as noxious weed species under the *Noxious Weeds Act 1993* in the Wellington Council area:

- African Box Thorn Lycium ferrocissimum;

- Bathurst Burr Xanthium spinosum;
- Blackberry *Rubus fruticosa* sp. agg;
- Noogoora Burr Xanthium occidentale:
- Prickly Pear Opuntia stricta;
- Sweet Briar *Rosa rubinginosa*; and
- Tree-of-Heaven Ailanthes altissima.

Presence of Threatened Flora

No threatened plant species have been recorded within 20 kilometres of the project area, or within the project area. Given the highly modified environment within the project area, it is unlikely that any threated species would occur.

9.2.2 Fauna

In total, 11 native mammals, 104 birds, 16 reptiles and three frogs have previously been recorded in the wider locality, with 87 of these species (76 native, 11 introduced) being recorded during this investigation within the project area.

Targeted bird counts as part of the investigation recorded 2,281 individual bird observations of 60 species in 33.6 hours. The results indicate that 97 percent of the birds were active below 20 metres, with only 0.4 percent of birds flying above 50 metres from the ground.

The Bat Fauna Assessment has identified a total of 6,184 identifiable echolocation calls over the nine nights of survey. The highest level of activity was recorded along creeks, where a total of 3,761 calls were recorded, or 60.8 percent of the survey total. The average number of calls each night was 139 at creeks, 85 at woodlands and five at open pasture sites. Only five common species were recorded in pastoral areas, representing 2.0 percent of activity as a whole.

Bat species recorded included the White-striped Freetail Bat, Gould's Wattled Bat, Chocolate Wattle Bat, Southern Freetail Bat, Longeared Bats, Yellow-bellied Sheathtail Bat, Large Forest Bat, Southern Forest Bat, and the Inland Forest Bat.

Habitat for Native Animals

As the majority of understory across the project area is dominated by exotic species, the most important habitat feature across the site are trees, which provide foraging, roosting and breeding resources for birds and other animals. Tree hollows are particularly important.

Of 361 trees which were surveyed as part of the field investigations, 17 percent of trees had at least one hollow. Kevin Mills and Associates consider 17 percent of hollow-bearing trees as 'not common' in the landscape. Of those hollow bearing trees, large hollows are rare, and large old trees are even rarer.

Areas of rocky outcrops have also been identified, as they provide important habitat for reptiles and other animal groups including bats and possums within the study area. Rocky outcrops are especially evident in the central and southern parts of the study area.

Low-lying flats and riparian zones along watercourses provide some wetland habitat, although all wetlands in the area are rare and ephemeral in nature. Farm dams within the project area provide relatively small areas of open water with little fringing wetland vegetation, only useful for low numbers of a few species.

Presence of Threatened Fauna

As identified in Chapter 5 of this EA, the relevant legislation to the assessment of flora and fauna is the NSW *Threatened Species Conservation Act* (TSC) *1995*, the NSW *Fisheries Management Act 1994*, and the Commonwealth *Environment Protection and Biodiversity Conservation Act* (EPBC) *1999*. The assessment has considered the likelihood for each threatened species to occur in or utilise the on-site habitats within the project area.

Table 9.1 describes the species that are listed as threatened species which have been recorded during field surveys.

Table 9.1 – Threatened Species within the Locality as Recorded

NAME	TSC ACT	EPBC ACT	COMMENT
Vegetation Communities			
White Box, Yellow Box, Blakely's Red Gum Woodland	E	E	Remnants of this community occur extensively across the tablelands and the western slopes. Within the project area, remnants occur as paddock trees, although in some locations in stands and along local road reserves. The stands of paddock trees almost always have an exotic understorey, free of shrubs, and occasionally native pasture occurs below these stands.
Threatened Mammals			
Spotted-tail Quoll *Dasyurus maculatus*	V	V	This species has been recorded twice within the project area, and is likely to be very thinly distributed throughout the project area and the wider region. The granite outcrops (as identified in Section 9.2.2.1) may provide for habitat.
Threatened Birds			
Superb Parrot *Polytelis swainsonii*	V	V	The Superb Parrot breeds further south of the project area between Cowra and Yass, and along the Murray River Valley. Birds move north during winter, with a number of sightings during the July 2011 survey.
Grey-crowned Babbler *Pomatostomus temporalis*	V	-	The Grey-crowned Babbler occupies the western slopes and plains of NSW, within woodlands dominated by mature eucalypts, tall shrubs and an intact ground cover of grass and forbs. The Grey-crowned Babbler was observed in the woodland along Gillinghall Road in July 2011.
Threatened Bats			
Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*	V	-	The only threated bat species recorded in the project area was the Yellow-bellied Sheathtail Bat, which is listed as vulnerable in the NSW Threatened Species Conservation Act. It was recorded at three creek sites, very irregularly, and by just a few calls each night.

Note: V = Vulnerable, E = Endangered, - = not listed

An assessment has been undertaken in determining the potential presence of additional threatened fauna species (including bat species) within the project area which were not recorded during the field surveys. This assessment included a determination of the extent to which the study area satisfies the habitat requirements and preferences, and previous records.

International migratory species listed by the EPBC Act occur in the locality, including diurnal birds of prey (eg Nankeen Kestrel) and waterfowl (eg native ducks). These species are not threatened in Australia, and are in some cases abundant. No important habitat for such species has been identified within the project area.

9.3 IMPACT OF PROPOSAL

9.3.1 General Impact Assessment

Overall, the impact on native flora and fauna (including bats) is small in that:

- the wind farm has a relatively small overall footprint;
- infrastructure has been located to avoid local habitat features, including creeks, high quality remnant woodland, rocky outcrops or other features which could be important to flora and fauna;
- native vegetation clearance will be minimal as the majority of tower locations and access routes are located over heavily modified grazing land; and
- large, mature trees with hollows have been avoided and can be retained to ensure maintenance of the existing habitat.

Almost no woodland will be required for removal, although inevitably some native ground cover will be removed. Although the exact amount of native vegetation required for removal will not be known until detailed design, the 'worst case' can be assumed.

The 'worst case' loss of native vegetation is calculated at 1.32 hectares. This calculation is based on WTG's 7, 8, 13, 24, 28, 30, 31, 34, 35, 44 and 46 having at least some native vegetation, and a turbine footprint of 1,200 square metres (refer Appendix 4 to Flora and Fauna Report, **Attachment G**). All other turbines locations are exotic grassland or crops and support little or no native ground cover.

Some sites have scattered trees in the vicinity, but given the opportunity for micro-siting the turbines up to 50 metres, almost no trees will be required for removal. Similarly, the road network and cabling routes can be micro-sited up to 50 metres to avoid stands of trees and native vegetation, and in consideration of local topography features.

Most vegetation that will need to be cleared will be exotic grasses. Where any clearing of native vegetation is required, it will be undertaken in conjunction with an ecologist to minimise the loss of habitat. Mitigation measures as described in Section 4.0 assist in further minimising any potential effects.

Other potential effects that have been assessed include blade strike to birds and bats, air turbulence and barotrauma. In assessing the likely effect of blade strike at Bodangora Wind Farm, Kevin Mills and Associates have identified that:

- there is no supportive habitat or topographical features present within the project area suitable for large soaring raptors or large waterbirds which would be the most likely to collide with turbines; and
- records of bird heights within the project area as recorded during the field surveys identified that the majority of birds flew below the local tree height and well below the rotating blade diameter.

Accordingly, the potential risk to threatened species from blade strike has been identified as very low to negligible.

Barotrauma is most likely to occur where bats swerve to avoid a moving turbine blade, but meet a zone of low pressure and suffer expansion of air in the lungs. It is difficult to mitigate for barotrauma issues, and deterrent devices are not available.

Given that the majority of bat calls were identified along the creek lines and in the woodlands, which are areas where the design avoids placing turbines, we can reasonably conclude that the design of the turbine layout minimises the opportunity for barotrauma.

9.3.2 Threatened Species

A full assessment against the five-step *Guidelines for Threatened Species Assessment*, and the impact of the proposed action on matters of national environmental significance under the EPBC Act has been included within the Flora and Fauna Assessment at **Attachment G**.

Threatened Species Conservation Act 1995

The following relates to the assessment of the impact to threatened species under the *Guidelines for Threatened Species Assessment*. As described by Kevin Mills and Associates, then *Guidelines* are used for assessments of proposals under Part 3A of the EP&A Act.

Threatened plant species: the field surveys did not find any threatened plant species, and none are expected to occur within the project area. The land is highly modified, much of which supports exotic grassland cover, and is cropped or pasture improved, and precludes the likelihood of threatened plants occurring. Those sites that support native plants, such as road reserves and the granite country, were targeted by the field surveys, notwithstanding no threatened plant species were identified.

Threatened animal species: three threatened species and one threatened community have been identified by the flora and fauna assessment, and one bat species has been identified by the Bat Fauna Assessment as known to occur in the locality. The following is the evaluation of possible impact to these species/communities:

- White Box - Yellow Box - Blakely's Red Gum Woodland: The quality of native understory is low to very low, although stands of these trees are common in the district. Whilst the wind farm will result in some loss of native vegetation that is part of the listed community, the loss is small and high value sites are not involved. Recommendations are proposed to address this clearance in Section 8 of **Attachment G**.

- Spotted-tail Quoll: Not likely to be widespread in the area. No turbines are proposed in the area where species have been spotted in the past and the likely habitat, being the granite country and in large areas of woodland.

- Superb Parrot: Although no breeding is likely in the project area where the bird is a winter visitor, micro-siting of infrastructure should avoid tree hollows which the bird depends upon for breeding. Blade strike is unlikely to be a threat since the parrot is a ground feeder and seldom fly above the canopy.

- Grey-crowned Babbler: This bird resides in natural woodland with a native understory, which is rare in most parts of the wind farm site. The wind farm does not impact upon any natural woodland. The species is a ground bird and could not be impacted by blade strike.

- Yellow-bellied Sheathtail Bat: Extensive information is available on the presence of the Yellow-bellied Sheathtail Bat in previous investigations by Greg Richards and Associates, including in the identification of the size of remnant vegetation areas which were necessary to support reasonable and viable populations of the species. The investigations found that the number of calls recorded was highly correlated with the approximate size of the remnant vegetation areas. For example, for a population of 'relative abundance' in exceeding an average of five calls per night, then the remnant area would need to exceed 650 hectares, but to dramatically increase to an average number of 16 calls per night then the remnant vegetation area must be 850 hectares or larger. The size of remnant vegetation areas at Bodangora within the project area is generally less than 50 hectares. Given that the majority of bat calls were identified along the creek lines and in the woodlands, which are areas where the design avoids placing turbines, we can reasonably conclude that the design of the turbine layout also minimises the opportunity for barotrauma.

Other threatened species that are occasional visitors are not likely to be significantly impacted as habitat features including woodland and rocky outcrops will be avoided. No threatened species is likely to occur in large flocks through the area and blade strike is unlikely to be significant. Most species which have been identified are ground birds and are unlikely to fly above the tree canopy.

Overall, it is not expected that the wind farm proposal will interfere with any important habitat for these species as long as care is taken in positioning the infrastructure, including access tracks and cabling. In accordance with Step 4 of the *Guidelines* and as recommended by Kevin Mills and Associates, as small amounts of vegetation clearance will be required, vegetation offsets are proposed.

In accordance with the justification against key thresholds as Step 5 of the *Guidelines:*

- the proposal is unlikely to diminish biodiversity values of the area;
- whilst some trees will be removed which form part of the White Box – Yellow Box - Blakely's Red Gum Woodland, and this woodland is utilised by threatened animals, the proposal is unlikely to reduce the long-term viability of a local population of the species, population or community given the impact can be avoided and minimised through micro-siting of infrastructure and the retention of vegetated areas, rocky outcrops and hollow-bearing trees;
- the wind farm is very unlikely to accelerate the extinction of species, population or community or place that species, population or community at risk; and
- the proposal will not affect any declared critical habitat.

Environment Protection and Biodiversity Conservation Act 1999

The Flora and Fauna Assessment at **Attachment G** assesses the effect of the proposal as a proposed action on any matters of national environmental significance under the EPBC Act.

The Superb Parrot is the only nationally listed threatened species known to occur in the project area, and the White Box – Yellow Box – Blakely's Red Gum Woodland is listed as a threatened community. As identified in Section 9.2.2.1, migratory species are also listed as occurring in the project area.

The impact of the Superb Parrot is not expected to be significant, as:

- hollow-bearing trees are critical to the parrot and the wind turbine and infrastructure layout can be constructed without the loss of any hollow-bearing trees;
- native grassland utilised by feeding parrots is largely absent from the area and little native grassland would be impacted by the proposal; and
- the winter occurrence of the parrot is outside of the breeding period of the birds.

The Policy Statement prepared by DEH '*White Box – Yellow Box – Blakely's Red Gum Woodland*' (2006) provides strict procedures for identifying the community. Almost none of the treed areas in the project area meet the minimum criteria for the community. Notwithstanding, micro-siting of project elements can avoid woodland areas.

The wind farm is not likely to have any impact on listed migratory species, in that:

- there is no 'important habitat' identified within the project area boundaries;
- the habitat in the vicinity of the wind farm is not likely to support an ecologically important proportion of such species;
- habitats affected by the wind farm do not support large or strategically important populations of listed migratory species; and
- only small populations of listed waterfowl and diurnal birds of prey occur in the area.

Kevin Mills and Associates recommends that the proposal is unlikely to have a significant impact on any matters of national environmental significance, and that a referral to the Commonwealth Minister for the Environment is not warranted.

9.4 MITIGATION

The following provides a summary list of measures which should be adopted to mitigate the impact of the project on flora and fauna (including bats) species, both for protected species and generally as per the assessments by Kevin Mills and Associates and Greg Richards and Associates.

The mitigation measures will be incorporated in the project Construction and Environmental Management Plan for the protection of the remaining native vegetation and habitat.

Micro-siting of turbines and infrastructure to avoid areas of woodland and native trees:

- involvement from an ecologist in determining the best possible routing of access tracks and cables to assist in avoiding creeks, woodland, and rocky outcrops in cleared areas as they provide valuable habitat. In particular, avoidance of hollow-bearing trees; and

- where turbines are proposed to be located among rocky outcrops which cannot be avoided, the excavated rock should be deposited nearby in a 'natural' formation to re-create rocky habitat.

It is expected that almost no clearing of trees will occur, although some ground cover will require removal. Where tree clearing cannot be avoided:

- an ecologist accredited as a Biobanking Assessor will be engaged to develop an appropriate tree clearance protocol;

- a vegetation clearance register be maintained, including tree locations, type, size and numbers for calculating clearing offsets if necessary (to be determined in consultation with DECCW);

- a suitable metric to determine the quantum of the offset required based upon the vegetation loss that occurs will be developed in accordance with the Office of Environment and Heritage (as per Section 9.4.1 of this EA).

In order to minimise the effect of the wind farm on threatened and other species, and for continued monitoring of the impact of the wind farm:

- In order to minimise the likelihood of impact to birds of prey:

    - no turbine will have perching places;
    - dead animals within 200 metres of a turbine will be removed as soon as possible, including road kill on wind farm access tracks;
    - turbines will not have night-lighting, this will minimise the attraction nocturnal birds and bats; and
    - buildings, poles or other structures should not be constructed within 200 metres of turbines as they may provide perching opportunities for birds of prey.

- Prior to construction, a field survey for the Superb Parrot will be undertaken by a qualified biologist to confirm whether the species is only a winter visitor to the area. The following methods should be employed in the survey:

  - undertaken during the breeding season (September to December);
  - local land owners will be interviewed to gain information about where the parrots have been seen, particularly in the current season;
  - general observations in the areas where the parrots were seen on previous visits;
  - targeted surveys along those ridges and other places where trees may be removed by the wind farm infrastructure;
  - where Superb Parrots are observed, intensive surveying to determine if they are nesting in the trees that may be removed;
  - if nest trees are located in the target area, documentation and marking of trees, and discussions with the Office of Environment and Heritage to determine the required mitigation measures; and
  - a report to the Department of Planning for forwarding to the Office of Environment and Heritage, outlining investigations, consultation and findings.

- Where possible no large dams should be constructed within 1.0 kilometre of turbines.

- Monitoring of barotrauma during the first year of operation of the Bodangora Wind Farm, and the results reported to the Department of Planning and DECCW.

- Monitoring the impact of blade strike to birds can occur by on-site staff recording birds found during their day to day work and the results reported to the Department of Planning and DECCW.

In relation to environmental management and construction procedures:

- Weed control measures will be implemented to ensure invasive weed problems are not exacerbated, particularly in the avoidance of the spreading of invasive weeds as previously listed.

- Measures to be taken to ensure construction of tracks, cable routes and hardstands should not cause excessive erosion. All works will be undertaken in accordance with a Soil and Water Management Plan to be prepared prior to construction. Construction should be monitored by a qualified environmental auditor to ensure the following:

  - permanent tracks should be stabilised as soon as practical;
  - temporary tracks and buried cable routes will be rehabilitated as soon as practical following, with back-filling of trench;
  - care taken on steep slopes to ensure that erosion does not occur, with any problems should be rectified as soon as practical;
  - on-site maintenance crew will be responsible for regularly checking the cable routes for erosion until the routes have been stabilised and satisfactorily revegetated; and
  - the property owners and/or Government authority will be contacted to identify a suitable cover crop for sites requiring seeding to accelerate revegetation.

- advice on micro-siting of wind farm components; and
- creation of rocky habitat where rock is excavated.

- If trees and other plants are planted around buildings and other facilities, these should be in locally indigenous species.

A full list of measures is provided in Section 8 of **Attachment G**. The listed matters will be incorporated into the project's Construction and Environment Management Plan, to be prepared prior to construction.

9.4.1 Vegetation Off-set Strategy

Whilst vegetation clearance will be avoided as far as possible, as previously indicated small amounts of vegetation clearance to the White Box – Yellow Box – Blakely's Red Gum Woodland is likely to occur within the project area.

Depending on the final amount of vegetation clearance required to facilitate the development and in consultation with DECCW, a vegetation off-set strategy may be required. Final figures for vegetation clearance and removal will be determined when the final project design is available. Due to the flexibility in micro-design for siting the infrastructure, it is expected that almost no trees will be required for removal according to the current project design.

The 'worst case' loss of vegetation as calculated in Section 9.3.1 is 1.32 hectares. Environmental consultants Kevin Mills & Associates are comfortable there are ample suitable offset opportunities on the associated wind farm properties. The off-set locations will be determined in consultation with an ecologist and the extent of any clearing should be related to the extent of the off-set area adopted. An ecologist who is accredited as a Biobanking Assessor will be utilised for the project.

The project area for which the proponent has agreements with the land owners, totals an area of 5,469 hectares. Accordingly, the maximum amount of offset therefore represents less than 0.1 percent of the project area.

At least part of the offset area would be located on the granite country, as that landscape contains good quality habitat for native animals, including rocky outcrops and native vegetation. That type of habitat is common along the southern ridge on the property *Glen Oak*. There would be ample opportunity on that ridge to locate an area to be fenced and managed for conservation. Elsewhere, there are strands of woodland in reasonable condition that would benefit from fencing, for example, on the eastern side of *Glen Oak* and on *Awahnee*.

Determination of a suitable metric to determine the quantum of the offset required will be based upon the vegetation loss that occurs, and will be developed in accordance with the requirements of the Office of Environment and Heritage.

The quantum of vegetation to be preserved is likely to be in the order of four times the area of vegetation removed, and will be adequately fenced from grazing stock. Based on the 'worst case' scenario of 1.32 hectares of vegetation removal, the maximum expected offset associated with the project is 5.28 hectares.

A vegetation off-set strategy will be developed in accordance with a qualified ecologist to assist in regeneration of woodland areas. This is likely to include the following:

- a full assessment of the ecological values and potential habitat of the areas being impacted, including an assessment of the condition of the vegetation and habitat and an assessment of the conservation status;
- preparation of an accurate register of trees and vegetation to be removed, including the location, species, and number of specimens to assist in calculating the off-set requirement;
- identification of the suitable off-set requirement, including areas of suitable stands of woodland which could be fenced from grazing and allowed to regenerate, or the fencing off of a suitable area and planting of suitable native species, at least one of the areas for fencing should be located in granite country where there is a good cover of rock and native vegetation;
- determining the location and total area of the woodland stands in consultation with an ecologist and the relevant authority, in consideration of the condition of any vegetation communities and the habitat removed; and
- developing an appropriate management strategy for the long term viability of the offsets, to include monitoring and maintenance activities, security of tenure and financial arrangements for the conservation management of proposed offsets.

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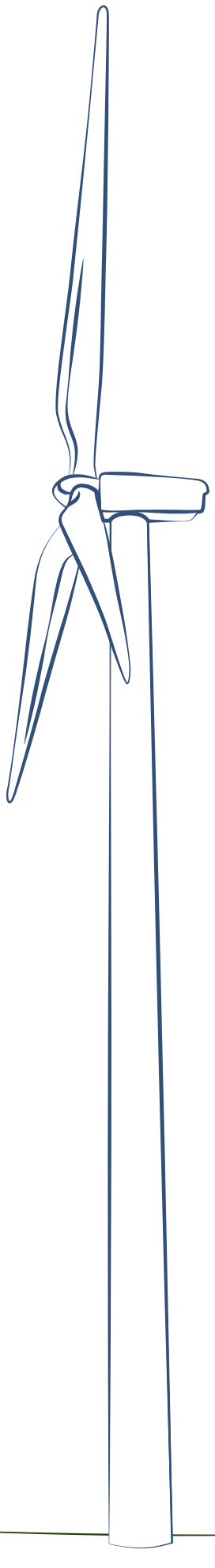
Chapter 10

Heritage



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CHAPTER 10 – HERITAGE

10.0 INTRODUCTION

This chapter provides a summary of the Aboriginal and non-Aboriginal heritage values associated with the Bodangora Wind Farm project. This includes identification of known Aboriginal and non-Aboriginal cultural heritage sites/places at the site, an assessment of the potential impact of the proposal on Aboriginal and non-Aboriginal cultural values, and identification of mitigation measures to reduce the impact of the proposal.

Specifically, this chapter of the EA provides the following details, as per the Director-General's requirements (DGRs):

Director-General's Requirements:

> *"The EA must include an assessment in accordance with Draft Guidelines for Aboriginal Cultural Impact Assessment and Community Consultation (DEC, 2005) that identifies that all items of Aboriginal cultural heritage at the site, the potential impact of the project components on indigenous heritage values (archaeological and cultural). The EA must demonstrate effective consultation with indigenous stakeholders during the assessment and in developing mitigation options (including the final recommended measures).*
>
> *The EA must provide sufficient information to demonstrate the likely impacts of the proposal on non-indigenous heritage values (including heritage vistas) consistent with the guidelines in the NSW Heritage Manual. Where impacts to State or local non-indigenous heritage items are proposed, a statement of heritage significance must be included and measures identified to mitigate and manage impacts"*

New South Wales Archaeology Pty Ltd were engaged to undertake an assessment of the heritage values of the project area, in accordance with the Director-General's requirements dated 12 November 2010. The assessment has included a desktop review and field survey conducted in August 2011. The full assessment report is enclosed in **Attachment I**.

10.1 ABORIGINAL HERITAGE

10.1.1 Consultation Process

Consultation for the project was undertaken in accordance with the Office of Environment and Heritage's (OEH) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (NSW DECCW 2010).

The consultation process has also been compliant with the *Interim Guidelines for Aboriginal Community Consultation - Requirements for Applicants* (NSW DEC 2004), in accordance with the provisions of the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (NSW DEC 2005).

The process for consultation included the following:

- written notification requesting persons who may have an interest in the project:
    - OEH ECP Dubbo Office;
    - Wellington Local Aboriginal Land Council (letter was returned to sender);
    - Office of the Registrar, Aboriginal Land Rights Act 1983;
    - the National Native Title Tribunal, requesting a list of registered native title claimants, native title holders and registered Indigenous Land Use Agreements;
    - Native Title Services Corporation (NTSCORP) Limited;
    - Wellington Council; and
    - The Central West Catchment Management Authority, requesting contact details for any established Aboriginal reference group (and four letters to individuals and on behalf of references groups sent accordingly).

Three groups registered an interest in the project, whose details have been forwarded to the OEH. A copy of the project details was forwarded to the three parties, but no responses were received pertaining to cultural information relating to the project area. A copy of the draft report by New South Wales Archaeology was provided to the registered parties for a period of 28 days for review.

At the time of writing, no responses have been returned following the review of the draft report by the consulted parties. There have been no late registrations of interest, but had there been, they would have been accommodated during the process of consultation. In particular, attempts were made to consult with the Wellington Local Aboriginal Land Council; however, at the time the study was conducted the organisation was not functioning.

Bodangora Wind Farm Pty Ltd will continue to attempt consultation with the Aboriginal Land Council throughout the assessment process.

No heritage areas, objects or places were identified as a result of the process of the Aboriginal community consultation undertaken for this project.

10.1.2 Existing Environment

Heritage Context

The project area was traditionally occupied by the Wiradjuri peoples, whom inhabited a widespread area extending from the Great Dividing Range west to the Macquarie, Lachlan and the Murrumbidgee Rivers. Although no investigations have been undertaken which specifically examine the Bodangora area, numerous have been undertaken within the broader region and reasonably near to the project area and the findings of which are available in **Attachment I**.

The proposed impact areas are located on landforms and terrain which is highly amorphous and generally undifferentiated in character. Biodiversity is assessed to be relatively low, and water sources are ephemeral. Accordingly, Aboriginal use of this landscape is predicted to have been sparse, of low intensity, and restricted to a limited range of activities such as movement through the country, hunting and gathering forays etc. These types of activities that would have resulted in artefact discard which is patchy and low density in distribution.

Recorded Heritage Places

The NSW *National Parks and Wildlife Act 1974* provides for nature conservation and the protection of Aboriginal objects and places in NSW.

A search of the NSW OEH Aboriginal Heritage Management Information System was conducted on 15 September 2010 and has identified 10 previously recorded heritage places, all of which are situated outside of the project area. These are listed in Table 10.1.

Table 10.1 – AHMIS Heritage Places Search

SITE ID	NAME	EASTING	NORTHING	TYPE
36-1-0159	B1 Bodangora Aerodrome	868900	6406550	Scarred tree
36-1-0160	B2 Bodangora Aerodrome	687000	6506500	Scarred tree
36-1-0161	B3 Bodangora Aerodrome	686650	6406800	Scarred tree
36-1-0162	B4 Bodangora Aerodrome	686700	6406400	Scarred tree
36-1-0255	Comobulla	685050	6418300	Open camp site
36-1-0257	Mitchells Creek Reserve	685000	6418120	Scarred tree
36-2-0001	Mt Bodangora	697863	6410220	Open camp site
36-2-0034	Mitchell Creek	689600	6407290	Scarred tree
36-2-0035	Mitchell Creek	689540	6407380	Scarred tree

SITE ID	NAME	EASTING	NORTHING	TYPE
36-4-0099	Isolated artefact CC-IF-01	686314	6401244	Artefact

Three heritage places are located outside of but in proximity to the project area, and have been identified in Figure 4.1.

The distribution of sites listed above is related at least in part to variance in topography and ground surface geology. Stone artefact scatter sites, scarred or carved trees and grinding grooves (found in rock surfaces and resulting from the manufacture and maintenance of ground edge tools) are the most common site types found within the region.

Larger and more complex sites are likely to occur in association with permanent watercourses, while sparse artefact scatters and evidence of intermittent and infrequent occupation will be located on landforms which area removed from permanent water sources, such as ridge tops of lower order ephemeral creeks.

Field Survey Results

A field survey has been undertaken in accordance with the Office of Environment and Heritage *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*. The archaeological survey was a comprehensive pedestrian and vehicle traverse survey and was undertaken by five people over a four day period, and aimed at locating Aboriginal objects and non-Aboriginal heritage items. A detailed methodology and approach for the field survey, including the designation of 31 survey units is provided in Section 7 of **Attachment I**.

Two Aboriginal objects were identified within the project area:

- An artefact locale (696852, 6411952), being a scatter of stone artefacts found along five metres of a farm track, including a chert flaked piece and retouched artefact, and quartz items including a core. There is no potential for the site to contain subsurface archaeological deposit, however it is likely that the items were likely to have been larger given the locale is highly disturbed from road grading and traffic. This item is located along a proposed access track.

- A possible stone procurement area (692880, 6411849) at a quartz outcrop which possess evidence of having been struck by means of hard hammer percussion. While the exact nature of the use of this quartz outcrop for this purpose is uncertain, archaeological excavation would be required for determination. This item is located along a proposed access track.

The dearth or Aboriginal objects most likely reflect low effective survey coverage, given the thick grasses within the survey area. Any unrecorded items present are likely to be present in low or very low density and a patchy distribution. Accordingly, the Heritage Assessment enclosed at **Attachment I** has provided a detailed analysis of predictive aspects relating to the Aboriginal land use of the area, and the predicted nature of artefact density such occupation is likely to have produced.

During the field study, no landforms (or areas in landforms) were identified that are likely to have been environmental focal points that Aboriginal people would have habitually occupied, and hence would result in high density concentrations of artefacts.

No Survey Units have been identified in the proposal area to warrant subsurface test excavation. Based on a consideration of the predictive model applicable to the environmental context in which impacts are proposed, sub-surface Aboriginal objects with potential conservation values are not predicted to have a high probability of being present. The environmental contexts in which the turbines and other infrastructure are proposed contain eroded and disturbed soils as a result of moderate levels of environmental degradation. Soils across the proposed activity areas are either absent and skeletal (ie lithosols) or very shallow, meaning there is no subsurface potential in the majority of proposed impact areas. The components of the project are small-scale, discrete and primarily narrow, linear impacts. In addition, it is considered that in regard to the archaeology itself, subsurface testing is unlikely to produce results much different to predictions made in respect of the subsurface potential of these landforms. Accordingly, a program of subsurface testing undertaken within the impact assessment and planning phase of the project is not considered to be necessary or warranted.

10.1.3 Impact of Proposal

Based upon heritage significance definitions and criteria by the NSW National Parks and Wildlife Service, the ICOMOS Burra Charter and the NSW Department of Urban Affairs and Planning's State Heritage Inventory Evaluation Criteria and Management Guidelines, New South Wales Archaeology assess Aboriginal archaeological sites under five categories of significance, being:

- cultural value to contemporary Aboriginal people;
- archaeological value;
- aesthetic value;
- representativeness; and
- educational value.

Table 10.2 provides an assessment of the Archaeological significance of the recorded Aboriginal object locales.

Table 10.2 – Archaeological significance of recorded Aboriginal object locales

LOCALE	PREDICTED DENSITY	INTEGRITY	SUBSURFACE POTENTIAL AT SITE	SUBSURFACE POTENTIAL AWAY FROM SITE	SIGNIFICANCE	CRITERIA
SU3/L1	Low	Highly disturbed, vehicle track – eroding.	No	No	Low local scientific significance.	Common Aboriginal object and site type. Low educational value. Low aesthetic value. Low research potentially: predicted low artefact density in majority of Survey Unit.
SU18/L1	-	Undisturbed	Yes	Yes	Moderate local scientific significance.	Reasonably rare Aboriginal object and site type. Low educational value. Low aesthetic value. Moderate research potential.

Following the findings of the field survey, it is recommended that the access track between Aboriginal object site SU18/L1 be micro-sited to avoid all impacts relating to this artefacts. Artefact SU3/L1 is assessed as highly disturbed, and is located at an existing access track.

New South Wales Archaeology Pty Ltd understand that the project area is likely to contain stone artefacts across the majority, if not all Survey Units defined within the study. As identified within Section 12.1.12, any unrecorded stone artefacts are predicted to be present in very low or low densities only. No landforms have been identified that are likely to have been environmental focus points for habitual occupation, in addition, biodiversity is assessed to be relatively low, and water sources are ephemeral.

Accordingly, Aboriginal use of this landscape is predicted to have been sparse, of low intensity, and restricted to a limited range of activities which is likely to have resulted in artefact discard which is patchy and low density in distribution.

New South Wales Archaeology concludes that the proposed impacts to the archaeological resource can be considered of low impact. Impacts as a result of the physical infrastructure proposed within the project area will be discreet in nature and will occupy a relatively small footprint. Archaeological resources within the broader area will not sustain any impacts as a result of the proposal.

New South Wales Archaeology concludes that direct impacts to the archaeological resource can be considered of low significance. Impacts as a result of the physical infrastructure proposed within the project area will be discreet in nature and will occupy a relatively small footprint. Archaeological resources within the project area, but outside of the infrastructure envelopes will not sustain any impacts as a result of the proposal.

None of the Survey Units or Aboriginal object locales in the project area has been assessed to surpass archaeological significance thresholds which would act to preclude the proposed development.

10.2 NON-ABORIGINAL HERITAGE

10.2.1 Existing Environment

Non-Aboriginal Heritage Context

Heritage values at Bodangora and in the wider region relate to the pastoral and agricultural activities, mining, and transport.

Pastoralists first arrived in the Wellington Valley as early as 1819, and in 1823 a remote convict stock station was established. A number of townships were established, including Montefiores on the northern bank of the Macquarie River, and Lincoln near to the Mudgee Road crossing of the Mitchells Creek. Agriculture increased in the region following the introduction of the Main Western Railway system to Sydney in 1880.

Other settlements were established following the discovery of gold including the township of Bodangora following the establishment of the Kaiser gold mine (located nearby to proposed wind turbine generator 44). The mine ceased production in 1881.

Proposals for an additional railway were advanced that would link the Main Western Railway line to the Northern Railway Line, being the Sandy Hollow to Maryvale line. This railway was constructed to 95 percent completion, although the track was never laid for various political and funding issues. A section of this railway is within the project area.

Recorded Heritage Places

Non-Aboriginal heritage is protected by the *NSW Heritage Act 1977*, which is to ensure that the heritage of NSW is adequately identified and conserved. The Act provides protection to items that have been identified, assessed and listed on various heritage registers, including State Government Section 170 registers, Local Environmental Plans, and the State Heritage Register.

A search of the Australian and State heritage databases has been undertaken, revealing the following heritage places which are protected by State and Commonwealth legislation:

- 42 items listed on the Register of the National Estate present within the Wellington Council, none of which are within the project area;
- 59 items of the NSW heritage database are present within the Wellington Council, three of which are located within, or are in proximity to the Bodangora project area:
    - Bodangora Gold Mine Former Remains – Chimney, Shaft and Engine Footings, Bodangora;
    - Sandy Hollow to Maryvale Railway, Sandy Hollow and Maryvale;
    - St Paul's Catholic Church, Bodangora;

The three heritage items which are listed on the NSW heritage database are identified on Figure 4.1.

In addition, two items are listed within the Wellington Council on the National Trust of Australia (NSW) Register, neither of which are present within the directly adjacent the project area. Whilst items identified by the National Trust do not have any statutory protection, the National Trust is widely recognised as an authoritative indication of the heritage significance of a place.

There is a probability that additional items of historical significance may be present within the project area, most likely related to the heritage themes of agriculture/pastoralism, mining, and transport/telecommunications, but which are not specifically listed on State or Commonwealth heritage databases. Items may include standing structures or ephemeral sites and ruins. It should be noted that whilst there is a potential for these items to occur, this does not necessarily indicate that any items which may be present will be of sufficient value to warrant heritage listing.

Field Survey Results

As previously identified, a field survey has been undertaken in accordance with the Office of Environment and Heritage *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*. The archaeological survey was a comprehensive pedestrian and vehicle traverse survey and was undertaken by five people over a four day period, and aimed at locating Aboriginal objects and non-Aboriginal heritage items. A detailed methodology and approach for the field survey, including the designation of 31 Survey Units is provided in Section 7 of **Attachment I**.

The field survey identified one previously recorded heritage item, being the Sandy Hollow to Maryvale Railway, and one other unlisted item of historic significance within the project area.

The unlisted item of historic significance as identified during the field survey is the Kaiser Mine, comprising a concrete ore treatment plant, the mine shaft, a mullock heap, and associated features and discarded items. The Kaiser Mine complex is situated entirely outside the area of the proposed turbine, access tracks and other infrastructure elements.

Sections of the unfinished Sandy Hollow to Maryvale Railway are present within the study area, and currently this feature is used as a farm road within the Glen Oak property.

10.2.2 Impact of Proposal

The investigations conducted by New South Wales Archaeology have identified three heritage items listed within the NSW heritage database in proximity to the project, two of which are located outside of the project area (Bodangora Gold Mine Former Remains – Chimney, Shaft and Engine Footings and St Paul's Catholic Church), and the third being sections of the Sandy Hollow to Maryvale Railway which are present within the project area.

The two items which are located outside of the project area are not expected to be impacted as a result of the project, as they are located away from any proposed physical development.

Sections of the Sandy Hollow to Maryvale Railway are currently utilised as a farm road within the project area. The roadway is proposed to be utilised for wind farm access during the construction and operation of the project. Notwithstanding, New South Wales Archaeology have concluded that the proposed impact to the railway/road would be negligible, as it is not expected that there will be any additional impacts beyond those to which the railway line already sustains as a road. Nevertheless, New South Wales Archaeology has prepared a Statement of Heritage Impact for the railway, which is enclosed as Appendix A to **Attachment I**.

One item of potential historic significance was identified during the field survey for the project, being the Kaiser Mine, located nearby to proposed WTG 44. Whilst not protected under State or Commonwealth heritage legislation, New South Wales Archaeology have undertaken an assessment of the item according to the State Heritage Register criteria, the NSW Heritage Office update Assessing Heritage Significance (2001) and the Heritage Council of NSW update Levels of Heritage Significance (2008) to confirm this item does not warrant heritage identification.

A Statement of Significance has been prepared by New South Wales Archaeology according to its assessment particularly against the criteria for assessment cultural heritage significance and for an item to be considered to be of State (or local) heritage significance. New South Wales Archaeology have determined that the Kaiser Mine does not warrant heritage listing. The following is the Statement of Significance as prepared in determination of the significance of the item:

> *"This item cannot be directly linked to people or events of historical importance; there is only very limited potential for the site to yield additional information and the site is not rare, representative of its type and does not display significant technological or aesthetic qualities."*

The Kaiser Mine is located near to, but outside of the proposed development site within the project area. It is not expected that there will be any direct impact to the Kaiser mine, and any associated impacts can be appropriately mitigated.

In Summary, New South Wales Archaeology determine that none of the Survey Units or non-Aboriginal heritage items as identified within the project area have been identified to surpass archaeological significance thresholds which would act to preclude the proposed development.

10.3 MANAGEMENT AND MITIGATION MEASURES

The following section outlines a range of management and mitigation measures which can be considered for Aboriginal heritage places within the project area:

- The stone procurement artefact area (SU18/L1) is an identified heritage place for conservation. Impact to this artefact will be avoided by micro-siting of the access track between WTG 35 and 37, allowing the diversion of the proposed access road around this object. Conservation is generally adopted in relation to sites which are assessed to be of high cultural and scientific significance.

- A conservation strategy will be developed as part of the Construction and Environment Management Plan for the project to detail the avoidance of artefact SU18/L1 by design.

- Ground disturbance impacts associated with the proposal will be kept to a minimum and to defined areas to ensure minimal impact to unlisted or unrecorded Aboriginal items. This is to be undertaken in accordance with the Construction Environmental Management Plan and Operational Environmental Management Plan.

- The scatter of stone artefacts (SU3/L1) has been assessed to be of low archaeological significance, and given the nature of the site, unmitigated impacts are appropriate. This artefact is located on an existing access track.

- An additional archaeological survey will be conducted in any area that is proposed for development that have not been surveyed during the heritage assessment enclosed within **Attachment I**.

- Where any additional, unrecorded Aboriginal objects are encountered during construction, works will stop immediately as all Aboriginal artefacts are protected by the NP&W Act. DECCW will be notified immediately of any such finds as per the legislative requirement.

- Where any additional historic items are encountered, works shall cease immediately in accordance with the *Heritage Act 1977* to allow an assessment of the object by an archaeologist. The archaeologist may need to consult with the Heritage Branch of the Department of Planning regarding the significance of the finds.

- A Cultural Heritage Management Protocol will document procedures required for impact avoidance or mitigation. This will be developed in consultation with an archaeologist, the relevant Aboriginal communities and the NSW Office of Environment and Heritage.

- Persons involved in the construction and management phases of the project will be trained in procedures to implement recommendations relating to cultural heritage.

No further archaeological investigation is warranted for the project. The project environment contains eroded and disturbed soils as a result of moderate levels of environmental degradation, sub-surface Aboriginal objects with conservation values are not predicted to have a high probability of being present, and artefact density is expected to be low. Furthermore, the proposed development works are small-scale, discrete, and primarily narrow, linear impacts. Accordingly, a programme of subsurface testing undertaken within the impact assessment and planning phase of the project is not considered to be warranted.

The following outlines management and mitigation techniques for non-Aboriginal heritage places in the project area:

- The Kaiser Mine is near to proposed Turbine 44. The mine will be identified as a restricted area during wind farm construction through the erection of fencing, to ensure the items associated with the site are not inadvertently impacted.

- The Sandy Hollow to Maryvale Railway line is currently utilised as a road. This road will be used during the construction and operation phases of the wind farm. A Statement of Heritage Impact for the item has been completed and is enclosed as Appendix A to **Attachment I**.

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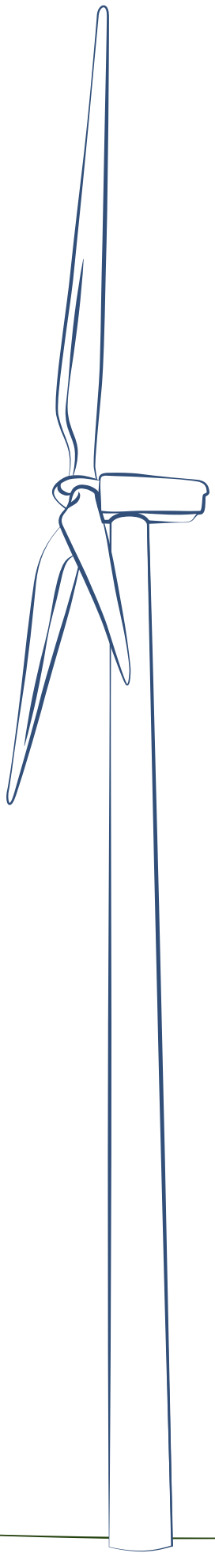

Chapter 11

Noise

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CHAPTER 11 – NOISE

11.0 INTRODUCTION

The chapter summarises the findings of a comprehensive Environmental Noise Assessment undertaken by Sonus Pty Ltd for the Bodangora Wind Farm. This assessment has reviewed noise of the various phases and components of the construction and operation of the wind farm.

Specifically, this chapter of the EA provides the following details, as per the Director-General's requirements (DGRs):

Director-General's Requirements:

"Include a comprehensive noise assessment of all phases and components of the project including, but not limited to, turbine operation, the operation of the electrical substation, corona and/or aeolian noise from the transmission line, construction noise (focusing on high noise-generating activities and any works proposed outside of standard construction hours), traffic noise during construction and operation, and vibration generating activities (including blasting) during construction and/or operation. The assessment must identify noise/vibration sensitive locations (including approved but not yet developed dwellings), baseline conditions based on monitoring results, the levels and character of noise (e.g. tonality, impulsiveness etc) generated by noise sources, noise/vibration criteria, modelling assumptions and worst case and representative noise/vibration impacts.

In relation to wind turbine operation, determine the noise impacts under operating meteorological conditions (i.e. wind speeds from cut-in to rated power), including impacts under meteorological conditions that exacerbate impacts (including varying atmospheric stability classes and the van den Berg effect for wind turbines). The probability of such occurrences must be quantified.

Include monitoring to ensure that there is adequate wind speed/profile data and ambient noise background noise data that is representative for all sensitive receptors.

Provide justification for the nominated average background noise level use in the assessment process, considering any significant difference between daytime and night time background noise levels.

Identify any risks with respect to low frequency or infra-noise.

If any noise agreements with residents are proposed for area where noise criteria cannot be met, provide sufficient information to enable a clear understanding of what has been agreed and what criteria have been used to frame any such agreements.

Clearly outline the noise mitigation, monitoring and management measures that would be applied to the project. This would include an assessment of the feasibility, effectiveness, and reliability of proposed measures and any residual impacts after these measures have been incorporated.

Include and contingency strategy that provides for additional noise attenuation should higher noise levels than those predicted result following commissioning and/or noise agreements with land owners not eventuate.

This assessment must be undertaken consistent with the following guidelines:

- *wind turbines – the South Australian Environment Protection Authority's Wind Farms – Environmental Noise Guidelines (2003);*
- *substation – NSW Industrial Noise Policy (EPA, 2000);*
- *site establishment and construction Interim Construction Noise Guidelines (DECC, 2009);*
- *traffic noise – Environmental Criteria for Road Traffic Noise (NSW EPA, 1999);*
- *vibration – Assessing Vibration: A Technical Guideline (DECC, 2006); and*
- *blasting – Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration (ANZECC, 1990)."*

The assessment by Sonus is provided in **Attachment J**.

11.1 BACKGROUND NOISE MONITORING AND SENSITIVE RECEIVER IDENTIFICATION

The assessment has been conducted in accordance with the following guidelines and the applicable noise criteria:

- Wind Turbines – the South Australian Environment Protection Authority's *Wind Farms – Environmental Noise Guidelines* (2003);
- Substation – NSW Industrial Noise Policy (EPA 2000);
- Site Establishment and Construction – *Interim Construction Noise Guideline* (DECC 2009);
- Traffic Noise – Environmental Criteria for Road Traffic Noise (NSW EPA, 1999); and
- Vibration – Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration (ANZECC 1990).

The assessment has been based on the 'worst case scenario' and highest possible noise levels for the wind farm, including the following:

- an assessment of the operating mode of the Vestas 112 turbine which produces the highest possible noise levels;
- construction noise assuming that all equipment is present and operating simultaneously on site for each stage of construction;
- worst possible construction traffic, including concrete transport from an off-site concrete batching plant;
- the criteria for assessment of the noise generated from wind turbines is based upon the generally lower night time background noise levels; and
- where background noise monitoring has not occurred at a neighbouring dwelling, the lowest measured background noise level at any of the five receivers has been used to derive the criteria.

The noise modeling is conducted for an atmospheric stability class that is the most conducive to noise propagation. This conservative approach is taken to provide a worst case (highest noise level) scenario with respect to the predicted noise levels. For any other atmospheric stability class, the predicted noise levels from the wind farm will be lower than those presented in this report. Refer to Section 11.1.1 for further detail on the selected atmospheric stability class.

The selected sensitive receivers were R12, R13, R14, R16 and R17, and were selected based on initial predictions of the wind farm noise, where preference was given to houses with the highest predicted noise and vibration levels and without commercial agreements. No sensitive receivers identified for modelling the noise assessment have commercial agreements with the proponent.

Background noise levels were measured at the five identified sensitive receivers in the vicinity of the proposed wind farm, between 16 February and 9 March 2011. Noise loggers were positioned according to the positioning of large trees and other noise sources, such as pumps at each dwelling. Background noise was measured in 10 minute intervals at each of the monitoring locations. Rainfall and wind speed data was also recorded at wind masts and at R14 to determine where the weather may have affected the background noise measurement, and data adjusted accordingly.

The location of sensitive receivers can be identified on Figure 4.2. The full methodology for background noise analysis is provided in **Attachment J**.

11.1.1 Atmospheric Stability Class

The noise modeling was conducted for an atmospheric stability class that is the most conducive to noise propagation. This conservative approach is taken to provide a worst case (highest noise level) scenario with respect to the predicted noise levels.

Noise predictions for the assessment of the noise impact during the construction and operation of the wind farm have been undertaken in accordance with ISO 9613-2:1996 – *Acoustics – Attenuation of sound during propagation outdoors*. This model has the ability to assess the distance between the source and the receiver, topography, hardness of the ground and atmospheric absorption at different frequencies in either temperature inversion or downwind conditions. The atmospheric stability class assessment is in accordance with the Director-General's Requirements issued on 12 November 2010.

The model has incorporated the worst case atmospheric stability class based upon the favourable meteorological conditions for noise propagation, including:

- still, night conditions (ie no wind) – noting it is unlikely that the turbines will be operating in 'no wind' conditions; and
- no cloud cover, resulting in maximum temperature inversion.

The modified inputs to the model establish the scenario for the 'highest background noise level' having regard to a combination of both temperature inversion and down wind conditions. The modified conservative inputs that affect the atmospheric stability class include:

- assuming 50 percent 'hard' and 50 percent 'soft' ground cover. 'Hard' is defined as sealed or building surfaces resulting in a greater reflection of sound and soft or unsealed surfaces have a greater absorbance of sound. In reality, the project area comprises close to 100 percent 'soft' ground conditions;

- an inherently conservative noise output level for the turbines as warranted by the manufacturer;

- scientifically accepted model inputs for both temperature and humidity, including:

  - a temperature of 10 degrees celsius;
  - a relative humidity of 70 percent.

  Both temperature and humidity are a low sensitivity in the model inputs.

- barrier attenuation accounting for topography of no greater than 2.0 dB(a). Due to the general line of sight to turbines this figure is conservatively low; and

- a 4.0 metre receiver height. Most receivers are at 1.5 metres above ground level.

These modified conservative inputs are listed on page 13 of the Environmental Noise Assessment and are presented in the institute of Acoustics Journal.

Accordingly, it is the combination of the conservation modified inputs to the noise propagation model that results in the most case 'atmospheric stability class'. As such, the predicted noise levels from the wind farm will be lower than those presented in this report for any other atmospheric stability class.

11.2 OPERATION OF WIND FARM

11.2.1 Context for Assessment

Noise from Wind Turbines

In accordance with the Director-General's requirements, noise generated from wind turbines is to be assessed against the South Australian Environment Protection Authority's *Wind Farms – Environmental Noise Guidelines 2003*.

The following provides the noise criteria for sensitive receivers to the wind farm:

> *"The predicted equivalent noise level ($L_{Aeq,\ 10}$) adjusted for tonality in accordance with these guidelines, should not exceed:*
>
> - *35 dB(A); or*
> - *the background noise level ($L_{A90,\ 10}$) by more than 5 dB(A)*
>
> *Whichever is the greater, at all relevant receivers for each integer wind speed[4] from cut-in to rated power of the WTG."*

It is noted that if the wind farm noise contains tonal characteristics a 5.0 dB(A) penalty is to be applied.

As previously identified, whilst the Guidelines provide for a separate assessment for both day and night periods, a conservative approach has been taken where the criteria for assessment within the Sonus report has been based upon the generally lower night time background noise levels, and accounts for the difference between the measured day and night noises.

In addition, where background noise monitoring has not occurred at a neighbouring dwelling to the wind farm, the lowest measured background level at any of the five locations has been used to derive the criteria.

[4] Wind speed is measured 10 metres above the ground in accordance with the SA Guidelines, unless specifically noted otherwise.

In relation to noise generated at wind farmer residences, the South Australian Environment Protection Authority's *Wind Farms – Environmental Noise Guidelines 2003* note:

> *"The criteria have been developed to minimise the impact on the amenity of premises that do not have an agreement with the wind farm providers."*

The landowners of a number of residences have entered into commercial agreements with the proponent. Where an agreement exists, suitable noise criteria for each residence will be agreed between the developer and the landowner. It is proposed that the noise at residences of landowners with an agreement will achieve the recommendations of the *WHO Guidelines for Community Noise* (World Health Organisation, 1999), being an indoor level of 30 dB(A) to protect against sleep disturbance, which equates to an outdoor noise level of 45 dB(A) with windows open of 52 dB(A) with windows closed.

Substation Noise

The New South Wales Environment Protection Authority's *Industrial Noise Policy 2000* (INP) is referenced as the relevant guidelines for the assessment of substation noise. The INP establishes criteria based on the existing ambient noise environment, with the most stringent criteria employed. If the noise levels are exceeded, then all reasonable and practical noise reduction measures should be implemented.

The Rating Background Level (RBL), which measures the lower tenth percentile for day, evening and night periods (effectively the 'lulls' in the noise environment and the quietest periods) are identified for the five sensitive receivers in Table 11.1.

Table 11.1 – Rating Background Level Background Noise Level – Night (dB(A))

RBL	R12	R13	R14	R16	R17
Day	30	30	30	31	30
Evening	30	30	30	31	30
Night	30	30	30	30	30

The INP requires that noise from industrial sources should not exceed the measured RBL by more than 5.0 dB(A), therefore the most stringent criterion in accordance with the INP's ambient noise method is 35 dB(A).

The INP also provides criteria based on the envisaged amenity of an area. Table 11.2 lists the recommended noise levels from industrial noise sources in order to protect the 'noise amenity' of dwellings in a rural environment.

Table 11.2 – Recommended LAeq Noise Levels from Industrial Noise Sources

RBL	RECOMMENDED LAEQ NOISE LEVEL DB(A)	
	ACCEPTABLE	RECOMMENDED MAXIMUM
Day	50	55
Evening	45	50
Night	40	45

Based on the above, the INP requires that noise from the proposed substation is no greater than 40 dB(A) at dwellings in the vicinity of the substation.

The INP applies the most stringent of the ambient and amenity criteria, which in this case is 35 dB(A). As a 5.0 dB(A) correction factor has been recommended to account for tonal noise features, in order to achieve the criteria provided by the INP it is recommended that the noise from the proposed substation achieves a level of 30 dB(A) at all residential locations.

11.2.2 Assessment of Operation Noise Impact

The assessment of the predicted noise from the wind farm against the relevant SA Guideline criteria is enclosed at Appendix H of the Noise Assessment located at **Attachment J**.

Noise from the wind farm has been predicted based on the use of Vestas V112 3MW; and based on manufacturers warranted sound power levels and octave band sound power levels (for low wind speeds, where low background noise levels result in the most stringent criteria. The sound power levels of the Vestas V112 turbines are contained in Table 11.3.

Please note that WTG 28 has been removed after the date of which the noise assessment by Sonus was completed, following land owner consultation and primarily to minimise visual amenity.

Table 11.3 – Vestas V112 Sound Power Levels (dB(A))

OCTAVE BAND CENTRE FREQUENCY (HZ)	WIND SPEED (M/S)						
	4	5	6	7	8	9	10
31.5	69.6	72.7	76.7	77.6	77.2	76.0	76.6
63	79.7	83.1	87.4	89.9	89.9	89.0	89.6
125	86.6	90.4	93.9	95.7	95.4	94.6	95.8
250	89.5	93.6	96.2	97.8	96.0	94.4	94.8
500	91.8	96.1	99.2	100.1	98.5	96.8	96.8
1,000	93.7	97.8	101.4	101.9	101.3	100.3	100.7
2,000	92.6	97.3	98.3	98.8	99.2	98.9	99.7
4,000	87.0	91.4	92.5	92.1	94.3	94.0	95.6
8,000	71.0	75.9	80.9	80.7	84.1	84.6	87.3
Warranted Total	**98.9**	**103.1**	**105.8**	**106.6**	**106.0**	**105.1**	**105.8**

The Vestas have several operating modes, which produce lower noise levels than that of the mode used in this assessment, being the worst case scenario for the Bodangora Wind Farm.

Based upon the predicted noise levels, the turbines are predicted to comply with the relevant criteria at 'all sensitive receivers', both with and without an agreement, and for all wind speeds. The criteria are easily met for those residences without an agreement.

Sonus have indicated that it is not expected that the proposed turbines will contain tonal characteristics which would otherwise require a penalty in noise criteria. The proponent may seek confirmation from the manufacturer if required.

Noise from the substation has also been included within the noise assessment for the wind turbine generators. Table 11.4 indicates the likely noise which will be generated by the substation.

Table 11.4 – 100-120MVA (33-132kV) Transformer, Sound Power Levels (dB(A))

OCTAVE BAND CENTRE FREQUENCY (HZ)	63	125	250	500	1,000	2,000	4,000	8,000	TOTAL
31.5	69.6	72.7	76.7	77.6	77.2	76.0	76.6	78.1	102.9

The predicted wind farm noise and relevant criteria, as according to the location of each of the sensitive receivers in proximity to the project area is provided in Table 13.6. This assessment has been based upon the propagation model, ISO 9613-2:1996 - *Acoustics – attenuation of sound during propagation outdoors*, which is widely accepted for the assessment of wind farms. The assessment has taken into account distance, topography, surface, and atmospheric conditions which consider the 'worst case scenario' for the noise propagation.

Based on the predicted noise levels shown, the turbines are predicted to comply with the relevant criteria at all residences, including those with and without an agreement with the proponent for all wind speeds. This is identified in Table 11.5 below. Dwellings have been grouped between neighbours and wind farmer properties, and correspond to those identified in Figure 4.2. The five sensitive receivers which were incorporated within the investigations are dwellings 12, 13, 14, 16 and 17.

Figure 11.1 provides a visual representation of the predicted noise levels for the wind farm during operation for the highest sound power level of the Vestas V112 model turbine, being 7.0 metres per second.

The predicted noise at the closest residence to the substation was 26 dB(A), which achieves the conservative criteria set by the INP. Accordingly, the operation of the substation will have no adverse impact on the amenity of residences in the locality of the wind farm.

For any turbine with a sound power level and hub height that is equal to or less than that assessed for the V112 turbines, the proposed layout can achieve the stringent requirements of the SA Guidelines.

Table 11.5 – Predicted Wind Farm Noise and Relevant Criteria

DWELLING NUMBER	NEIGHBOUR (N)/WIND FARMER (W)	CRITERIA DB(A)							PREDICTED NOISE LEVEL DB(A)							CRITERIA MET Y/N
		4	5	6	7	8	9	10	4	5	6	7	8	9	10	
1		45	45	45	45	45	45	45	36	40	43	44	43	42	42	Y
2	W	45	45	45	45	45	45	45	32	36	39	40	39	38	39	Y
3	W	45	45	45	45	45	45	45	30	35	38	39	38	37	37	Y
4	W	45	45	45	45	45	45	45	32	36	40	41	40	39	39	Y
5	W	45	45	45	45	45	45	45	30	34	38	39	38	36	37	Y
6	W	45	45	45	45	45	45	45	28	32	35	36	35	34	34	Y
7	W	45	45	45	45	45	45	45	26	26	26	27	27	26	27	Y
8	W	45	45	45	45	45	45	45	24	24	25	26	25	25	25	Y
9	W	45	45	45	45	45	45	45	27	27	27	28	27	27	27	Y
10	W	45	45	45	45	45	45	45	30	34	37	39	38	36	37	Y
11	W	35	35	35	35	35	35	37	24	28	32	33	32	31	31	Y
12	N*	35	35	35	35	38	42	45	21	25	29	30	29	28	29	Y
13	N*	40	41	41	42	43	45	46	23	27	30	32	31	30	30	Y
13A	N	35	35	35	35	35	35	37	22	26	30	31	30	29	29	Y
14	N*	35	35	35	36	39	42	45	15	19	22	23	23	22	22	Y
15	N	35	35	35	35	35	35	37	18	20	23	24	24	23	23	Y
16	N*	35	35	37	41	44	47	49	20	24	27	29	28	27	28	Y
17	N*	35	35	35	35	35	35	37	26	26	26	26	26	26	26	Y
18	N	35	35	35	35	35	35	37	15	16	18	20	19	18	19	Y
19	N	45	45	45	45	45	45	45	27	31	34	35	34	33	34	Y
20	N	35	35	35	35	35	35	37	10	14	17	19	18	17	18	Y
21	N	35	35	35	35	35	35	37	14	18	21	23	22	21	22	Y
22	N	35	35	35	35	35	35	37	16	18	20	21	21	20	21	Y
23	N	35	35	35	35	35	35	37	19	23	26	27	27	25	26	Y
24	N	35	35	35	35	35	35	37	14	17	21	23	22	21	22	Y
25	N	35	35	35	35	35	35	37	14	18	21	23	22	21	22	Y

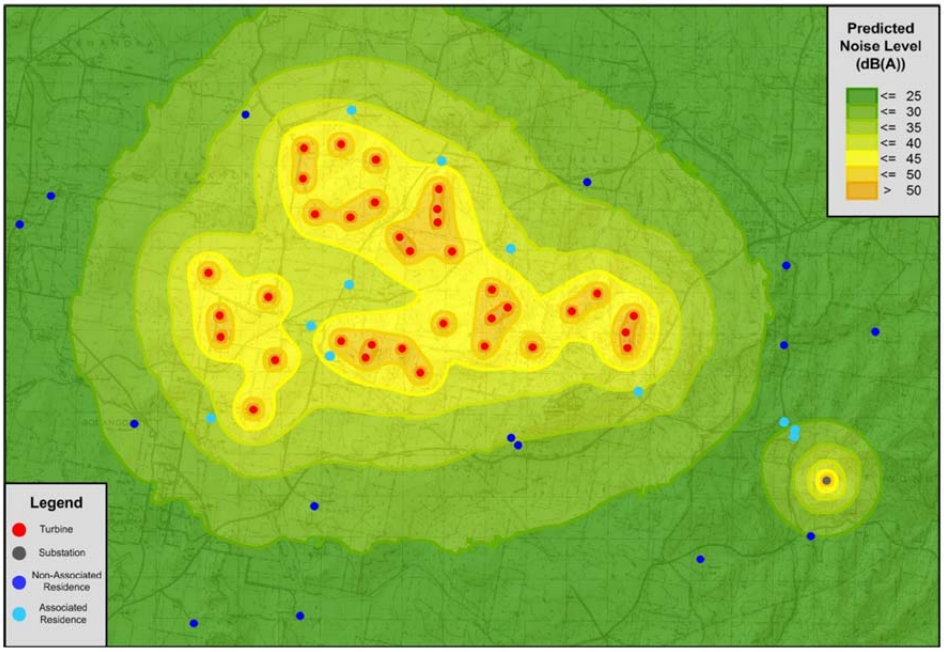

FIGURE 11.1 – NOISE CONTOURS AT 7M/S, FROM APPENDIX I TO NOISE ASSESSMENT REPORT BY SONUS.

Cumulative Impact

The SA EPA Noise Guidelines require an assessment of the cumulative impact of wind farms which are in close proximity and which may impact on the same relevant receiver. As there are currently no known wind farms within the vicinity of the proposed Bodangora Wind Farm, it is not expected that the cumulative effect of the wind farm is an issue in this instance.

Modulation

The SA EPA Noise Guidelines also require an assessment of amplitude modulation, or the 'swish' of wind turbines as a fundamental characteristic of the noise generated by the wind farm, which is most likely to occur when wind speeds at the wind farm are low under a clear sky. The Van Den Berg effect is known as an increase of the modulation depth from a wind farm under very specific meteorological and operation conditions. In previous decisions by the NSW Land and Environment Court for wind farms at Gullen Range[5] and Taralga[6], the determination has been made that the required meteorological conditions to trigger the effect were not a feature of the environment.

[5] NSW LEC 41288 of 2998
[6] NSW LEC 11216 of 2007

Sonus has concluded that if suitable conditions did exist to regularly generate high levels of swish, then there is no scientific research to indicate that the stringent SA Guidelines do not adequately account for it. Given the conditions are more likely to occur at night, then sleep disturbance would be the main issue to address, and the noise standards applied by the SA Guidelines to wind farms are significantly more stringent than limits established by the potential onset of sleep disturbance.

Compliance with the SA Guidelines will account for 'swish' and an adequate level of protection for the amenity of the surrounding area due to their stringency. The assessment by Sonus also provides a more stringent assessment by considering background noise levels during the night time period only.

Low Frequency Noise

Aerodynamic noise from a wind turbine is not dominant in the low frequency range of 20 and 200 Hz. As the wind farm is located in an environment that includes masking noise in the mid and high frequencies, such as that produced by wind in nearby trees, it is possible that low frequencies will remain audible and detectable at a distance from the wind turbines, albeit at low levels.

Predictions of the C-weighted noise level (the C-weighting is used to indicate low frequency content) at residences have been made based on the warranted sound power level spectral data for the V112 turbines down to 31.5Hz, and an estimate of the sound power level of the V112 turbines in the 16 Hz octave band, based on measured levels in the vicinity of an operating wind turbine.

Based on the above, it is predicted that low frequency noise at the closest non-associated residence to any wind turbine will be less than 48 dB(C) at any wind speed. This predicted level is significantly below that required to prompt a detailed analysis in accordance with the *Draft NSW Wind Farms Planning Guidelines*, which sets threshold levels of 65 dB(C) during the day and 60 dB(C) during the night.

It is expected that the project will also achieve compliance with the SA Noise Guidelines in providing an adequate protection of amenity in the surrounding area from low frequency noise.

Infrasound

Infrasound is sound below 20 Hz, which is often described an inaudible, although remains audible if produced at sufficiently high levels. Non-audible perception (vibrations) of infrasound only occurs at levels well above the threshold of hearing, and modern turbines generate lower levels of infrasound than early turbine designs. The accepted approach for a common audibility threshold is an infrasound level of 85 dB(A) or greater.

Whilst the aerodynamic noise from a rotating turbine blade produces energy in the infrasound range, measurements of infrasound noise emissions from modern turbines indicates that at distances of 200 metres, infrasound is in the order of 25 dB(A) below the recognised threshold of 85 dB(A), which represents an 100 fold difference in energy content. Infrasound reduces further at greater distances, and separation distances between turbine and sensitive receptors are well in excess of 200 metres.

It is noted that there are natural sources of infrasound including wind and man-made sources including industrial processes, vehicles and air conditioning systems which are at a similar or greater level than that regularly measured within 200 metres of a modern wind turbine.

11.3 CONSTRUCTION OF WIND FARM

11.3.1 Context for Assessment

Construction Activities

Construction activities including road construction, civil works, excavation and foundation construction, electrical infrastructure works and turbine erection requires activities such as heavy vehicle movements, crushing and screening, concrete batching, loaders, excavators, generators, cranes, and possibly blasting.

Construction noise is assessed against the Department of Environment and Climate Change, *Interim Construction Noise Guideline 2009* (the ICN Guidelines). The Guidelines emphasise 'feasible' and 'reasonable' noise reduction measures, and refer to the existing RBL to determine appropriate 'management levels' for noise. The management levels are detailed in Table 8 of **Attachment J** and include the following:

- During recommended standard working hours (Monday to Friday 7.00am to 6.00pm, Saturday 8.00am to 1.00pm, no work on Sundays or public holidays):
  - Noise Affected: RBL+10 dB(A) – the point at which there may be some community reaction to noise. Where the predicted or measured $L_{(Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
  - Highly Noise Affected: 75 dB(A) – represents the point above which there may be strong community reaction to noise. The relevant authority may require respite periods by restricting the hours that the very noisy activities can occur, taking into account times identified by the community when they are less sensitive to noise, or if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
- Outside recommended standard working hours:
  - Noise Affected: RBL+5 dB(A) – a strong justification would be required for works outside the recommended standard hours. All feasible and reasonable works practices should be applied to meet the noise affected level. Where all feasible and reasonable practices are being applied and noise is more than 5.0 dB(A) about the noise affected level, the proponent should negotiate with the community.

Traffic Noise

Traffic noise is to be assessed against the NSW Environment Protection Authority, *Environmental Criteria for Road Traffic Noise* (ECRTN). The most appropriate traffic noise classification for the

Bodangora Wind Farm is *"land use developments with the potential to create additional traffic on load roads"*. This classification applies to an ongoing operation (as opposed to a temporary construction process) and accordingly provides a more conservative approach. Criteria for traffic noise is:

- equivalent ($L_{Aeq,\ 1\ hour}$) traffic noise of no greater than 55 dB(A) during the daytime (7.00am to 10.00pm) and 50 dB(A) during the night (10.00pm to 7.00am). This noise level is to be achieved outside, at a distance of 1.5 metres from the façade of a dwelling.

Blasting Noise

Blasting noise is to be assessed against the *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* (ANZECC, 1990). The Blasting Guidelines require the following criteria :

- peak sound pressure level of 115 dBL for 95 percent of blasts over a 12 month period, and a maximum level of 120 dBL;
- peak particle velocity of 5.0 millimetres per second for 95 percent of blasts over a 12 month period, and a maximum velocity of 10 millimetres per second; and
- blasting should generally only be permitted during the hours of 9.00am to 5.00pm Monday to Saturday, and should not take place on Sundays or public holidays.

Construction Vibration

The *Assessing Vibration: A Technical Guideline* (DECC, 2006) is relevant to the assessment of construction vibration, which provides an emphasis on construction activity and implementing feasible and practical vibration reduction measures. The Vibration Guidelines establish goal vibration levels, based on human responses to vibrations. Table 11.6 identifies the vibration criteria at the dwellings, based upon the core document used as the technical basis for the Guideline: the British Standard BS 6472-1992 *'Evaluation of human exposure to vibration in buildings (1-19Hz)*'.

Table 11.6 – Vibration Criteria

CONTINUOUS MM/S^2 VERTICAL (RMS)	IMPULSIVE MM/S^2 VERTICAL (RMS)	INTERMITTENT M/S$^{1.75}$ VIBRATION DOSE VALUE
10-20	30-60	0.2-0.4

11.3.2 Assessment of Construction Noise Impact

The noise during construction has been predicted as a worst case (highest noise level) scenario, where it is assumed that all equipment is present and operating simultaneously on-site for each stage of construction.

The weather conditions used for the predictions are the most conducive for the propagation of noise, being an overcast day with a breeze from the construction activity to the receiver.

Table 11.7 provides an indication of the impact to the closest sensitive receiver to a proposed turbine. The scenario incorporates the transport vehicle deliveries for construction, including features of the 'worst case scenario' including the concrete batching plant.

Table 11.7 – Predicted Construction Noise Levels at 1,200 metres

PHASE	MAIN PLANT AND EQUIPMENT	PREDICTED NOISE LEVEL AT 1,200 METRES DISTANCE
Site set-up and civil works	Generators Transport trucks Excavators Low loaders	41 dB(A)
Road and hard stand construction	Mobile crushing and screening plant Dozers Rollers Low loaders Tipper trucks Excavators Scrapers Transport trucks	48 dB(A)
Excavation and foundation construction	Concrete batching plant Mobile crushing plant and screening plant Truck-mounted concrete pumps Concrete mixer trucks Excavators Front end loaders Mobile crane Transport trucks Tipper trucks	47 dB(A)
Earthing	Percussion drilling rig	46 dB(A)
Electrical installation	Concrete trucks Low loaders Tipper trucks	46 dB(A)

PHASE	MAIN PLANT AND EQUIPMENT	PREDICTED NOISE LEVEL AT 1,200 METRES DISTANCE
	Mobile crane Rock trenchers	
Turbine delivery and erection	Extendable trailer trucks Low loaders Mobile crane	41 dB(A)

Based on the predicted levels, it is expected that construction noise will be greater than 10 dB(A) above the RBL, and less than 75 dB (L_{Aeq}) at a distance of 1,200 metres.

In accordance with the ICN Guideline it is expected that a dwelling 1,200 metres from construction activity may be 'noise affected' but not 'highly noise affected'. Therefore, the developer should apply *"all feasible and reasonable work practices to meet the noise affected level"* and should inform any impacted residents of the proposed construction work. These measures are detailed in Section 11.4.

Blasting

The separation distances between the potential blasting activities and the nearest dwellings are in the order of magnitude for which ground vibration and airblast levels have been adequately controlled at other sites. Monitoring should occur around sites where blasting occurs to monitor and ensure compliance with the Blasting Guidelines.

Construction Vibration

It is expected that the main sources of vibration will be the drilling rigs where required, rock trenching equipment and roller operation during the road and hard stand construction. The level of vibration at a distance will be subject to the energy input of the equipment and the local ground conditions. Typically, the distances required to achieve the construction vibration criteria provided in the Technical Guidelines are in the order of 20 metres to 100 metres (100 metres being a conservative estimate).

Based on the separation distances between the construction activities and the nearest sensitive receivers being well in excess of 100 metres, vibration levels are expected to easily achieve the criteria.

Where construction activities may occur within 100 metres of a dwelling, such as along areas of new road construction, it is recommended that a monitoring regime is implemented to ensure compliance with the Technical Guidelines.

11.4 MANAGEMENT AND MITIGATION

As the operational aspects of the wind farm meet the relevant noise criteria for all sensitive receivers at the Bodangora Wind Farm, all management and mitigation measures relate to the construction of the wind farm.

The proponent will implement all 'feasible and reasonable' noise control strategies to minimise noise during construction. Whilst Sonus has identified that it is unlikely that the above measures will result in meeting the construction noise goals at all times due to the stringency of these goals, and the variable nature of construction activity, the proposed mitigation measures will serve to reduce the impacts identified and represent the extent of 'feasible' and 'practical' noise reducing measures in accordance with the ICN Guidelines.

The following measures will be implemented through a Construction Noise Management Plan:

- Engineering measures:
  - temporary acoustic barriers/screens will be constructed around fixed noise sources including for the fixed crushing and screening plant, concrete batching plant and percussions drilling rigs wherever these noise sources are located within 1,200 metres of a non-associated dwelling and do not have direct line of sight blocked to that dwelling, in accordance with the following requirements:
    - (a) located as close as practical to the noise source;
    - (b) constructed from mounding using excavated soil from the site, or a material with a minimum surface density of 10 kilograms per square metre, such as 1.2 millimetre thick sheet steel or 9.0 millimetre thick compressed fibre cement sheeting;
    - (c) constructed to a minimum height that blocks direct line of sight between the noise source and any received within 1,200 metres;
    - (d) constructed such that there are no air gaps or openings at joints;
    - (e) extended such that the length is at least five times greater than its height or so that it is bent around the noise source; and
    - (f) if barriers (rather than mounding from excavated soil) are constructed, then include acoustic installation facing into the noise source in accordance with the following detail:

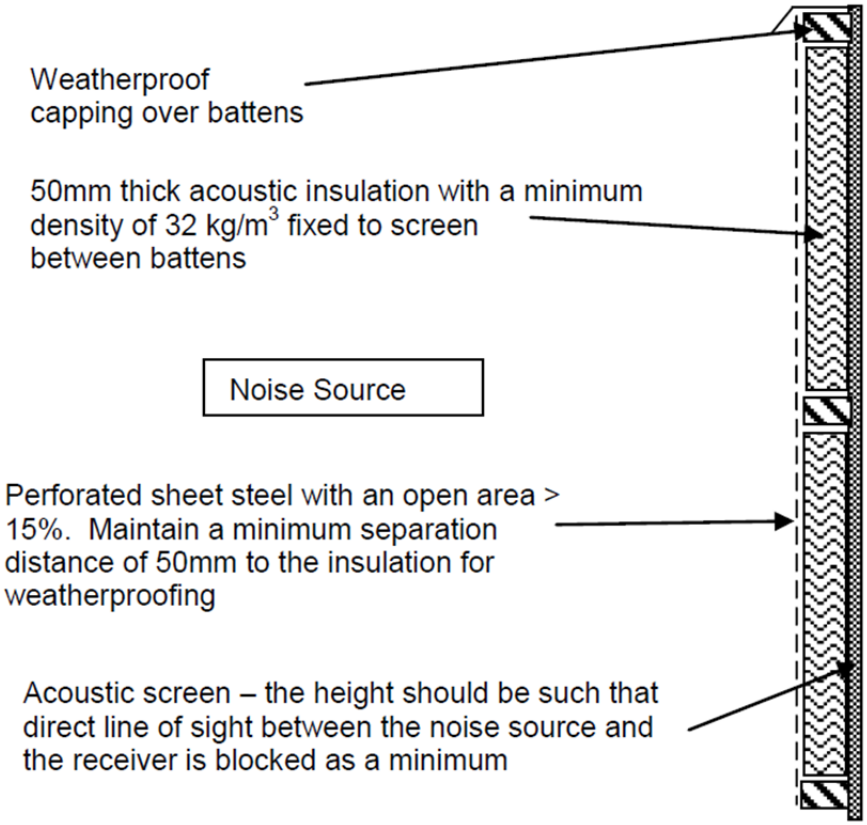

FIGURE 11.2 – BARRIERS TO INCLUDE ACOUSTIC INSTALLATION FACING THE NOISE SOURCE (SONUS, 2011).

- the site topography, and other shielding features eg large stationary machines, mounds of topsoil and piles of materials should be used to an advantage in terms of increased shielding when locating fixed noise sources within 1,200 metres;
- proprietary enclosures will be used around compressors and generators;
- use of silencers;
- the proponent will investigate and implement alternative processes were feasible and practical, such as hydraulic or chemical splitters as an alternative to impact rock breaking, or the use of broadband reversing alarms[7] in lieu of high pitched devices. The fitting of a broadband alarm will be subject to an appropriate risk assessment, with the construction team being responsible for ensuring the alarms are installed and operated in accordance with all relevant occupational, health and safety legislative requirements;
- the fitting of broadband reversing signals; and
- fixed noise sources (for example a crushing and screening plant, concrete batching plant, percussion drilling rigs and generators and compressors) will be located at the maximum practical distance to the nearest dwellings, and where possible will use existing landforms to block the line of sight between the equipment and nearby dwellings.

[7] A broadband reversing alarm emits a unique sound which addresses the annoyance from the high pitched devices.

- Administrative measures:

  - inspections;
  - construction works, including heavy vehicle movements into and out of the site will be restricted to between 7.00am and 6.00pm Monday to Friday, and 8.00am to 1.00pm on Saturday;
  - works undertaken outside of the designated working hours will only entail works that do not cause noise emissions to be audible at any nearby residences not located on the site; or the delivery of materials as requested by Policy or other authorities for safety reasons; or emergency work to avoid the loss of lives, property and/or to prevent environmental harm;
  - other works additional to those as described above will require the consent of the New South Wales Department of Environment and Climate Change and Water; and
  - providing training to establish a noise minimisation culture for the works.

- Site management practices will include the following:

  - selecting and locating centralised site activities and material stores as far from noise sensitive receivers as possible;
  - care will be taken not to drop materials, such as rock, to cause peak noise events, including materials from a height into a truck. Site personnel will be directed as part of an off-site training regime to place material rather than drop it;
  - plant known to emit noise strongly in one direction, such as the exhaust outlet of an attenuated generator set, will be orientated so that the noise is directed away from noise sensitive areas if practicable;
  - machines that are used intermittently will be shut down in the intervening periods between works or throttled down to a minimum; and
  - worksite induction training and education for staff will be implemented.

- An equipment and vehicle monitoring regime will be implemented to ensure the following;

  - equipment will have Original Equipment Manufacturer (OEM) mufflers installed;
  - equipment will be well maintained and fitted with adequately maintained silencers which meet the OEM design specifications and inspection will be part of a monitoring regime;
  - silencer and enclosures will be inspected to ensure they are intact, and rotating parts are balanced, loose bolts are tightened, and frictional noise is reduced through lubrication and cutting noise reduced by keeping equipment sharp;
  - power necessary only for the task required will be used; and
  - plant and equipment will be inspected as part of the monitoring regime, to determine if it is noisier than other similar machines and to replace and rectify as required.

- The developer will provide noise and vibration elements into the community consultation process. The aim of consultation will be to ensure adequate community awareness and notice of expected construction noise. Consultation will include:

  - regular community information newsletters providing details of the construction plan and duration;

- a site notice board in a community location (such as Wellington) providing copies of the newsletters, updated construction programme details, contact details of the project team members, and an ability to register for email updates of the newsletter;
- a feedback mechanism for the community to submit questions to the construction team and for the construction team to respond;
- regular updates on the construction activities to local authorities to assist in complaint management if necessary; and
- contact details of the project manager and/or site 'environmental representative'.

- Prior to construction activity occurring within 1,200 metres of a non-associated dwelling, significant construction traffic periods, impacts on local road conditions, or blasting activity, the following will occur:

  - the local community potentially affected by the proposed works will be contacted and informed by letter of the proposed work, the location of the work, the date(s), day(s), times(s) of the works;
  - this contact will occur a reasonable time before the proposed commencement of the work; and
  - the letter will provide the contact details of the project manager and/or site 'environmental representative'.

- Construction Traffic Management:

  - the daytime criterion provided by the ECRTEN is an equivalent (LAeq, 1 hour) noise level of 55 dB(A) during any given hour, which is expected to be achieved at a distance of 10 metres from the road side for 10 passenger vehicle movements and three heavy vehicle movements in one hour;
  - the number of movements can double at twice the distance from the roadside and continue to achieve the 55 dB(A) criterion;
  - care will be taken to avoid the acceleration of trucks and the use of truck engine breaks in close proximity to dwellings;
  - communication will occur with the affected community in accordance with the provisions outlined previously;
  - a route will be established and maintained to the site so that heavy vehicles do not enter noise sensitive areas for access where practicable;
  - drivers will be informed of the approved route to access the site and the need to mitigate impacts through driver operation at certain locations;
  - construction traffic deliveries will be evenly dispersed as far as practical; and
  - construction traffic will be restricted to daytime operating hours, subject to the scheduling of caveats in the Construction Noise Management Plan.

- Monitoring of blasting activities will occur in accordance with a Monitoring Blasting Scheme to ensure compliance with the Blasting Guidelines.

- Monitoring will occur to construction activities where they occur within 100 metres of a sensitive receiver, to ensure vibrations are compliant with the Technical Guidelines.

11.4.1 Contingency Strategy

In the event that the commissioned turbine noise exceeds the noise predictions, the noise of turbines will be reduced through the use of lower noise modes for use under certain operating conditions, which will produce lower noise levels.

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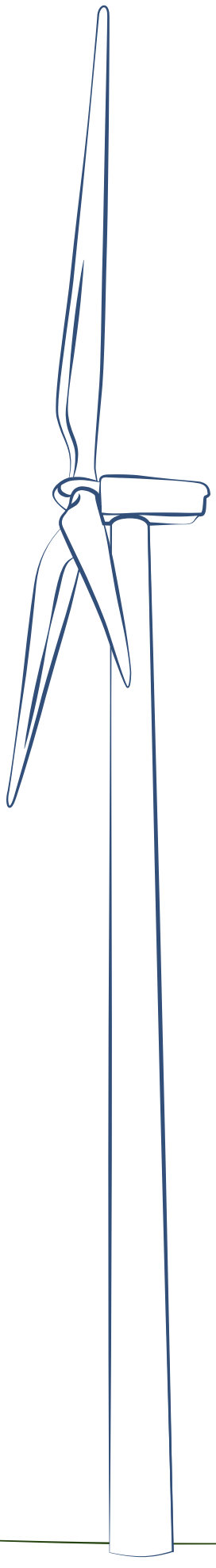

Chapter 12

Traffic & Transport

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CHAPTER 12 - TRAFFIC AND TRANSPORT

12.0 INTRODUCTION

This chapter of the EA describes the traffic and transport issues related to the Bodangora Wind Farm development. Identified within this chapter are additional details on the nature of and volume of traffic generated by the proposal, the most likely transport routes, proposed upgrades including regional and project area upgrades, and measures to mitigate or manage any potential impacts.

This chapter aims to summarise the key relevant information as provided in the detailed *Traffic and Transport Issues* Report by Infigen Energy. Infigen Energy's report has been prepared to meet the requirements of the Director-General's requirements dated 12 November 2010. The full report is provided in **Attachment K** to this EA.

Specifically, this chapter of the EA provides the following details, as per the Director-General's requirements (DGRs):

Director-General's Requirements:

> *"The EA must assess the construction and operational traffic impact of the project, including:*
>
> - *Details of the nature of traffic generated, transport routes, traffic volumes and potential impacts on local and regional roads (including impacts on the structural integrity of the road network) bridges and intersections, including any proposed road upgrades and repaid and taking account of relevant Council road policies.*
> - *Details of measures to mitigate and/or manage the potential impacts, including measures to control soil erosion and dust generated by traffic volumes.*
> - *Details of site access roads including how these would connect to the existing road network and any operational maintenance or handover requirements."*

The traffic and transport elements of the proposal have been based upon the proponent's previous construction experience, industry standards, relevant legislation (as outlined in Chapter 5), publically available information on road conditions, guidelines set by the NSW Roads and Traffic Authority (RTA), and following consultation with the Wellington Council and the NSW RTA. The assessment can be broadly divided into impacts during the construction and operational phases of the project, and on-site and off-site transport impacts.

12.1 CONSTRUCTION

The proposed wind farm can be considered in two distinct phases, construction and operation. The construction phase of the project will result in a short term increase in the volume of traffic movements to the site including the delivery of infrastructure via restricted access vehicles (RAV). The construction phase will continue for a period of approximately 18 months with the majority of major components arriving between six and 12 months.

12.1.1 Proposed Delivery Routes

The proponent has considered delivery options by both road and rail. Given the vertical and horizontal clearances required with rail transport, and additional stages of handling required, road transport provides the most suitable option for the Bodangora Wind Farm.

The following represents the most suitable and economic path from the likely delivery port to the project area at the time of writing. Final access routes will be selected and approved during further consultation with the Wellington Council and The Roads and Traffic Authority (RTA), including where there are variations proposed beyond the information below. The final access route will also depend upon the points of origin for infrastructure components, including the delivery ports, the selection of suitable suppliers, and the sources of local materials for construction.

Points of Origin

The following presents the most likely option for import locations for wind farm infrastructure within Australia:

- wind turbine generator components will be imported to Australia. The most likely option is via the Port of Newcastle (the next viable option via Port Kembla);
- tower sections for wind turbines may be manufactured in Australia within either Queensland, South Australia, Victoria, or may be imported via the same port as the turbine generator components (ie either the Port of Newcastle of Port Kembla);
- electrical equipment may be sourced from various locations in Australia. It is expected that the main transformer will arrive at the Port of Newcastle;
- concrete and aggregate will be sourced from local quarries and importers including at Dubbo, Mudgee, Molong and Maryvale; and
- employees, services and small deliveries are most likely to be sourced from Dubbo and Wellington as the most proximate commercial centres to the project area.

Proposed Route

The following route described will allow for the delivery of infrastructure parts via restricted access vehicles (RAV) to the project area.

The route utilises National and State Highways as primary freight routes within Australia, with a speed limit of up to 100 or 110 kilometres per hour. It is anticipated that pilot vehicles and police escort will be required to guide RAVs to the project area.

The following is the preferred route for the delivery of infrastructure components via RAV arriving at the Port of Newcastle:

- Bourke Street, Newcastle;
- Hannel Street;
- Industrial Drive;
- Pacific Highway;
- New England Highway;
- Golden Highway;
- Mitchell Highway;
- Goolma Road; and
- Gillinghall Road, Bodangora.

The route is approximately 450 kilometres in length, is described in detail in **Attachment K**, and is visually represented in Figure 1 to **Attachment K**.

Tower sections, if transported from South Australia could be transported via the Sturt, National, Newell and Mitchell Highways to Wellington, and if transported from Queensland could be transported via the Warrego, Leichardt and Newell Highways to Dubbo, and then the Mitchell Highway, Goolma Road and Gillinghall Road. Towers manufactured in Victoria may be transported via the Princes Highway, Goulburn Valley Highway, Newell Highway, Mitchell Highway, Goolma Road, and Gillinghall Road.

Figure 1 of **Attachment K** details the most likely route for the delivery of wind farm infrastructure for construction to the site. Also identified is the likely route for concrete and aggregate deliveries from Dubbo, Mudgee, Molong and Maryvale.

12.1.2 Nature of Delivery Vehicles

Traffic Loads

Dimensions and loads for the major components for delivery are detailed in Table 12.1.

Table 12.1 – Load Dimensions and Masses

COMPONENT	HEIGHT (METRES)	WIDTH (METRES)	LENGTH (METRES)	LOAD (TONNES)	ON ROAD WEIGHT (TONNES)
Rotor	3.1	3.9	4.5	20	35
Blades	3.0	3.0	55	15	30
Tower Sections	4.3	4.3	26	65	85
Nacelles	4.0	4.0	9.5	70	80
Main Transformer	4.5	4.5	8	120	160
Transmission line poles[8]	-	-	20	-	-

The details indicated in the table above are nominal. Dimensions and weights will be finalised following the selection of the turbine supplier, and the specialist haulage contractors are selected.

Likely vehicle types for the delivery of wind farm components include low loaders, semi-trailers, concrete agitators, dump trucks, restricted access vehicles and regular trucks and light vehicles (ie vans or cars).

Figure 12.1, 12.2, and Plates 12.1 and 12.2 from **Attachment K**, provide an indicative 'worst case scenario', being the largest and heaviest possible vehicle for transformer and blade delivery. RAV are those vehicles which are longer than 19 metres, and/or heavier than 42.5 tonnes.

Delivery vehicle dimensions will be confirmed in the Construction and Environmental Management Plan.

[8] The number of transmission line poles required will depend of the number of poles per vehicle, and the total length of above ground transmission line required.

Traffic Volumes

Traffic volumes have been prepared which assume that concrete will be delivered to the project area from an off-site location, turbine foundations will be of the 'gravity' type (requiring a greater volume of concrete), and that rock will be required to be imported to the site for the capping of tracks. This is considered the 'worst case' scenario, with the greatest level of possible vehicular traffic generation for assessment purposes.

Table 12.2 provides an estimate of the number of one-way vehicle movements during the 18 month construction period, for the delivery of all required components for the construction of the wind farm, including all materials and staff movements during construction. A full breakdown is provided in Table 2 of **Attachment K**.

The maximum number of vehicles per day is estimated to be in the order of 120 vehicles. The maximum number of vehicles are expected during the concrete pouring for the foundations. The average number of vehicles per day outside of the peak period is expected to be around 25 vehicles.

Note that whilst restricted access vehicles will be utilised for delivery to the site, some custom trailers used for blade delivery can be retracted for their return trip.

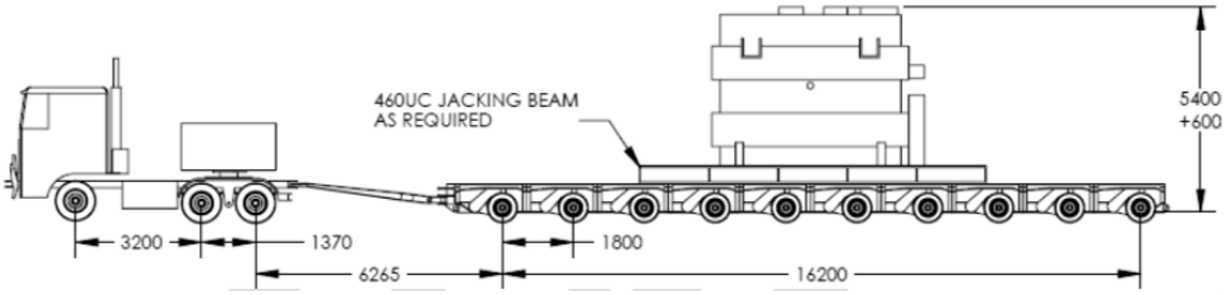

FIGURE 12.1 – EXAMPLE VEHICLE FOR TRANSFORMER DELIVERY.

PLATE 12.1 – EXAMPLE DELIVERY ARRANGEMENT AND VEHICLE FOR TRANSFORMER DELIVERY.

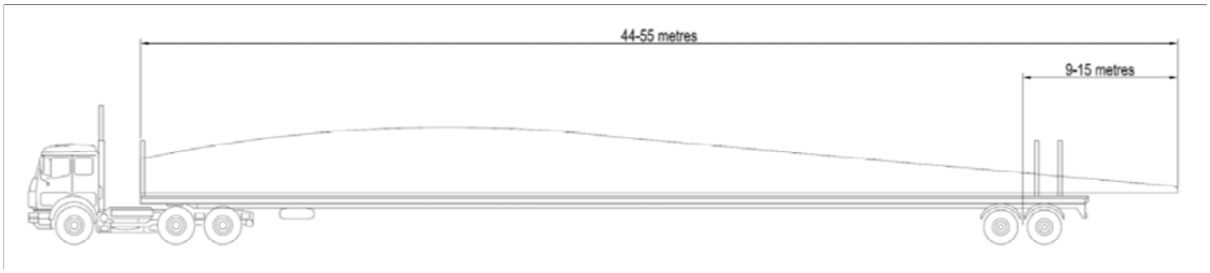

FIGURE 12.2 – EXAMPLE VEHICLE FOR BLADE DELIVERY.

PLATE 12.2 – EXAMPLE DELIVERY ARRANGEMENT AND VEHICLE FOR BLADE DELIVERY.

Table 12.2 – Summary of One-Way Vehicle Movements During Construction

LOW LOADER	SEMI-TRAILER	TRUCK	CONCRETE AGITATOR	RAV	DUMP TRUCK	LIGHT VEHICLE
SITE SET-UP AND DE-MOBILISATION Delivery and removal of construction equipment including a portacabin, skip, generator and water tank.						
12	2	2	-	-	-	-
ROADS AND HARDSTAND CONSTRUCTION Delivery of materials for roads, laydown areas and crane hardstands, excavators, compactors, bulldozers and other equipment						
16	-	3,680 (including 3,668 Truck+Dog)	-	-	-	-
FOUNDATIONS Concrete delivery, reinforced street and formwork delivery, plant delivery						
16	64	-	3,288	-	-	-
WIND TURBINE GENERATORS Delivery of turbine sections, cranes, internal equipment and tools						
68	8	-	-	612	-	-
CABLE INSTALLATION Delivery of cables, backfill material, plant equipment including excavator.						
8	30	-	-	-	290	-
OVERHEAD LINE Delivery of conductors, poles, and plant equipment including excavator.						
8	18	-	-	6	-	-
SUBSTATION Delivery of concrete, stitchroom, O&M and workshops, transformer and electrical equipment.						
12	16	-	20	2	-	-
OTHER Employee vehicle movements, met masts, waste collection, consumables and miscellaneous.						
-	-	140	-	-	-	12,036

12.2.4 Timing

Traffic volumes will be spread over the 18-24 month construction period, although the majority of traffic movements will occur during the six month to 12 month period for deliveries.

The morning peak on a daily basis at the project area would include delivery via approximately 30 light vehicles, three restricted access vehicles and five heavy vehicles between 6.00am and 7.00am.

The delivery of equipment is limited by restrictions placed on the movements of restricted access vehicles through urban areas during designated peak areas, including at Newcastle.

The delivery of the majority of equipment during the times of 6.00am and 7.00am will also assist in avoiding school drop off and pick up hours at Dubbo.

12.3 OPERATION

Once construction is completed, the wind farm will require a small volume of vehicles to access the site on a daily basis. Typically, this will consist of between six to 10 small vehicles accessing the site per day, with most vehicular movements to the substation site where the site offices will be located. Local transportation routes during operation will be the same as during the construction phase of the project, as previously identified in Section 14.1.1 and will be identified and approved in the Construction Environmental Management Plan.

Periodic visits for maintenance purposes is larger vehicles will also be required as necessary. Any access for RAV's during the operational period for major maintenance activities will be similar to the same approval processes for the construction phase of the project as outlined in Section 5 of this EA.

Overall, it is considered that the likely impact to adjoining land uses and the road network during the operation phase of the project will be small given the expected traffic volumes.

12.4 ROAD NETWORK IMPACTS

The major issues for traffic and transport for the project is the movement of large and oversized vehicles, and additional volumes of traffic during construction.

The following is considered relevant to the assessment of potential impacts as a result of the traffic which would be generated by the project[9]:

- Given the points of origin for wind farm delivery being spread between Newcastle, Mudgee, Wellington and Dubbo (particularly during the maximum traffic period during the foundation concrete construction), the impact to the volumes on the surrounding highways is expected to be minimal.

- Potential impacts to general road safety will include additional vehicle movements, large vehicle movements, congestion with other road users, and the identification of areas which may require special consideration for upgrades. Measures will be incorporated to ensure the safety of all road users for the movement of large and/or heavy infrastructure, including:

    - the use of traffic control personnel;
    - pilots and police escort during the delivery of RAV with specific control arrangements or during potentially unsafe movements on public roads;
    - signage and flashing lights; and
    - temporary speed restrictions;

- The timing of vehicle movements could potentially impact upon sensitive land uses along the travel route. Vehicle movements should be coordinated to reduce the impact of construction traffic on the regional and local road network. Considerations may include the following:

    - a school at Dubbo has been identified, and a requirement set for RAV travel times to be outside of school drop-off and pick up times at this location; and
    - travel times near to and within the project area will occur during daylight hours to reduce the impact upon nearby sensitive land uses, including dwellings.

    The actual timing for deliveries will be confirmed in the Traffic Management Plan.

- Requirements including the movement of RAVs during selected hours will assist in reducing the impact of construction traffic on the regional road network.

- The movements of construction staff to and from the project area on a daily basis will also be the cause of additional traffic; however this will occur in light vehicles.

[9] Note that the noise assessment of the road transport is contained within Chapter 11 of this EA.

- The construction phase for the project will have an increase on the volume of traffic on load roads. Movements of construction staff to and from the site on a daily basis will also temporarily increase the traffic volumes on local roads. The implementation of a community information and awareness programme about the construction and timing will assist to manage local and regional road impacts.

- The operational phase of the project will involve relatively small traffic volumes including periodic visits by maintenance staff, which is not expected to cause any disruption.

Preliminary assessment of the capacity of strength of the road network has been undertaken. Further assessment will be undertaken during the preparation of the Traffic Management Plan, following detailed design and the selection of supplier and contractors for the project. Further assessments may include the requirement for upgrading of the horizontal geometry or pavement for safe access, and swept path and dry run analysis.

The following sections of road have been identified which may require further investigation for capacity and strength:

- Denman Road/Golden Highway, Denman (turning angles);

- Palace Street/Golden Highway, Denman (traffic controls);

- Goolma Road/Gillinghall Road, Bodangora (swept path analysis and turning angles);

    - swept path analysis was undertaken to provide the geometry of the site, and is shown in Figure 3 of **Attachment K**. The swept path analysis of this intersection is proved to be adequate;
    - spray seal at the intersection will be extended to allow for increased turning movements;

- Mitchell Creek crossing, Bodangora (bridge strength); and

- Gillinghall Road, Bodangora (sealing).

In addition, there are a number of on-site watercourses which may require the construction of new culverts with inlet and outlet protection. Exiting forwards may need to be upgraded for construction due to vertical geometry suitability for delivery vehicles. All works to watercourses will be subject to sedimentation and erosion control measures to be outlined in the CEMP.

Underground cables will typically run parallel to site access tracks within the project area. Where underground cables are required to cross Gillinghall Road, they will be buried and protected in accordance with Council standards and Australian Standard AS3000. Construction works will be carried out in the road reserve under permit (Section 138) with the appropriate traffic controls in place. Likewise, the overhead line crossing of Mudgee/Goolma Road will be designed and constructed in accordance with applicable RTA and Council standards.

12.5 ON-SITE ROAD UPGRADES

Proposed new access roads to a width of 9.0 metres within the project area are identified on Figure 1.3 (Project Overview). The new access roads will provide for access to the wind turbines and other infrastructure within the project area. Generally, these access roads are located in cleared and exotic pasture areas.

The following has been taken into regard for the design of new access roads:

- access points have been provisionally determined based on sight distances, including:
  - adequacy of sight lines along the public road to ensure that operation safety is not compromised while entering or existing the wind farm site during both the construction and operation phases;
  - suitability of existing entries to maximise the use of existing tracks within the project area; and
  - proximity of turbine locations to reduce required track lengths;
- access parameters include grade and alignment restrictions for RAVs;
- proximity and accessibility to turbine locations;
- consultation with land owners, and the location of existing access tracks on wind farmer properties with a preference to upgrade existing access roads wherever possible;
- site topography, including the requirement for drainage, erosion and sediment control measures; and
- flora and fauna, and heritage assessment requirements and the avoidance of sensitive areas and heritage features as detailed in Chapters 9 and 10 of this EA.

Micro-siting and rationalisation will occur during the detailed design phase of the project, and once geotechnical investigations have been undertaken. Final detailed access road locations will be prepared in conjunction with authorised ecologist and heritage consultants.

It is likely that a number of water course crossings will be required, and stormwater culverts will be installed where necessary according to erosion control measures.

As indicated in Chapter 3, access roads will be required for ongoing maintenance of the wind farm during operation. Tracks will be reduced to 5.0 metres in width following the completion of construction, and adjoining areas restored.

12.6 MANAGEMENT AND MITIGATION MEASURES

The traffic and transport impacts associated with the wind farm can be appropriately managed to minimise adverse impacts on the local and regional communities. The majority of impacts will be limited to the relatively short construction period, with the majority of traffic occurring between six and 12 months of the 18 month construction time. The management and mitigation measures relate to those provisions which will be incorporated within the Traffic Management Plan, and the public awareness programme.

12.6.1 Traffic Management Plan

The Construction Environmental Management Plan for the Bodangora Wind Farm project will incorporate a detailed Traffic Management Plan. The following is for incorporation within the Traffic Management Plan, which will be developed in consultation with the Wellington Council and NSW RTA in order to reduce and manage the effect of traffic movements on both regional and local roads for the delivery of wind farm components and equipment during construction.

The following traffic control measures will be incorporated within the Traffic Management Plan:

- Measures will be incorporated to ensure the safety of all road users, including the use of traffic control personnel, pilots and police escort will be provided during delivery of RAV with specific control arrangements for difficult or potentially unsafe manoeuvres on public roads. Signage and flashing lights, and temporary speed restrictions may also be used.

- The timing of the delivery of large equipment and materials will be restricted to mitigate local impacts, including:

    - RAV movements will be restricted to avoid passing schools during school drop off-pick up periods to avoid RAV movements conflicting with school bus operations (including schools at Dubbo); and
    - local deliveries to the site will be during daylight hours only to mitigate safety problems on local roads and to reduce disturbance for residences near to the access roads.

- An inspection and maintenance programme for local road access will be established to ensure local road conditions are maintained in a safe state for heavy and RAV access.

- Road access/occupation permits will be obtained as upgrade works are required for the public road network.

- On-site speed restrictions will be implemented for the project area.

- On-site access will be restricted to defined tracks.

- The detailed design, construction, and remediation of access track routes in proximity to environmentally and heritage sensitive areas with direct involvement and guidance from relevant specialists.

- Implementation of a proactive Erosion and Sediment Control Plan during the construction of new access roads, including the following:

  - Regular water spraying during construction to suppress dust. /
  - At the conclusion of the construction phase, any tracks not required for subsequent operation will be restored and revegetated to the satisfaction of the Office of Environment and Heritage and the land owner.
  - All works to watercourses will be subject to sedimentation and erosion control measures.
  - Where underground cables are required to cross Gillinghall Road, they will be buried and protected in accordance with Council standards and AS3000. Construction works will be carried out in the road reserve under permit (Section 138) with the appropriate traffic controls in place.
  - The overhead line crossing of Mudgee/Goolma Road will be designed and constructed in accordance with applicable RTA and Council standards.

12.6.2 Public Awareness

The implementation of a community information and awareness programme will assist in the management of traffic impacts.

A programme of consultation will be initiated prior to construction commencing to ensure residents are fully aware of construction activities and the programme for delivery to the site. The programme will include the following:

- press releases in the local newspapers;

- specific newsletters and individual letter drops to neighbouring residences along the access route to the site;

- provision of a website providing details of the status of works and contact details for any complaints or enquires; and

- signposting of the access roads with appropriate heavy vehicle and construction warning signs in consultation with the Wellington Council:

  - specific warning signs located adjacent to the entrances to the site to warn existing road users of entering and exiting traffic; and
  - day warning notices for specific construction activities.

Provision of traffic control and warning signs will be provided where particular road safety issues have been identified.

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Chapter 13

Telecommunications

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CHAPTER 13 - TELECOMMUNICATIONS

13.0 INTRODUCTION

This chapter of the Bodangora Wind Farm Environmental Assessment describes the telecommunication aspects of the project, including an assessment of the potential impacts of the project, and management and mitigation measures to be employed.

Specifically, this chapter of the EA provides the following details, as per the Director-General's requirements (DGRs):

Director-General's Requirements:

"Possible effects on telecommunications systems must be identified."

An investigation conducted by Lawrence Derrick and Associates has provided a technical assessment of the effect of the proposed wind turbines on TV and sound broadcasting reception in the general area of the wind farm from the transmitting stations utilised by residents, and a determination of whether any of the proposed wind turbines are close to radio link paths traversing the wind farm site. Recommendations are made for radio link path and radio site clearances. This investigation is provided in **Attachment L**.

Wind turbines have the potential to cause interference by physical and electromagnetic obstruction. The desktop assessment has been based upon the relevant International Telecommunication Union documents, other professional reports based on Australian and overseas experience, and data from the Australian Communications and Media Authority's RADCOM database to determine the location of radiocommunication services within a 50 kilometre radius of the wind farm.

13.1 EXISTING SERVICES

Existing broadcast transmitter site location and radio frequency channels which provide services in the region of the proposed wind farm include the following:

- analogue and digital television services, generally viewed from Mount Canobolas (Central Tablelands) or Mount Cenn (Central Western Slopes National), located approximately 105 kilometres and 118 kilometres from the site respectively:
    - digital television services are currently being radiated in parallel with analogue television signals, however the Australian Government has announced that digital only television will be achieved in Southern NSW by 30 June 2012;
- four low power TV retransmission stations which may receive signals 'off air' from the Mount Canobolas and Mount Cenuiach;
- Central Tablelands Frequency Modulation (FM) sound broadcasting services are radiated from Mount Canobolas and Mount Cenuiach, and some Sydney and the Cumnock and Tamnock Medium Frequency (MF) sound broadcasting services are receivable in the general area;
- dwellings may have satellite or 'free to air' service antenna installations;
- a large number of point to point radiocommunication links are registered within a 50 kilometre radius:
    - there are in excess of 20 Ultra High Frequency (UHF)/Very High Frequency (VHF) link paths which intersect the project area of the wind farm, which have one repeater located at Mount Bodangora;
    - there are 47 radio link registered with multiple links existing on some of the paths; and
    - six microwave links (>1GHz) intersect the wind farm site, also with repeaters at Mount Bodangora;
- cellular mobile base stations of Optus and Telstra are located between 13 and 19 kilometres from the nearest turbines of the wind farm site;
- a number of private and public utility bases for two-way mobiles exist in the wider area;

- a number of point to multipoint (PMP) systems exist, however locations are generally not registered and it is not possible to check if any of the turbines are in the paths from the base station; and
- three radio sites are located at Mount Bodangora (sites 250307, 10768 and 10769), with various repeaters.

In addition, the following forms of telecommunications are not evident within the project area:

- there are no records of location or operators of CB radio in the locality, and no impact from the wind farm is expected with the exception of mobile units in the immediate vicinity of the wind farm (which could be avoided by a small change in location);
- there are also no listed radar sites for aviation services within the locality of the project area, the nearest services for a ground-air VHF service is at Mudgee, which is not expected to be affected due to separation distance;
- there are no TV/radio broadcasting or emergency services paging facilities on the three radio facilities at Mount Bodangora which would require consideration of buffer zones; and
- there are also no registrations for the meteorological bureau in the area.

13.2 ASSESSMENT OF POTENTIAL IMPACT

The potential for electromagnetic interference (EMI) to telecommunication links is a complex matter which has been extensively studied. The effect of EMI will depend on the location of the wind turbine and transmitter, physical and electrical characteristics of the wind turbine, and the radio wave propagation in the local atmosphere.

Lawrence Derrick and Associates identifies wind turbines will affect point to point links in microwave and lower frequency bands where the turbine tower is within the second 'Fresnel Zone' of the link.

In reviewing previous investigations of EMI from both Australian and overseas, calculations utilising the University of Michigan method and an assessment of the topography of the area, Lawrence Derrick and Associates draw the following conclusions for the effect of EMI, and physical impacts as a result of the Bodangora Wind Farm (effects to analogue TV services is assessed separately in Section 13.2.1):

- there is no expected interference to either MF or FM sound broadcasting services in the region:
    - any minor effects to MF broadcasting would occur within 10's of metres from turbines, and given there is at buffer area of at least 500 metres between any turbine and any dwelling within the project area, no corrective action is required;
- digital TV services:
    - digital TV services are not subject to ghosting degradation in high signal strength areas, however some reduction of service area could occur as a result of reflected unwanted signals at the limits of the service area; and
    - there may be some isolated areas which are shadowed by local hills resulting in reduced signal levels. Such effects are unlikely, but also difficult to exclude;
- it is unlikely there will be any disturbance to the four low power TV rebroadcast station locations listed in the study area, as the paths to the retransmission sites and Mount Canobolas and Mount Cenncruiach do not cross the wind farm project area;
- no interference is likely to occur to satellite pay TV services unless the required pointing of the dish antennas to the serving satellite is also in line with a turbine; in which case mitigation measures will be proposed if degradation is reported;

- point to point radio services:

  - a large number of point to point radio services have been identified within the project area, with all links connecting to Mount Bodangora;
  - consideration clearances are required to be achieved to 2nd Fresnel clearance for the microwave systems and 0.6 by 1st Fresnel clearance for VHF/UHF;
  - Fresnel clearances have been calculated at a distance from the towers of 10 kilometres to cover the worst case scenario and error margins. Fresnel clearances relate to the horizontal spacings of the turbines between radio links;
  - Lawrence Derrick and Associates have undertaken an assessment of the clearance of the wind turbine layout and can recommend that all turbines exceed for WTG 10 has sufficient horizontal clearance;
  - whilst WTG 10 has insufficient horizontal clearance, the vehicle path profile indicates that there is sufficient vertical clearance above the turbine as generated within digital elevation model data; and
  - the current wind turbine layout within this proposed Environmental Assessment have acceptable clearances between currently registered point to point radio links and buffer zones are considered to be adequate; there are three identified microwave links passing close to the turbines, however none are closer than the 2nd Fresnel;

- it is not likely that the operation of the wind turbines will have any significant impact on cellular mobile coverage, since the nearest Optus and Telstra mobile phone towers are registered at 13, 16 and 19 kilometres from the wind farm site and at these distances it is considered that the operation of the wind farm will have no significant impact on mobile coverage;

- no significant impact from the wind farm on two-way mobile coverage beyond normal mobile operational performance is expected, whilst local performance may change, moving a short distance from a wind turbine will restore performance to normal (ie similar to two-way mobile reception when situated adjacent to a large building, silo, tower etc);

- with regard to satellite or 'free to air' service antenna installations, unless a particular subscriber's antenna reception direction and elevation is closely aligned with a turbine, which is highly unlikely, no impacts on TV reception are expected;

- the closest Airservices radio facility at Mudgee is sufficiently separated from the turbines, and the proposal is not expected to interfere with operation given it is ground – air communication;

- microwave band point to multi-point registrations are located at significant distances from the wind farm, the closest being operated by Murray Regional Telecommunications (10757) at Wellington. The operators of the systems will be best placed to determine if there are any likely impacts expected, and consultation with the operators is recommended as part of the consultation for the project;

- radio towers located at Mount Bodangora require a buffer zone of 800 metres radius to any wind turbines to allow for field zones of radio towers, which is determined by antenna gain and the operating frequency for each radio link. There are no turbines situated within 800 metres of the radio towers located at Mount Bodangora; and

- during the construction of the wind farm, there is the potential for construction cranes to cause interference with microwave links. Whilst the majority of crane movements will be located within the rotor diameter which will not affect operating radio link paths, where the movement of cranes is required outside of the turbine rotor diameter then there is the possibility for movement within the Fresnel clearances. Mitigation measures are provided in Section 13.3.

13.2.1 Analogue Television

There is likely to be some impact to analogue television services as a result of the wind farm. The effect to analogue TV services is described below:

- some interference may be experienced to analogue TV services within a 20 degree sector, up to 3.0 kilometres from each turbine in a forwards scatter direction, with backscatter up to 0.5 kilometres;

- interference will be where the path of the TV transmitter for a given receiver location intersects the wind turbine blades, or where there is a partly obstructed path to the transmitter;

- some neighbouring residences to the wind farm are predicted to have some probability of perceptible TV picture degradation for a percentage of time depending on the direction and speed of the wind;

- it is difficult to determine the exact effects of the wind farm to analogue TV, given the additive effects of a number of turbines, the effect of undulating terrain, and the individual choice of a few TV transmitting stations; and

- in general, dwellings to the south of the wind farm and close to turbines are at increased risk of having some interference to analogue TV signals.

Notwithstanding, the Australian Government has announced that digital only television will be achieved by 30 June 2012 which is prior to the completion of the Bodangora Wind Farm. Lawrence Derrick and Associates provide that:

- the scale of impact to analogue TV reception is likely to be situated at the International Telecommunications Union's grade 4 of a 5 grade impairment scale, which is *"perceptible but not annoying"*; and

- no mitigation measures are proposed where reception may be impacted by the turbines when the receivers are clearly outside of the Australian Communication and Media Authority (ACMA) planned coverage area for the particular service being received. This is since it is not reasonable to attempt to protect services which are likely to be of low signal level, and which may vary in quality of reception depending on the time of day, weather patterns and season.

This is in accordance with previous conditions imposed against decisions made by Responsible Authorities in New South Wales. Accordingly, any mitigation of interference as a result of the wind farm is focused on the digital transmission of television signals. The provision of any digital TV solutions to any degraded analogue reception would simply be advancing an inevitable transition to digital reception.

13.3 MITIGATION AND MANAGEMENT MEASURES

The following mitigation and management measures are proposed for the Bodangora Wind Farm:

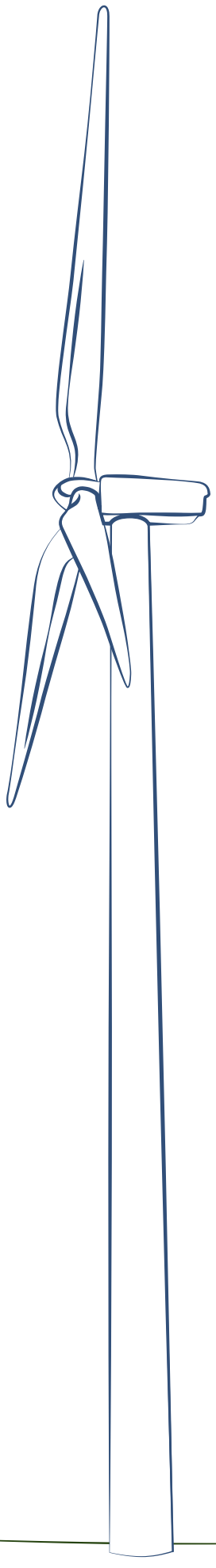
- Where any degraded FM or TV broadcasting service is reported to the proponent during the operation of the Bodangora Wind Farm project, techniques to be explored between the proponent and the landowner, at the cost of the proponent will include:

  - replacement of the exiting antenna system with a higher gain, and more directive model;
  - repositioning of the antenna in height or horizontally on the dwelling;
  - installation of an antenna elsewhere on the property and the provision of a cable to the dwelling;
  - changing the orientation of the existing antenna to receive an alternative station if available;
  - the provision of an alternative satellite service, eg the proposed Viewer Access Satellite Television (VAST) or Austar pay TV service; or
  - the installation of a TV or FM repeater station to provide service to groups of residents in a shadow zone (this is likely to only be justified for higher density population areas and other measures will be utilised first).

- Additional consultation for the telecommunication aspects of the project is to include the following:

  - consultation with Telstra and Optus, as the operators of the nearest cellular mobile base stations in the region are to be notified of the wind farm proposal;
  - Murray Regional Telecommunications, as the owner of the microwave band point to multi-point registration at Wellington will be notified of the wind farm proposal and given the opportunity to provide comment;
  - consultation with the operators of point to point radio systems which cross the project area;
  - consultation with operators of point to multi-point operators which cross the project area; and
  - in addition, consultation with the Commercial Television Station operators in the area, Broadcast Australia for the ABC and SBS networks.

- In addition, if there is any additional movement of construction cranes outside of the rotor diameter, then movements will be in accordance with Fresnel clearance requirements for the project.



Chapter 14

Environmental Management

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CHAPTER 14 – ENVIRONMENTAL MANAGEMENT

14.0 INTRODUCTION

This chapter of the EA provides an assessment of the general environmental management of the project, including on air quality, geology and soils, and water supply, water quality and impact to waterways within the project area, and proposed mitigation measures.

Specifically, this chapter of the EA provides the following details, as per the Director-General's requirements (DGRs):

Director-General's Requirements:

"The EA must identify water demands and determine whether an adequate and secure water supply is available for the life of the project including the statutory (licencing)/water sharing plan context of the water supply sources, and assess potential environmental impacts associated with the identified sources, including impacts on groundwater. Where the project would cross significant waterways, the EA must identify likely impacts to the waterways and measures to minimise impacts on hydrological, water quality, aquatic and riparian impacts. Details of the design of the waterway crossings where such crossings are to be located in third order or higher streams are to be provided. The EA must also address soil erosion issues, the potential for clearing to create a salinity risk and the potential for accidental spills to affect water quality.

The EA must include an environmental risk analysis to identify potential environmental impacts associated with the project, proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of the additional key environmental impact(s) must be included in the EA.

The EA must also detail measures to contain any hazardous substances to prevent the contamination of pastures and dams."

14.1 AIR QUALITY

Due to the moderate rainfall in the region and reasonable grass cover, there is less likelihood of air borne dust than for other drier parts of NSW. The existing air quality in Bodangora can vary with the seasons in response to airborne particulate matter associated with windy and dusty conditions, and events such as bushfires.

The project area is located approximately 12 kilometres away from the Mitchell Highway, and it is unlikely that there will by any significant impact from highway vehicle emissions on air quality at the project area. There are no major extractive land uses nearby to the project area which are likely to affect air quality in proximity to the project area. Agricultural activities, including the ploughing of fields and the spraying of crops can be associated with air borne dust during drier conditions.

14.1.1 Impacts to Air Quality

The wind farm represents a low emission form of electricity generation that will have minimal impact upon the air quality of the locality once operational. The turbines will not produce emissions at the project area, however emissions can be associated with the manufacturing and delivery of the project, and for staff travel to and from the project area. Overall, as identified in Section 2.4 of this EA, the Bodangora Wind Farm will enable net savings in greenhouse gas emissions to assist in displacing the greenhouse gas emissions produced by other forms of electricity generation.

Potential impacts as a result of the wind farm include earthworks, the transport of large amounts of equipment and materials, and drilling/explosive operations. During earthworks, there is the potential for the exposure of soils, and the potential for airborne dust due to the formation of temporary stockpiling during construction. Control measures will be proposed for the project to minimise the potential effect of dust from construction earthworks.

The impact of construction vehicles on air quality is likely to be negligible in the context of the operational life of the wind farm.

14.1.2 Mitigation of Impacts to Air Quality

The following mitigation measures are proposed to assist in reducing the potential for air emissions as part of the Bodangora Wind Farm, and will be implemented as part of the Soil and Erosion Control Plan:

- Earthworks:
    - rolling and wetting of access tracks with water as necessary to compact loose soil exposed during track formation;
    - the application of an approved wetting agent to exposed soils during dry and windy periods;

- the capping of access tracks with gravel to suit the track usage requirements and to limit dust generation;
- the stabilisation of exposed soils and stockpiles;
- the placement of stockpiles in locations sheltered from wind and surface water flows as necessary; and
- the rehabilitation of disturbed areas as soon as possible.

Local water supplies will be used for dust control management measures, and will be balanced between the amount of available water supply and the severity of dust events. This will be likely to require consultation with the Wellington Shire Council and the DECCW Guidelines to determine the approach that is acceptable for addressing air pollution whilst conserving local water resources.

- All construction vehicles will be registered vehicles that are required to maintain the necessary emission controls.

- Drilling for rock anchor installations:

  - to ensure stability of the turbine footings, rock anchors may be required;
  - air blast drilling would occur in preparation for rock anchors, and can be associated with dust plumes if not subject to controls; and
  - dust filters and/or mist sprays will be applied to control any dust resulting from the air blast drilling.

Given the scale of the project and existing farming activities such as the ploughing of fields, it is expected that dust generated by the construction of the wind farm can be effectively managed and will form only a minor contribution to air emissions in the wider region.

14.2 GEOLOGY AND SOILS

14.2.1 Geology

The project area is located at the eastern edge of the Lachlan Fold Belt, just outside the north-western extremity of the Sydney Basin geological province.

The area is largely overlain by older rock, both sedimentary and granite. The major ridges in the project area are composed of granite and are characterised by large outcrops of rock, often with large boulders sitting on bedrock. There are also areas of Permian sedimentary rocks associated with the Sydney Basin in selected locations. The majority of rock is sedimentary shales.

There are possible mineral deposits in the region, as evidenced through the exploration leases located over a portion of the project area. Consultation with the owners of the exploration leases is described in Chapter 4 of this EA.

The region in which the project is located is indicated by Geosciences Australia to have a low incidence of earthquake activity. There are no known major active volcanic or surface tectonic structures in the project area.

There is no evidence of any major landslides at the site which would influence turbine or access track stability. Nevertheless, attention will be paid to formation of any tracks on the steeper slopes and formation of associated drainage.

A Geotechnical Assessment will be undertaken as part of the detailed design phase of the project. Initial assessments have not identified any obvious geotechnical constraints that would preclude the proposed development. Based on preliminary investigations, the following has been determined (subject to detailed geotechnical assessment:

- the potential turbine sites are located on stable ground on the ridge tops and appear to have acceptable foundation conditions;
- where low level blasting is to be required, it is expected to be confined to small localised areas and will be performed in a controlled environment in accordance with all statutory and project approval requirements; and
- potential impacts as a result of the blasting may include noise, ground vibrations and overpressure, however blasting will occur during designated times only to reduce the potential for impact.

As far as possible, the location of access tracks have been selected to avoid steep slopes and provide reasonable grades. Based on the initial investigations and site inspections, the existing ground surface is stable and in most cases appears to provide a solid sub-base material for access track construction.

Some areas of high erodability for steep sections of track may require special treatment to avoid erosion of the track. The following measures will be implemented:

- where access tracks cross any alluvium filled creek valleys, it may be necessary to increase the thickness of road base material and provide suitable drainage measures; and
- all turbines and access tracks will be constructed in accordance with relevant engineering standards.

14.2.2 Soils

The soils within the project area consist of a mixture of deep alluvial loams, and shallow loams. Soils are often stony and/or sandy, most of the deeper or more productive soils have been extensively cleared of their natural vegetation. Overall, existing instances of erosion are rare and for most parts of the site, substantial grass cover is present.

The steepest slopes in the project area are the sides of valleys, and in most cases these areas have been avoided. Most of the development, including the access tracks, will be on flat to gently sloping ground.

Some areas of tracks have been located on steeper sloped areas due to proximity, however these areas will be specifically designed to minimise the grade and include drainage to avoid erosion of the surrounding slopes. Earthworks in these areas will be designed to ensure that the completed formations are stable in the longer term, and that comprehensive controls will be applied during construction to minimise any potential for construction. A Soil and Water Management Plan will be prepared prior to construction following the preparation of the final design layout.

Dust generation is a potential impact during the construction of the wind farm, particularly when there are low levels of soil moisture, most common during summer due to a combination of lower rainfall and higher evaporation at this time. In addition, vegetation selected for following construction will need to consider the existing fertility of the soils in order for effective restoration.

Potential issues caused by the disturbance of soils on the site can be effectively managed. Erosion and sediment control during the construction period of the project will be managed according to the following:

- The preparation of a Soil and Water Management Plan (SWMP) as part of the Construction Environmental Management Plan to outline the water floor and erosion and sediment control measures that will be utilised to mitigate the potential impacts of the construction works. The SWMP will be designed to:
  - divert surface run-off away from earthwork areas and soil stockpiles;
  - reduce the energy of surface flows in areas of potential erosion;
  - prevent sediment-laden or contaminated water leaving construction areas;

- provide containment for sediment entrained in surface flows; and
- reduce susceptibility of disturbed areas to erosion and include prompt revegetation of disturbed areas.

- A full geomorphic assessment will be conducted on any watercourses where crossings are required. The design of the crossings will ensure geomorphic stability of the watercourse.

- Typical erosion and sediment control measures include the following:

  - construction of drains and check dams;
  - construction of diversion banks, perimeter banks and level spreader sills;
  - use of sediment traps;
  - sediment fences around stockpiles and areas of earthworks;
  - stabilisation of temporary and permanent batters;
  - straw bale and geotextile filter fabric sediment traps and filers; and
  - minimisation of periods in which disturbed soil remains exposed.

- Disturbed areas will be stabilised according to the following:

  - temporary vegetation or mulch will be applied to all disturbed areas, including soil stockpiles that remain exposed for a period of 30 days or more;
  - all temporary diversion banks and sediment basin embankments will be seeded and fertilised as soon as practicable after construction, and take into account the growing seasons;
  - stabilisation of all batters will be commenced within one week of completion of formation.

- Topsoil suitable for stripping and re-use in revegetation will be stockpiled:

  - stockpiles will be clearly identified;
  - stockpile locations will be selected free of traffic and away from drainage lines and watercourses;
  - stockpiles will be managed to minimise erosion and loss of topsoil, with surface stabilisation to prevent wind erosion where necessary.

- Erosion and sediment devices will be inspected regularly following each rain period and during periods of prolonged or heavy rain, and any defects will be rectified promptly.

- All sediment control devices will be maintained in satisfactory working order until such time that disturbed areas have been stabilised to the satisfaction of Bodangora Wind Farm Pty Ltd and the respective land owners.

- At the conclusion of construction, all temporary tracks and areas disturbed by construction work, including cable routes and hardstand areas surrounding the wind turbines will be reinstated and revegetated.
- All temporary control measures will be removed when revegetation has established on formerly disturbed areas, and will be disposed of in a satisfactory manner. Follow up maintenance will be undertaken until the areas are satisfactorily stabilised and restored.

14.3 WATER

14.3.1 Project Area Drainage

The project area is located within the Central West Catchment Management Authority region, and is also located within the Macquarie-Bogan River Catchment as identified by the Department of Environment, Climate Change and Water. The drainage features of the wider region include the Cudgegong River to the east and south of the project area which drains to the Burrendong Dam to the south of the project area, as a major water storage facility in the region. The Macquarie River is a major regulated river which flows from south-east to north-west. The Talbragar River also exists to the north of the project area, which meets the Macquarie River to the north of Dubbo.

Drainage of the wind farm site is via a number of smaller unregulated creeks which subsequently drain to the Talbragar River. Creeks within the project area include Mitchell Creek, Reids Creek and Driel Creek, which drain below the southern and western turbine groupings in a general north-west direction, and Mullion Creek which drains past the central turbine areas and meets Spicers Creek further to the north. Minor creek lines within the project area are highly variable and dependant on soil moisture and rainfall.

Potential Impact

Activities which may affect drainage include soil disturbance associated with earthworks, the creation of temporary stockpiles of soil and rock, and works associated with creek crossings by tracks, underground and overhead cables.

As most development is located on elevated ridgelines, few new/upgraded creek crossings will be required. The locations where underground cable routes and access tracks will cross minor watercourses are the following:

- at three locations along Gillinghall Road:
  - part way between the proposed access WTG 10 and Goolma Road at the crossing of Reids Creek;
  - at Gillinghall Road, to the north of Dwelling 5 at the crossing of Mullion Creek; and
  - east of WTG 33;
- a number of locations along the access track following the Sandy Hollow to Maryvale Railway line, as identified on Figure 1.4, including between Gillinghall Road and Wondrona Lane;
- access track immediately east of WTG 24;
- access track south-west of WTG 12;
- at two locations along the access track to the north of WTG 13 and 27;

- at various locations where the proposed overhead (or underground) 33kV transmission line connects WTG 18 to the substation; and
- at two locations along Gunnegalderie Road.

The laying of pipes and cables in and across a watercourse is a controlled activity under the *Water Management Act 2000*, and would require approval. The NSW Office of Water *Controlled Activities: Guidelines for Laying Pipes and Cables in Watercourses* Guideline promote a number of mitigation measures for trenching options which have been considered by the proponent, which have been addressed in the proposed mitigation measures.

Flooding of local creeks may occur during times of heavy rain, however are unlikely to significantly affect the construction or operation of the wind farm. The design and construction of creek crossings will address the potential for occasional short term flooding along watercourses.

The project involves a very small land component with the majority of the project components located at upper ridges in the project area, and accordingly the project is unlikely to affect groundwater recharge which is more common at low-lying areas. No springs were observed discharging from the upper slopes.

The Central West Catchment Management Authority identifies that the project area is situated in an area of 'low' salinity risk. Since vegetation clearance, at the site is expected to be minimal, there is no expected effect to the salinity of the region as a result of the proposal.

It is expected that the operation phase of the wind farm will have minimal impact on the local drainage system.

Mitigation Measures

The implementation of mitigation measures during the upgrading of existing roads/access tracks which cross watercourses are expected to reduce the expected impact of the wind farm on site drainage.

The proponent will consider the use of overhead 33kV cables at sensitive locations, including the creek crossings as identified above in order to minimise ground disturbance and erosion risk. This measure is considered appropriate in balance between the visual impact of cables and a lower risk of erosion and native vegetation.

If underground cables are installed, measures to prevent erosion include the following (as according to NSW Office of Water *Controlled Activities: Guidelines for Laying Pipes and Cables in Watercourses* Guideline):

- cables are to be situated:

- on the downstream side of channel bedrock outcrops; and
- across a straight section of the watercourse (ie avoiding bends);

- backfilling needs to restore the channel shape and bed level to preconstruction condition;
- the trench is to be open for minimal length of time only;
- water flows should be continuous both during and after construction (ie avoiding or minimising 'stopping' the flow); and
- measures taken to prevent potential water quality issues (turbidity, spills).

With regard to the construction/upgrading of roads/access tracks, culverts or pipes should be installed underneath new roadways to ensure that the natural drainage of the watercourse and fish movements are not impacted. Culverts or pipes should be designed in accordance with the *Why do Fish Need to Cross the Road; Fish Passage; Requirements for Waterway Crossings* document (Fairfull and Witheridge, 2003).

Other measures regarding the site erosion and control measures have been included in Section 14.2.2 of this EA, which will assist in the mitigation of impacts to site drainage.

14.3.2 Water Supply Requirements

Once operational, the project will require a relatively small water supply which will be primarily sourced from roof drainage at facility buildings, and imported from domestic supplies as necessary.

The construction phase of the project will have a water requirement for dust control, use within facility buildings and fire fighting reserves. It is estimated that up to 10 megalitres of water will be required over the 18 to 24 month construction period. The majority of the water will be required for dust control measures as outlined in Section 14.2.2. The actual consumption measures will depend on the amount of precipitation during the construction period.

If a concrete batching plant is used on-site, then an additional 2.0 megalitres of water would be required, however it is most likely that concrete will be sourced off-site.

The water for the project will be obtained from the Wellington Council. The amount of water required for the project is expected to comprise a small quantity of the total water supplied by Wellington Council.

The contractor will be required to negotiate the arrangements for water supply with Wellington Council at the time of construction. In the instance that licences or permits are required for water supply, these will be obtained as required.

The following management measures will assist in ensuring the protection of groundwater:

- Any interception or the use of groundwater may require a licence under relevant NSW water legislation. All proposed groundwater works including bores for the purpose of investigation, extraction, dewatering, testing or monitoring will be identified and approval obtained from the NSW Office of Water prior to installation.

14.4 ENVIRONMENTAL MANAGEMENT OF HAZARDOUS SUBSTANCES

The project will involve the collection, storage, and removal of sewerage effluent from construction workforce facilities, and the storage and handling of fuels, oils and chemicals from the project area. Potential impacts of the project on the local environment, and the local drainage system during the operational phase of the project are a loss of oil from electrical or mechanical equipment, a low potential for leakage from batteries stored on-site, and the operation of a wastewater septic system at the construction site office and laydown area, and electrical substation area.

The following describes the storage of hazardous substances at the site:

- Oil will be permanently stored and utilised, including at the transformers located at the substation site, as well as at the base of each wind turbine. Up to 30,000 litres of oil will be stored within bunded containers at the site of the substation for use in the two transformers, with the use of a secondary containment in the form of an earthen bund embankment.

- At the wind turbine transformers, oil storage will be in the order of 2,000 litres in total across the 33 proposed wind turbines[10], and will include internal containment measures. Any leakage at turbine transformers will be small volumes and can be appropriately mitigated with a site-specific emergency response.

- Oil will also be used around the site in smaller quantities, including in vehicles or mobile equipment. The wind turbine structures will require small quantities of lubricating, hydraulic or insulating oils. The turbines will be designed to contain this oil in the event of a spill or leakage.

- Batteries will be required at the substation to supply back-up power for control systems in the event of a grid supply electricity failure. Batteries will be located in the facilities/auxiliary services building, which will contain spillage measures.

All potential impacts are assessed of 'low' risk through the use of appropriate mitigation measures:

- wastewater septic system:

    - installation and management will be in accordance with all relevant standards and guidelines, and consents obtained for discharge;
    - the Operation Environmental Management Plan will require routine inspection to ensure effective maintenance;

[10] Dry oil will be stored at the site in the event the transformer is located in the nacelle.

- storage and use of oils, fuels and chemicals generally:

  - procedures for the maintenance and handling of oils, fuels and chemicals will be documented and followed by construction and maintenance staff;
  - procedures will address waste oil removal from site and appropriate disposal or recycling; and
  - staff will be trained in emergency response and clean-up procedures should these be required, this will include waste oil removal and appropriate disposal or recycling;

- management of spills/leakages at transformers at the substation:

  - bunds for the oil storage areas at transformers will be designed to contain any spill or leak for the maximum volume of contained substances;
  - secondary containment will be provided in the form of an earth dam to contain the maximum total containment volume; and
  - spill response equipment will be maintained on-site and the site will maintain a site-specific emergency response plan;

- management of spills/leaks at wind turbine transformers:

  - oil will be stored in containers within internal bunding measures;
  - any leakage which has escaped the containment would only affect a relatively small and localised area around the generator transformer that could be effectively remediated; and
  - regular inspection of the transformers and turbine equipment will be undertaken to ensure the equipment remains in good working and leak-free condition;

- small quantities of oil stored for turbine equipment will be situated within specifically designed containment devices within the turbines, and will include spill recovery equipment and materials; and

- battery storage at the substation will incorporate containment measures, and the condition of batteries will be monitored through routine checking and adjustment of electrolyte levels and replacement as necessary.

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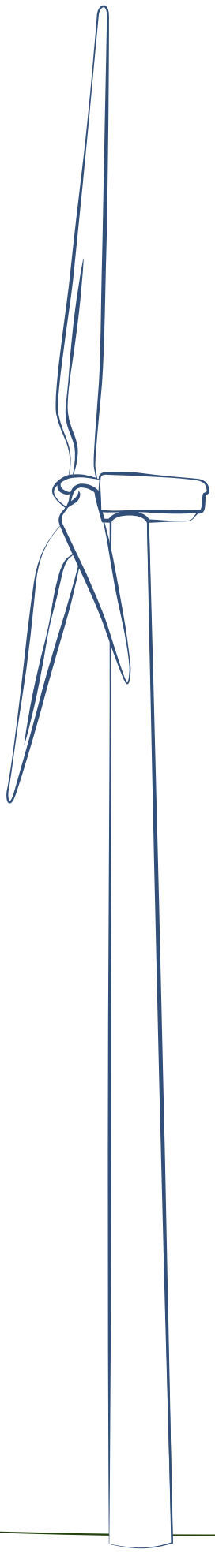
Chapter 15

Hazards



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CHAPTER 15 – HAZARDS

15.0 INTRODUCTION

This chapter of the EA provides an assessment of the hazard, safety and health issues of the Bodangora Wind Farm. These issues include aviation, physical safety, electrical safety, bushfire risk, the use of plant and equipment on steep slopes on the land, and infrasound and health.

Specifically, this chapter of the EA provides the following details, as per the Director-General's requirements (DGRs):

Director-General's Requirements:

> *"The EA must include an assessment of the potential impacts on aviation safety, taking into account cumulative impacts from surrounding approved or proposed wind farms in the locality, including the need for aviation hazard lighting considering nearby aerodromes and aircraft landing areas, defined air traffic routes, aircraft operating heights, radar interference, communication systems, and navigation aids. Aerodromes within 30 kilometres of the turbines should be identified and impacts on obstacle limitation surfaces addressed, with particular reference to Wellington Airport. In addition, the EA must assess the impact of the turbines on the safe and efficient aerial application of agricultural fertilisers and pesticides in the vicinity of the turbines and transmission line. Potential hazards and risks associated with electric and magnetic fields (EMFs) (with reference to Australian Radiation Protection and Nuclear Safety Agency standards) and bushfires must be assessed. The EA should demonstrate, particularly in relation to grid connection transmission lines, the application of the "Principles of Prudent Avoidance in relation to EMFs."*

Other hazards which are assessed elsewhere within this EA include road safety, addressed in Chapter 12 of this EA, shadow flicker, addressed in Chapter 8 of this EA, and noise and infrasound, addressed in Chapter 11 of this EA.

15.1 AIR SAFETY

The Bodangora Wind Farm will involve the construction and operation of up to 33 turbines with a maximum height of up to 150 metres to blade tip. Tall structures can become a hazard to air safety, depending on the orientation of the air strips for landing, the distance and relative height differences, and the local knowledge of the pilot.

The potential issues relating to air safety include the proximity of the site to the Wellington Aerodrome and the availability of safe aircraft approaches, aerial agricultural operations, and other flying activities including geophysical surveying and recreational flying.

15.1.1 Records of Turbine Structures

Regulation 139.365 of the *Civil Aviation Safety Regulations 1998* requires:

> *"Any person who proposes to construct a building or structure the top of which will be 100 metres or more above ground level must inform CASA of that intention and the proposed height and location of the building or structure".*

The proponent has provided the details of the proposed layout of the wind farm to CASA, the Wellington Council, Air Services Australia, the Department of Defence and the Aerial Agricultural Association of Australia. Once the final detailed design of the wind farm is approved, the elevation and height of the turbine structures will be provided to CASA prior to their erection and 'as constructed' following turbine erection so that relevant databases and maps can be maintained with accurate details of the wind farm.

According to the CASA's requirements, all relevant authorities for certified and registered airports will maintain a record of the turbine details.

15.1.2 Safety Assessment

CASA Certified and Registered Aerodromes

The Wellington Aerodrome is located approximately 4.5 kilometres to the south-west of the nearest turbine proposed. Wellington Council was consulted during the preparation of this EA, as the owner and operator of the Wellington Aerodrome. Council has advised that the major use of the aerodrome is for transport to/from the nearby Wellington Correctional Centre.

The air strip at the Wellington Aerodrome is orientated north-west/south-east, which will orientate the direction of planes away from the proposed turbines. Based on the distances involved, the topography of the locality and the obstacle limitation surfaces of the site, it is expected that aerodrome traffic will be well clear of the wind turbine structures. An Obstacle Limitation Surfaces map was sought for the project from Wellington Council.

There are no other certified or registered aerodromes located within 30 kilometres of the project area. The next closest aerodromes are at Dubbo and Mudgee, both situated approximately 45 kilometres away from the project area. Given the distance at which they are located from the wind farm site, it is not expected that the operations of these aerodromes will be affected by the proposal.

Consultation with CASA has identified no requirement for the lighting of the turbines proposed.

Having regard to the above, the wind farm is not expected to present an obstacle to certified or registered aerodromes in the locality.

Other Aircraft Operations

Other aircraft operations can include agricultural, recreational and geophysical surveying operations. No known unregistered aircraft landing strips within the immediate vicinity of the wind farm site have been identified throughout the land owner and neighbour consultation process, or through a review of the aerial photography surrounding the site, however it is likely that aircraft landing strips occur in the wider locality.

It is expected that usage of the local air fields by the relevant property owners or persons familiar with the respective properties will mean that the location of the wind farm relative to the respective air strip will be well known and as such aircraft movements for the small aircraft involved can avoid the wind turbine structures. The small planes that use the local air strips will use visual, rather than instrument based landings and the turbines are readily identified from long distances.

It is expected that aerial fertilising will still be able to be undertaken for neighbouring properties to the wind farm. The turbines are located on properties in which the land owner thoroughly understands the implications of the development; and that the turbines will constrain some future aerial agricultural operations within the project area.

The presence of the wind turbines has the potential to deter future airborne aerial surveys of the immediate locality. The prominent and visible nature of the wind turbines will mean they will be easily avoided by pilots. It should be noted that a recent airborne geophysical survey has been undertaken of the locality for the purpose of this wind farm. Similarly, the wind farm will be readily apparent to any recreational users of the aerodrome.

The 33kV overhead transmission line, proposed for connection between WTG 18 and the proposed substation will be relatively low to the ground in comparison to the height of the turbines, and is located adjacent to existing obstacles, being the 132kV Wellington-Beryl or the 330kV Wellington-Wollar transmission lines. Accordingly this overhead transmission line is not expected to be the cause of any substantial additional hazard.

Having regard to the above, the wind farm is not expected to present an obstacle to any unregistered aircraft landing strips or other aircraft operations in the locality.

15.2 PHYSICAL SAFETY

Physical safety aspects of the Bodangora Wind Farm relate to the structural or mechanical failure of a tall structure, such as errors during construction, tower failure, blade separation, ice throw and contact with moving blades. In the vast majority of cases, risks are reduced by design features of modern turbines, such as fitting the blades with metal lighting strips, and blade separation reduced though built in systems to warn of impeding failure and to shut down.

Rare instances of tower failure and blades being separated from turbines have been reported, with damage having occurred as a result of storms, materials fatigue, poor maintenance practices, or lightning. The Bodangora Wind Farm site is situated away from built areas, which significantly reduces the likelihood of a person being present in the highly unlikely event of turbine failure. During periods of high wind speeds, the turbines utilise fail-safe shut down mechanisms to avoid damage occurring, and notwithstanding there would need to be exceptional circumstances for people to be in the vicinity of a turbine during a storm event.

Land owners will be advised to avoid the area around the turbines during the few periods of below freezing temperatures at this location each year to avoid the very unlikely possibility of ice being formed on the blades, and this ice being dislodged.

There is no likely risk of persons coming into contact with moving blades during operation as the minimum distance between blade tip and the ground will be 30 metres.

Further, the proposed wind farm is physically separated by roads, and will incorporate signage at property entry points to warn for 'no entry', and turbines will automatically shut down when maximum speeds are reached to ensure safe operation.

Physical safety as part of the wind farm will be ensured by meeting the following relevant standards:

- AS/NZS 1170.2 - Structural Design Actions- Wind Loads;
- AS/NZS 1170.4- Structural Design Actions-Earthquake Actions;
- AS 2550 - Cranes - Safe Use;
- AS 3600 - Concrete Structures;
- AS 4100 - Steel Structures (except tower);
- Steel Tower – DIN 18 800;
- IEC 61400-1 Wind Turbine Generator Systems - Safety Requirements; and

- IEC 61400-23 Wind Turbine Generator Systems – Full-scale structural testing of rotor blades.

In addition, all construction works will be carried out in accordance with all relevant requirements of the WorkCover Authority and other statutory requirements.

Based on Infigen's global fleet of turbines and industry experience, the probability of blade throw is around 1:3000, and the risk of this affecting anyone is significantly lower.

At some locations through the project area, access tracks will be located on or close to steep slopes, where a risk of accidents exist for mobile plant or vehicles leaving the track area and descending the slope. Measures to reduce the risk of accidents will include the following:

- the identification of steep areas prior to the construction period commencing;
- the 'benching' of steep access locations into the slope to provide for safe trafficable passage;
- the installation of barriers, warning signs and/or tapes where steep areas have been identified to alert drivers of the hazard;
- construction periods during daylight periods only; and
- monitoring of working conditions.

15.3 ELECTRICAL SAFETY

Electrical safety is a key design consideration for the Bodangora Wind Farm, and safe conditions will be achieved by ensuring that the design of plant and equipment are achieved in accordance with the relevant standards, or approval obtained for an alternative specification if necessary.

Standards include the following:

- AS/NZS 4853 – Electrical Hazards on Metallic Pipelines;
- AS 3000 – Australian SAA Wiring Rules;
- IEC 61024-1 – Protection of Structures against lightning – Part 1: General Principles;
- IEEE STD 80 – Guide for Safety in AC Substation Grounding;
- IEC 60034 – Rotating Electrical Machines;
- BS 4999 – General Requirements for Rotating Electrical Machines;
- BS 5000 – Specification for Rotating Electrical Machines of Particular Types or for Particular Applications Compliance with BS 5000 subject to review;
- IEC 60076-1 – Power Transformers: Part 1 General;
- IEC 60146.1.1 Semiconductor converters – General requirements and line commutated converters;
- IEC 62271.100 High-voltage switchgear and control gear – High-voltage alternating-current circuit-breakers;
- IEC 60282.1 – HV Fuses (for Rated Voltages greater than 1,000 volts);
- IEC 62271.200 High-voltage switchgear and control gear – A.C. metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV;
- IEC 60529 – Degrees of Protection Provided by Enclosures;
- IEC 60947 – Low Voltage Switchgear and Control gear;
- IEC 60439.1 – Low Voltage Switchgear and Control Gear Assemblies; and
- IEC 60269.1 – Low Voltage Fuses - General Requirements.

One anticipated issue is lightning strike, however lightning protection is a standard design features of all modern turbines. Electrical failure is a potential bushfire risk, as described in Section 16.4 below.

The following are management and mitigation measures to document the safe construction and operation of the electrical equipment for the project to address the requirements listed above, in addition to other general safety requirements:

- protective equipment will be installed to detect faults and disconnect faulted equipment;
- the substation will be equipped with an underground earth grid which will extend for a distance of 1.0 metre beyond the perimeter fence, as well as surge diverters and lightning masts;
- public access to live electrical equipment will be prevented by a perimeter fence of chain and barbed wire construction to a height of 2.0 metres;
- the effects of lightning strike will be reduced by the following turbine design features:
    - metallic conductors running throughout the turbine blades and electrically connected to the metal structure;
    - supporting structures to be sufficiently well earthed to limit the voltage rise during a lightning strike; and
    - internal electrical equipment to be protected against voltage rises due to lightening.

Further information relating to Electric and Magnetic Fields (EMFs) is provided in Section 15.5 of this EA.

15.4 BUSHFIRE RISK

Issues associated with bushfire risk include the potential for the construction or operational activities to initiate a bushfire, and the impacts on the facility for a bushfire affecting the site, whether originating from the site or elsewhere.

The risk of bushfire during the construction period is most likely to originate from 'hot work' activities such as welding, fires within engines, or from sparks from friction igniting dry-grass.

During operational periods, bushfire risk is most associated with electrical failure. Mitigation measures for electrical failure are prescribed in Section 16.3 above. A number of features of the wind farm will assist in reducing bushfire risk, including:

- the use of fully enclosed electrical equipment on turbine structures and padmount transformers;
- extensive use of underground cabling between turbines;
- design of any overhead lines in accordance with industry standards;
- exclusion of vegetation from within the substation enclosure;
- the use of circuit breakers and fuses to interrupt any electrical fault; and
- the adoption of the lightning protection measures.

The proposal will be mostly located in cleared grazing areas, with occasional scattered trees. The overall risk of bushfire to the project is 'low'. Where turbines are located adjacent to steep slopes and have considerable vegetation cover, the risk of bushfire is slightly higher. The nature of grass risk will depend on the level of grazing and climatic conditions. Within the site, alternative access and egress routes exist for most wind turbine sites should they be required in the event of an emergency.

A Bushfire Risk Management Plan (BFMP) will be prepared by the project contractor in consultation with the NSW Rural Fire Service (RFS) . The plan will be incorporated into the Construction and Operational Environmental Management Plans. The plan will ensure that the wind farm will be designed, constructed and operated to minimise ignition risks, and provide for asset protection consistent with relevant RFS design guidelines, including *Planning for Bushfire Protection 2006* and *Standards for Asset Protection*.

The following management measures will be incorporated within the BFMP as part of the Construction Environmental Management Plan:

- at the commencement of building works the property around the wind turbines to a distance of 20 metres shall be maintained as an inner protection area;
- the contractor will be required to comply with all relevant sections of the *Bush Fires Act 1954* and the *Fire Brigades Act 1942* and will be required to liaise with the Rural Fire Service;
- where necessary, native vegetation may be required for removal where in excess of 100 millimetres high at access track and work sites locations;
- construction vehicles will use diesel fuel;
- a mobile 1,000 litre water tanker unit complete with motor-driven pump, hose and nozzle will remain at the site during construction work;
- knapsack sprays and McLeod tools (handheld fire fighting tools) will be kept at each work station;
- where welding is undertaken, flame cutting or grinding will be carried out in the open during periods of fire danger, and an observer will be required to hold a knapsack spray on hand;
- the contractor will be required to maintain the exhaust systems of all vehicles on-site in sound condition and to avoid any build-up of dry vegetation under vehicles; and
- on days of high bushfire risk, the use of explosives will not be allowed.

The following measures will be incorporated into the BFMP as part of the Operational Management Plan:

- the property around the wind turbines to a distance of 20 metres shall be maintained as an inner protection area;
- suitable buffers between vegetation and installed equipment and working areas will be maintained; and
- alternative access tracks to installed equipment maintained where existing.

15.5 ELECTRIC AND MAGNETIC FIELDS

15.5.1 Background

Electric and Magnetic Fields (EMFs) are a combination of invisible electric and magnetic fields, which occur both naturally (light is a natural form of EMF) and as a result of human activity. Nearly all electrical and electronic devices emit some type of EMF, and humans are readily exposed to numerous EMF fields on a daily basis.

Examples of EMFs are identified in Table 15.1 below.

Table 15.1 – Typical Magnetic Field Measurements and Ranges Associated with Various Appliances and Power Lines (Energy Networks Association, 2006)

	TYPICAL MEASUREMENT (MG)	RANGE OF MEASUREMENTS (MG)
Stove	6	2 – 30
Desktop Computer	5	2-20
Television	1	0.2-2
Electric Blanket	20	5-30
Hair Dryer	25	10-70
Refrigerator	2	2-5
Toaster	3	2-10
Kettle	3	2-10
Fan	1	0.2-2
Distribution Line: directly under the line	10	2-20
Transmission Line:		
Directly under the line	20	10-200
At the edge of the easement	10	2-50

EMF has in the past been identified as a potential issue wherever electrical equipment operates. Despite extensive research and numerous public inquiries, whilst adverse health effects have not been established, the effects have not been entirely ruled out for high voltage lines.

15.5.2 Relevant Guidelines

The National Health and Medical Research Council (NHMRC) provide the following conclusive statements based upon research of the effect of EMF from wind farms in *Wind Turbines and Health; A Rapid Review of the Evidence* (July 2010):

> *"The electromagnetic fields produced by the generation and export of electricity from a wind farm do not pose a threat to human health (Windrush Energy, 2004). The closeness of the electrical cables between wind turbine generators to each other, and shielding with metal armour effectively eliminates any EMF (Australian Wind Energy Association, no date)."*

Notwithstanding, in designing new electrical equipment, a precautionary approach to EMF risk is recommended whilst research continues. The main sources of EMFs from the wind farm would be the electrical equipment within the turbine structures, the substation and the interconnecting underground cables and any overhead transmission lines.

It is important to note that there are currently no Australian standards for exposure to power frequency. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) of the Australian Government has prepared a draft *Radiation Protection Standard; Exposure Limits for Electric & Magnetic Fields – 0 Hz to 3 kHz; Public Consultation Draft* dated 7 December 2006. Whilst the research has identified that concerns for the health effects of electric and magnetic fields is not fully dispelled by existing scientific data, a precautionary approach is recommended.

Previously, the NHMRC has provided *Interim Guidelines on Limits of Exposure to 50/60 Hz Electric and Magnetic Fields* (1989). These Guidelines identify a 24 hour exposure limit of 1,000 milligauss (mG) for magnetic fields and 5.0 kilovolts per metre (kV/m) for electric fields, and a for exposure for a few hours each day, a limit of 10,000 mG for magnetic fields and 10 kV/m for electric fields.

15.3.3 Expected Impact

Previous research has identified the following previously measured EMFs (note that the following information provides details for larger transmission lines than those proposed at Bodangora):

- transmission lines:
  - measurements from immediately underneath a 220 kV transmission line identified a maximum of the equivalent of 78 mG (Transpower, 2009);
  - levels of a magnetic field measured under a 330 kV transmission line ranged from 5.0 to 50 mG at a distance of 30 metres from the centre of the easement (NGH Environmental, 2008);
  - electric field measurements from immediately underneath a 220 kV transmission line resulted in a maximum recorded limit of 3.2 kV/m (Transpower, 2009);

- electric field measurements from 30 and 60 metres from a 115 kV transmission line have been recorded at levels of 0.7 kV/m and 0.01 kV/m respectively (Hafemeister, 1996);

- substations have been recorded at between 1.0 mG and 66 mG (recorded at the security fence) (Health Protection Agency, 2004); and

- a 1.65 MW wind turbine has recorded a magnetic field of 0.04 mG at a distance of approximately 3.0 metres from the base of the turbine, with no measurable magnetic field identified at a distance of 7.5 metres from the base of the turbine (Windrush Energy, 2004). The EMF from a 3.5 MW wind turbine as proposed is similarly expected to provide minimal EMFs, and for the EMF active to decline as distance from the turbine increases.

The nearest dwellings to electrical infrastructure are as follows (refer to Figures 1.3 and 4.2):

- neighbouring dwellings:
  - the nearest neighbouring dwelling to a wind turbine is Dwelling 24, located approximately 2.35 kilometres from WTG 16;
  - the nearest neighbouring dwelling to the substation is Dwelling 17, located approximately 1.2 kilometres. This dwelling is situated closer to the existing 132kV Wellington – Beryl and 330kV Wellington – Wollar transmission lines, given the substation will be constructed to the north;

- dwellings with land owner agreements:
  - the nearest dwelling with a land owner agreement to the overhead 33kV powerline connecting WTG 18 and the proposed substation is Dwelling 9, located at a distance of approximately 400 metres; and
  - the nearest dwelling with a land owner agreement to a wind turbine is Dwelling 1, located at a distance of approximately 400 metres to WTG 37.

Accordingly, whilst the actual level of EMFs will be dependent on a number of factors according to the final design including on the load current, the spacing of equipment, and temperature, it is expected that the proposal will easily conform to the recommended maximum exposure of 1,000 MG in a 24 hour period for all sensitive receptors which are within or proximate to the project area.

The nearest dwelling to any EMF source is a dwelling located approximately 400 metres from the 33kV overhead powerline, and a dwelling located approximately 400 metres from WTG 37. It is expected that both infrastructure is sited to provide adequate separation based upon the measurements described above. Whilst the information above relates to a wind turbine of 1.65 MW, it is expected that all 3.5 MW wind turbines are adequately sited.

All sensitive receptors are appropriately separated from EMF sources. The electrical components of the project will be largely located on elevated ridges, and all electrical components are located on private property. The equipment will be occasionally visited by project workers, and accessible also to land owners and farm workers only. In all cases, all EMFs will be very localised in areas not frequented by the general public. On this basis, the possibility of human health effects due to EMFs is not considered to be an issue for the project.

All equipment will be constructed according to industry accepted practices and standards. The Draft *Radiation Protection Standard* identifies that there is a range of Australian occupational, health, safety, and environmental laws which provide obligations on employers, designers, manufacturers and suppliers of equipment to ensure activities or equipment does not form an unreasonable or unacceptable risk to the health and safety of employees or third parties that may be affected. In effect, these laws require relevant parties to continually assess and improve the safety and health impact of their activities.

15.6 PUBLIC HEALTH

There are public concerns that wind turbines could potentially cause health issues, including diabetes, heart palpitations, behaviour swings, depression and headaches. These alleged public health effects have been considered by a senate enquiry in 2010 and by state governments.

In 2010, the National Health and Medical Research Council of the Australian Government issued a statement on this matter of wind turbines and human health (NHMRC, 2010). It stated:

> *"There are no direct pathological effects from wind farms and that any potential impact on humans can be minimised by following existing planning guidelines".*

Further, the NSW Ministry of Health made a submission on the *Draft NSW Wind Farms Planning Guidelines*, correspondence dated 15 March 2012. This submission indicated that NSW Health recommend that there is currently no evidence to support a generic 2.0 kilometre separation distance from dwellings to a proposed wind turbine on grounds of health effects.

No wind turbines are proposed to be located within 2.0 kilometres of any neighbouring dwelling. All associated dwellings (including those located within 2.0 kilometres of a wind turbine) have signed an agreement with Bodangora Wind Farm Pty Ltd with full knowledge of alleged health risks.

NSW Health made a statement on the expected health effects of wind farms in the Capital II Wind Farm determination. Consistent with this recommendation, the proposed Bodangora Wind Farm complies with the South Australian EPA *'Environmental Noise Guidelines: Wind Farms'* (2003) and other relevant Director-General Requirements.

Further, we note that Infigen as the largest owner of operating wind farms in Australia, have never received any formal complaints relating to health.

Accordingly, the proposed wind farm is not expected to cause any adverse human health impacts.

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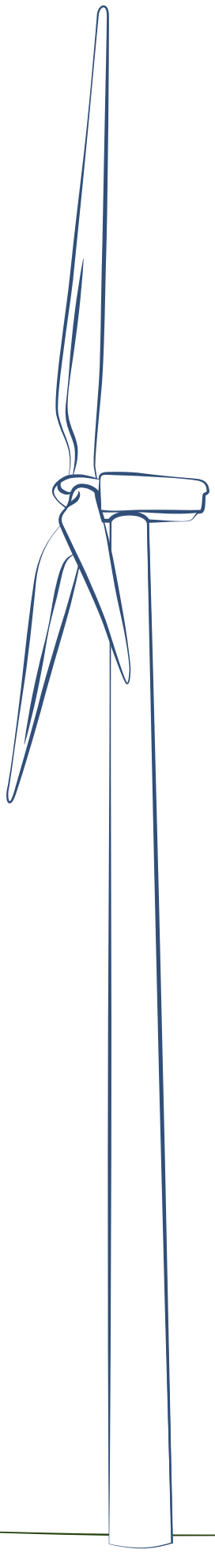
Chapter 16

Social & Economic Aspects



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CHAPTER 16 – SOCIAL & ECONOMIC ASPECTS

16.0 INTRODUCTION

This chapter of the EA provides an assessment of the social and economic aspects of the development.

Specifically, this chapter of the EA provides the following details, as per the Director-General's requirements (DGRs):

Director-General's Requirements:

"Taking into consideration the … social and economic impacts of the project".

16.1 SOCIAL ASPECTS

The Wellington Council area has a predominately rural character, with the majority of rural land being sheep and cattle grazing and cropping. Wellington is the largest town in the Council area, and provides health, educational and recreational opportunities for the regional population. Wellington is also serviced by larger towns in neighbouring local government areas including Dubbo.

An extensive consultation programme for the wind farm has been undertaken to date, and is detailed in Chapter 6 of this EA. Neighbours to the wind farm have expressed various views in regard to the project. Whilst the majority have indicated support for the project, others have expressed concerns relating to the visual aspects of the project in particular. An assessment of the visual impact of the project is located in Chapter 8 of this EA. Mitigation measures, particularly the planting of screening vegetation is expected to improve the visual integration of the wind farm, and the retention of the existing landscape character. On balance, the visual landscape of the region has the capacity to absorb the proposed development.

The following describes the likely social effects of the wind farm development:

- The development is unlikely to affect the ongoing rural use of land within the project area, or the rural use of neighbouring land. There are no neighbouring residences within 2.0 kilometres of any wind turbine. There will be some disruption of rural activities within the project area during the construction phase of the project to associated land owners.

- The project will allow for employment and associated economic benefits within the region, particularly resulting from the construction stage of the project. Services such as accommodation, vehicle maintenance, refuelling and food are likely to benefit from additional construction staff. These services are likely to be spread within the region including at Wellington, Mudgee, Gulgong and Dubbo.

- A viewing area for the Bodangora Wind Farm is proposed to be developed at a later stage. This viewing platform will assist visitors to safely view the wind farm and to learn more about the wind farm operation. Wind farms are a proven tourist attraction.

Also regarded as an economic aspect, neighbours to the wind farm have expressed an opinion that the wind farm may affect property values in the region. There is limited evidence that wind farm developments lead to reduced property values, it is not unusual for neighbours to not be supportive of developments where they result in a change to the existing environment, whether small or large. In 2009, the NSW Department of Land published the *Preliminary Assessment of the Impact of Wind Farms on Surrounding Land Values* in Australia, prepared for the NSW Valuer-General. The following has been extracted from the Executive Summary of the report:

"This study investigated eight (8) wind farms across varying land uses (rural, rural residential, residential) using conventional property valuation analysis. Two (2) wind farms were selected in NSW and six (6) in Victoria.

The main finding was that the wind farms do not appear to have negatively affected property values in most cases. Forty (40) of the 45 sales investigated did not show any reductions in value. Five (5) properties were found to have lower than expected sale prices (based on a statistical analysis). While these small number of price reductions correlate with the construction of a wind farm further work is needed to confirm the extent to which these were due to the wind farm or if other factors may have been involved.

Results also suggest that a property's underlying land use may affect the property's sensitivity to price impacts. No reductions in sale price were evident for rural properties or residential properties located in nearby townships with views of the wind farm."

Overall, it is expected that the Bodangora Wind Farm will have minimal negative social effects to the region. The proposal will provide a stimulus to the local economy, with resultant employment opportunities in particular.

16.2 ECONOMIC ASPECTS

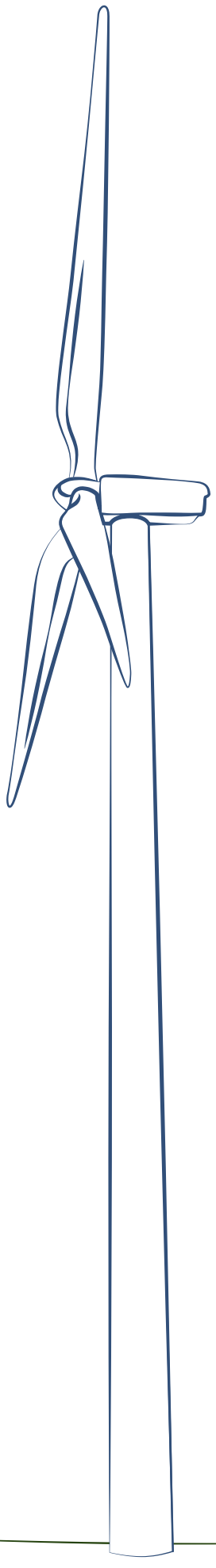
The Bodangora Wind Farm is being developed as a commercially viable project, and produce electricity for the National Electricity Market. At a national level, the project will contribute to Australia's economic health through reduced reliance on non-renewable resources. Renewable energy sources have a greater degree of insulation of global energy prices and global instability.

The project will provide for increased employment opportunities during the construction phase of the project, and also as flow-on effects to businesses in the local community. Bodangora Wind Farm Pty Ltd has established a contractors' register list, identifying local tradesman for use within the project. Large contractors used for the project will be encouraged to employ local tradesman for suitable construction where possible.

The following can be expected:

- Income to local service suppliers, including accommodation, food and general supplies, service stations, local contractors, and increased employment and associated incomes as a result in the wider region including surrounding towns.
- Employment to a large temporary workforce, and a smaller workforce for ongoing operations and maintenance activities.
- Improvements to local infrastructure within Wellington Council and more particularly within the project area, however roads in the wider region may experience some wear and tear as a result of heavy traffic movements.
- Properties situated within the project area with financial agreements with the proponent will supplement existing farming related incomes with the agreed lease rates for the land required for the project development, this will assist in 'drought proofing' the properties.
- Whilst there will be limited opportunity for increased rural residential densities throughout the project, this opportunity is not reflected within Zone 1(a) (General Rural) as further subdivision of pastoral properties is restricted. Accordingly this is not considered a significant issue.

Overall, it is expected that the project will provide substantial benefits to land owners within the project area, and will provide an economic stimulus to parts of the local economy in the wider region.



Chapter 17

Cumulative Impact

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CHAPTER 17 - CUMULATIVE IMPACT

17.0 INTRODUCTION

This chapter of the EA includes an assessment of the cumulative impacts of the proposed Bodangora Wind Farm development.

The Department of Planning's Guideline for wind energy facilities states that:

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

The cumulative impacts of the wind farm on the region are to be considered in the context of existing and proposed developments, and the general environmental characteristics of the region.

As identified in Section 4.3.4 of this EA, the existing and proposed major developments/infrastructure in proximity to the project area are the following:

- the existing 132kV Wellington-Beryl electrical transmission line and the 330kV Wellington-Wollar electrical transmission lines, transecting the south-eastern portion of the project area;
- Wellington Correctional Centre located along Goolma Road towards Wellington;
- the proposed Uungula Wind Farm, comprising up to 330 wind turbines located a minimum of 12 kilometres from the Bodangora Wind Farm project area (application lodged with the Department of Planning and DGR issued);
- the approved Wellington Gas-Fired Power Station, located nearby to the existing Wellington Substation, along Goolma Road towards Wellington; and
- gas pipelines, including one approved gas pipeline connecting Young and Wellington, and one proposed gas pipeline (DGR's issued), connecting Narrabri and Wellington.

17.1 CUMULATIVE EFFECTS OF WIND FARMS IN THE LOCALITY

The proposed Bodangora Wind Farm will be located in cleared pastoral land, with low density rural residences. Besides the location of the proposed Uungula Wind Farm to the south-east, land to the north and west of the project area is generally less suitable for wind farm development according to the wind modelling results undertaken by the proponent of the development. Suitable sites are elevated, with cleared land, and with potential for grid connection in close distance. Whilst there is a likelihood of future development of wind farms in NSW, such developments are limited to sites that have a suitable wind energy resource and which satisfy a range of environmental, social and infrastructural requirements, and have land owner agreement. A number of elements will prevent further wind farms in the wider region, including general topographical constraints, Lake Burrendgong, National Parks, town centres and associated developed areas. When these factors are considered, it is likely that there is limited potential for additional wind farm developments within proximity of the Bodangora Wind Farm project.

The proposed Uungula Wind Farm is likely to be the only potential wind farm located within proximity to the Bodangora Wind Farm project area. The main cumulative impact related to multiple wind farm development is usually related to the combined visual impact of the wind farms at locations where more than one wind farm is visible. An assessment of the cumulative visual impact of the two wind farms has been undertaken by Moir Landscape Architecture, and is included in Section 8.3.3 of this EA.

The analysis concludes that it is unlikely that the receptors in the locality will be able to view both developments in combination, largely as a result of the topography and vegetation within the landscape. Whilst some elevated locations may have views of both wind farms, there are few sensitive receptors located at the ridge lines in which the turbines of the Bodangora Wind Farm are located.

Notwithstanding, there may be a perceived visual impact where the two wind farm developments are viewed in succession as travellers move through the landscape. Generally it is considered that as the viewing distance increases, the visibility of the wind farm/s increases, however the turbines become smaller in scale and a less significant element within the landscape. Whilst it is conceivable that if other wind farms in the local area became more prevalent, and the spatial and landscape separation between the wind farms decreases, there may be limitations for continued development on visual amenity grounds.

Cumulative noise impact is not expected given there will be at least 12 kilometres distance between the two proposed wind farms. There are no residences which are expected to receive a noise impact from both the Bodangora and Uungula wind farms, in that the immediate neighbours are not expected to be affected by the operating noise of both the Bodangora Wind Farm and Uungula windfarms. Accordingly, the cumulative noise impact is not expected to be an issued.

Specialist investigations included within this EA, including avifauna impacts have been undertaken within a broader regional context, and other environmental issues such as heritage and vegetation clearing are expected to be site specific to the Bodangora Wind Farm.

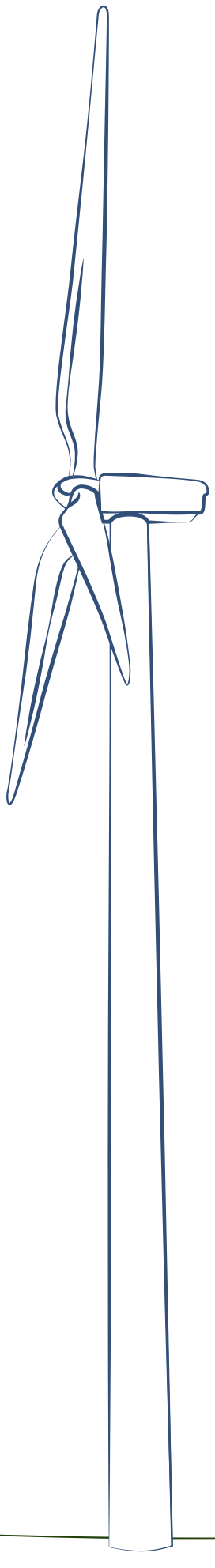
17.2 CUMULATIVE EFFECTS OF OTHER INFRASTRUCTURE IN THE LOCALITY

As identified, existing and proposed infrastructure in the locality include existing electrical transmission infrastructure, proposed underground gas pipelines, a proposed gas fired power station (adjacent to an existing substation), and the Wellington Correctional Centre.

The electrical transmission lines existing within the project area are proposed for connection to the Bodangora Wind Farm, through the development of a 33kV/132kV substation. The 33kV transmission line between the wind turbines and the substation form part of this EA. The proposed 33kV transmission line is a far smaller structural element than the existing 132kV transmission line already existing in the locality, and the location of the proposed 33kV transmission line is centrally located within the 'project area', where is it distant to neighbouring properties. The 33kV transmission line will, however cross Goolma Road.

In addition, the existing Wellington Correctional Centre, existing substation and proposed gas fired power station are located along Goolma Road towards Wellington. The proposal is not expected to cause impact or be affected by the Bodangora Wind Farm in terms of cumulative visual impact, given the separation distances involved. New gas pipelines are not expected to cause any cumulative impact, given the majority of the infrastructure will be located underground.

Accordingly, the cumulative impact of the wind farm with existing infrastructure is considered to be very minor, given the scale and distance of the infrastructure components.



Chapter 18

Risk Analysis

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CHAPTER 18 – RISK ANALYSIS

18.0 INTRODUCTION

The Director-General's Requirements for the Bodangora Wind Farm requires an assessment of the general environmental risk factors to consider all potential environmental issues, the level of risk of those issues, management options identified, and the resulting level of risk.

Director-General's Requirements:

> *"Notwithstanding the above key assessment requirements, the EA must include an environmental risk analysis to identify potential environmental impacts associated with the project, proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of the additional key environmental impact(s) must be included in the EA".*

The assessment has been prepared with reference to the method described in Australian Standard 203:2006 *Environmental Risk Management – Principles and Process* and the Companion to AS 203:2006. The following provides a description of the methods used in the analysis in this chapter.

Guide words have been used to define each risk analysis component so that there is a common understanding of the meaning. These are described in Table 18.1.

Table 18.1 – Classification of Consequence. Sourced from Companion to AS 203:2006

CATEGORY	HEALTH AND SAFETY	ENVIRONMENT	COMMUNITY
Catastrophic	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	Single fatality and/or sever 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	Injury or illness (hospitalisation).	Moderate impacts on populations and habitat but no negative impacts on ecosystem function,	Moderate inconvenience leading to general community concern.

CATEGORY	HEALTH AND SAFETY	ENVIRONMENT	COMMUNITY
		damage to a limited area.	
Minor	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	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.

The following provides the classification of likelihood or probability of an impact or event occurring during the lifetime of the project.

Table 18.2 – Classification of Likelihood. Sourced from Companion to AS 203:2006

CATEGORY	DESCRIPTION	FREQUENCY
Almost certain	Expected to occur frequently	At least annually or more frequently
Likely	The event has occurred in the past	Once every three years
Possible	The event may occur, unusual but possible	Once every 10 years
Unlikely	Not expected to occur	Once every 30 years
Rare	Conceivable only in exceptional circumstance	Once every 100 years

The following provides the consequences and likelihood of the impact or event to develop the level of management required to minimise the risk of the event or impact occurring.

Table 18.3 – Qualitative Risk Analysis Matrix

		CONSEQUENCE				
		CATASTROPHIC	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 management requirements apply:

- extreme – immediate action required;
- high – senior management attention required;
- moderate – management responsibility and required ongoing monitoring and maintenance; and
- low – managed by routine procedure.

Two levels of risk have been provided in this analysis:

- level of initial risk: this is an assessment of the potential project environmental risk before any project planning, controls or mitigation measures have been considered. This would be considered the worst case scenario in the absence of any environmental consideration during the planning and implementation of the project; and
- mitigated risk: this provides the assessment once the environmental issues have been considered and appropriate mitigation measures or controls have been put in place. The safeguards, controls and mitigation measures considered have been included in the table. Therefore, this column represents the risk of the project constructed and operated as proposed in this EA.

The information in Table 18.4 shows that risks associated with key environmental issues have been identified and considered, and that potential impacts can be effectively managed through the mitigation operation that have been recommended.

Issues that require ongoing monitoring, review and possible corrective action in the event of unforeseen and unacceptable impacts, a minimum residual risk has been assigned.

Bodangora Wind Farm Pty Ltd has given consideration to whether there are other potential environmental impacts associated with the project which were not identified in the Director-General's Requirements. 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 farm projects also owned by Infigen Energy.

18.1 RISK ASSESSMENT

The following provides a risk assessment analysis which has been carried out for the Bodangora Wind Farm using the qualitative risk analysis matrix shown in Table 18.3.

Table 18.4 – Environmental Risk Analysis

ASPECT	POTENTIAL IMPACT	L	C	LEVEL OF RISK	PROPOSED MANAGEMENT	MITIGATED RISK
					L – Likelihood, C - Consequence	
LAND USE						
Mineral Exploration	Development in an area of significant mineral potential.	C	3	High	Consultation with Department of Industry and Investment, Department of Primary Industries, and all mineral title holders. The wind farm is likely to have minimal effect on underlying mineral resources.	Low
Agriculture	Development will reduce potential for existing primary production land uses.	D	4	Low	Assessment has determined development will not prevent or prejudice the continuation of existing primary production land uses. Development will not result in subdivision (with exception for substation allotment) Additional income for wind farm properties can be reinvested into improved rural production, reducing the potential for further subdivision. Management measures relate to control of weed species, dust management and water as outlined elsewhere.	Low
VISUAL ASPECTS						
Visual impact of turbines	Visual impact of turbines and infrastructure on local community and non-associated land owners. Change to landscape character. Cumulative impact.	C	4	Moderate	Removal of WTG 8, 9, 28 and 47 following land owner consultation, primarily to mitigate views and improve amenity. The visual impact of the project has been assessed in Chapter 8 of this EA. Vegetation screening is proposed to mitigate in areas of high visual sensitivity, with additional screen planted to be undertaken subject to land owner and neighbour requests.	Low

ASPECT	POTENTIAL IMPACT	L	C	LEVEL OF RISK	PROPOSED MANAGEMENT	MITIGATED RISK
					The spatial separation of proposed and existing infrastructure in the locality is expected to mitigate cumulative views.	
Visual impact of other infrastructure	Visibility of associated infrastructure including tracks, cabling, transmission lines.	C	4	Moderate	Earthworks will be restored as soon as practical following construction. Cable trenches will be backfilled as soon as possible. Overhead lines are largely located away from roads and minimised. Substation is not visible from any dwellings or public roads.	Low
Shadow Flicker	Five dwellings have been identified which are likely to experience shadow flicker. All are associated land owners. Of these, two dwellings are at risk of experiencing shadow flicker levels beyond guidelines.	D	4	Low	Modelling indicates all five associated dwellings which are likely to experience shadow flicker will experience less than 45 minutes per day. No neighbouring dwellings will experience shadow flicker given distance from turbines.	Low
Blade glint	Sun reflection off blades causing annoyance to local community and distraction to local road users.	C	4	Moderate	Blade surface is designed for low reflectivity with a matte coating to reduce turbine glint. Turbine location at higher altitudes will negate blade glint.	Low
FLORA AND FAUNA						
Avifauna Bird Strike	Potential for avifauna deaths by blade strike, air turbulence and barotrauma.	C	4	Moderate	The flora and fauna assessment has concluded that there is no supportive habitat or topographical features present suitable for birds which would be most likely to collide with turbines. Records of bird heights identified the majority of birds fly below the rotating blade diameter. Measures will be taken to reduce the impact to birds of prey, such as ensuring no turbine has perching places, and dead animals within 200 metres of a turbine are removed as soon as possible.	Low
Vegetation and Habitat	Extent of clearing required for infrastructure. Disturbance to native fauna habitat.	C	4	Moderate	Infrastructure has been located to avoid habitat features, and native vegetation clearance will be minimal as the majority of tower locations and access routes are located over heavily modified grazing land. Large mature trees have been avoided and can be retained.	Low

ASPECT	POTENTIAL IMPACT	L	C	LEVEL OF RISK	PROPOSED MANAGEMENT	MITIGATED RISK
					Micrositing during final detailed project layout will occur to avoid clearing and identified areas of threatened or significant vegetation. Where clearing is required it will be undertaken in the presence of an ecologist. A flora and fauna management sub-plan will be prepared as part of the CEMP. Weed control measures will be implemented.	
Threatened species	Potential impact of project on threatened species.	C	3	Moderate	The flora and fauna assessment has identified that no threatened plant species identified under State legislation will occur or are likely to occur in the project area. Three threatened species and one threatened community which are identified under State legislation occur. Mitigation measures outlined above will protect against impact to State legislated threatened species. A field survey for the Superb Parrot will be undertaken to determine whether the species is only a winter visitor to the project area and the results reported to Department of Planning and DECCW.	Low
HERITAGE						
Aboriginal Heritage	Potential disturbance of Aboriginal sites or objects.	D	3	Moderate	Comprehensive investigations have been undertaken. A heritage sub-plan will be prepared as part of the CEMP. Track and cabling locations will be micro-sited to avoid sites of known heritage significance. Where a known artefact site has been identified (listed as SU18/L1 in Chapter 10), a conservation strategy will be developed to detail the avoidance of this artefact by design through the diversion of the proposed access road around the artefact. Unrecorded artefacts are likely to be present in low or very low densities only. The predicted impact following the comprehensive investigation is low. Where any additional unrecorded Aboriginal objects are encountered, works shall cease immediately and DECCW will be notified immediately of the find.	Low

ASPECT	POTENTIAL IMPACT	L	C	LEVEL OF RISK	PROPOSED MANAGEMENT	MITIGATED RISK
					An additional archaeological survey will be conducted in any area proposed for development that has not been previously surveyed. A cultural management protocol will document procedures required for impact avoidance or mitigation, developed in consultation with an archaeologist, the relevant Aboriginal communities and the NSW Office of Environment and Heritage.	
Non-Aboriginal Heritage	Potential disturbance to non-Aboriginal heritage sites	D	3	Moderate	A heritage sub-plan will be prepared as part of the CEMP. None of the survey units or non-Aboriginal heritage items as identified within the project area have been identified to surpass archaeological significance thresholds which would preclude the proposed development. Sections of the Sandy Hollow to Maryvale Railway is currently utilised as a farm road within the project area. This road is proposed for upgrade, however it is not expected that there will be any future impact beyond what is existing. A Statement of Heritage significance has been prepared and is located at Attachment A to **Attachment I**. The Kaiser Mine will be identified as a restricted area during wind farm construction through the erection of fencing. Where any additional historic items are encountered, works shall cease immediately to allow an assessment of the object by an archaeologist.	Low
NOISE						
Operational noise	Potential for exceedance of operational noise guidelines for nearby sensitive receivers. Impact from modulation, low frequency or infrasound noise. Potential that noise will impact on health	D	4	Moderate	Comprehensive noise modelling of the operational noise aspects of the wind farm has been undertaken. Noise levels of the turbines and substation are predicted to comply with the relevant standards in a 'worst case' scenario. In the event that the turbine noise levels exceed the noise predictions, the noise of the turbines will be reduced through the use of lower noise modes for use under certain operating conditions which produce lower noise levels in accordance with the required standards. Compliance with the stringent guidelines for operational noise will account for the noise of the 'swish' of turbines (modulation) and for low level noise.	Low

ASPECT	POTENTIAL IMPACT	L	C	LEVEL OF RISK	PROPOSED MANAGEMENT	MITIGATED RISK
					Infrasound reduces at distances, and separation distances between turbines and sensitive receptors are adequate. There is no scientific or medical evidence that infrasound or low frequency noise causes health effects.	
Construction noise	Potential for exceedance of construction noise limits resulting from traffic noise, construction activities, blasting noise and vibration	C	3	High	Comprehensive noise modelling has considered the worst case scenario of the likely construction noise. It is expected that a dwelling 1,200 metres from construction activity may be 'noise affected' but not 'highly noise affected'. The proponent has proposed to apply 'all feasible and reasonable work practices to meet the noise affected level'. A Construction Noise Management Sub-Plan will be prepared for the CEMP. A range of engineering, administrative, and site management measures are proposed to limit noise. This includes measures such as acoustic barriers, propriety enclosures, for fixed noise structures to be located at a maximum practical distance from dwellings, regular inspections, construction works limited to designated periods, and an equipment and vehicle monitoring regime will occur. Traffic will be limited to day time operation, will follow the approved construction route, will be evenly disbursed, and care will be taken to avoid the acceleration of trucks in close proximity to dwellings. There will be a thorough community notice program and complaints register. Monitoring of blasting activities will occur and where construction occurs within 100 metres of a sensitive receiver.	Moderate
TRAFFIC AND TRANSPORT						
Construction off-site impacts	Movement of oversize and overmass vehicles and impact to traffic flows. Increased frequency of traffic and impact to traffic flows.	B	3	High	Consideration of transport issues in project route design and impact assessment. A Traffic Management Plan will be prepared as a sub-plan to CEMP in consultation with local Councils, including Wellington Council, and the RTA.	Moderate

ASPECT	POTENTIAL IMPACT	L	C	LEVEL OF RISK	PROPOSED MANAGEMENT	MITIGATED RISK
	Heavy loads causing degradation to local roads				Measures to ensure the safety of all road users, including the provision of traffic control personnel where required, avoiding sensitive areas such as schools en route, and warning and general signposting on access routes. Restrictions on timing of delivery of large equipment by oversize trucks. A community information and awareness program and a community complaints procedure established. An inspection and maintenance program undertaken to ensure road conditions are maintained. Road access/occupation permits will be obtained as access works are required. Induction of staff to ensure awareness of traffic management requirements.	
Construction on-site impacts	Vehicles driving off-road causing disturbance to natural habitats and causing erosion Degradation of access tracks due to vehicle movements	C	4	Moderate	A Traffic Management Plan will be prepared as a sub-plan to CEMP in consultation with local Councils, including Wellington Council, and the RTA. Construction of tracks near environmentally sensitive areas will be avoided or guided by relevant specialists. Implementation of sediment and erosion control programs. On-site speed restrictions implemented, access limited to defined tracks, and induction of staff to ensure awareness of traffic management requirements. At conclusion of construction, any tracks no longer needed will be restored and revegetated.	Low
Operation impacts	Impact of periodic visits by vehicles	C	5	Low	The likely impact to adjoining land uses and the road network during operation will be small given the expected traffic volumes.	Low
TELECOMMUNICATIONS						
Radio	Possible interference with radio broadcasts and reception	E	4	Low	Comprehensive telecommunications investigation undertaken. Siting of turbines has considered communication impacts and potential issues addressed. Turbine layout is expected to provide adequate clearances. Overseas and local experience demonstrates that radio broadcasts are unlikely to be impacted by wind farm operation.	Low

ASPECT	POTENTIAL IMPACT	L	C	LEVEL OF RISK	PROPOSED MANAGEMENT	MITIGATED RISK
					If there is any additional movement of construction cranes outside of the rotor diameter, then movements will be in accordance with Fresnel clearance requirements for the project.	
Mobile phone reception	Possible interference with mobile phone reception in the area	E	4	Low	It is not likely that turbines will impact cellular mobile coverage. Transitional signal deterioration is unlikely but may occur as the mobile phone moves through the area. In the event of deterioration, investigations would be conducted and steps undertaken to rectify the situation.	Low
Television	Interference to digital television. Interference to analogue television.	D	4	Low	A reduction in service area through reflected signals, or through shadowing is very unlikely. Some interference with analogue television may occur for dwellings particularly to the south of the wind farm however digital only television will be achieved by 30 June 2012 which is prior to the completion of the Bodangora Wind Farm. Where any degraded service is reported than a range of techniques are proposed to be implemented to improve the service at the dwelling at the cost of the proponent, such as the replacement or repositioning of antenna or satellites. Additional consultation will occur with commercial television station operators in the area.	Low
Microwave communication	Potential for interference to point to point microwave communication links	D	4	Low	Impacts to microwave band point to multi-point registrations are located at significant distances from the wind farm. Consultation with owners of microwave band point to multi-point registrations will occur as the operators of these systems will be best place to determine impact.	Low
GREENHOUSE GAS						
Greenhouse gas emissions	Net generation of greenhouse gases from manufacture, construction, operation and decommissioning	D	4	Low	Within three months of operation, the wind farm will offset any greenhouse emissions. Significant savings to national emissions will be provided in the long term.	Low

ASPECT	POTENTIAL IMPACT	L	C	LEVEL OF RISK	PROPOSED MANAGEMENT	MITIGATED RISK
GENERAL ENVIRONMENTAL MANAGEMENT MEASURES						
Air quality	Dust and minor air emissions may impact local area Vehicle emissions	C	4	Moderate	Works will be implemented as part of the Soil and Erosion Control Plan to mitigate the potential for dust, including wetting exposed soils, gravel capping on access tracks, and rehabilitation as soon as possible. Local water supplies will be used for dust control and will be balanced on the amount of available water. All construction vehicles will maintain emission controls. Given the scale of the project and existing farming activities such as the ploughing of fields, it is expected that dust generated by the construction of the wind farm can be effectively managed and will form only a minor contribution to air emissions in the wider region.	Low
Soil management	Soil erosion as a result of construction Controls inadequate to minimise erosion	C	3	High	Assessment has identified areas with erosion potential. The project design has minimised the extent of soil disturbance, and vegetation clearance has been minimised. Soil and Water Management Plan to be prepared for the CEMP to outline erosion control measures. Project component will consist of only a small component of land area. The majority of construction activity will occur where erosion potential is low and ongoing monitoring and maintenance will occur.	Moderate
Water management	Impact of sediment run-off Excessive use of local water supplies	C	3	High	Upgrading of existing crossings will reduce the impact on site drainage. Overhead cables will be considered at creek crossings to minimise disturbance and erosion risk. Cable crossings at creeks are to be installed to appropriate guidelines. Trenches will be open for minimal periods only, and backfilled to preconstruction condition.	Moderate

ASPECT	POTENTIAL IMPACT	L	C	LEVEL OF RISK	PROPOSED MANAGEMENT	MITIGATED RISK
					Water for the project will be obtained from Wellington Council, and will be negotiated with Council at the time of construction. The expected water usage is not excessive and is required for mitigation measures, such as dust control. Minimal water will be required during the operational phase.	
Hazards	Spills or leaks of sewerage, fuel, chemicals or batteries	C	3		Hazardous substances will be safely stored in areas with containment in case of leaks. Procedures for handling and storage of substances will be documented and monitored. A number of hazardous substances have secondary containment measures. Staff will be trained in emergency response and clean-up procedures.	
SAFETY ASPECTS						
Aircraft safety	Turbines may impact upon the safe operation of aircraft in the area for recreational and agricultural purposes	E	2	High	The Wellington Aerodrome is 4.5 kilometres to the south-west of the nearest turbine proposed, and will orientate north-west/south-east, which will orientate the direction of planes away from the proposed turbines. All relevant stakeholder to the Wellington Aerodrome have been advised of the wind farm. Final as built locations will be provided to relevant stakeholders for inclusion on aviation charts. The wind farm will be readily apparent to recreation and agricultural air space users, and can be readily avoided.	Low
Physical safety	Risk associated with tower failure, blade separation, and ice throw Vehicle accidents	C	4	Moderate	Construction works to be carried out in accordance with all relevant standards. Turbines will shut down if maximum speed is reached to avoid damage. Land owners will be advised to avoid turbine locations during the few periods of below freezing temperatures. Steep sections at or adjacent to access tracks will be identified prior to construction commencing, step access locations will be 'benched' and barriers, warning signs, and/or tapes will be used. Construction will occur during daylight hours only and working conditions will be monitored.	Moderate
Electrical safety	Electrical failure Lightning strike	C	4	Moderate	Development will occur in accordance with all relevant standards. Lightning protection as a standard feature on all modern turbines.	Low

ASPECT	POTENTIAL IMPACT	L	C	LEVEL OF RISK	PROPOSED MANAGEMENT	MITIGATED RISK
					Protective equipment will be installed to detect faults, and the substation will be protected by surge dividers, lightning masts and an underground earth grid. Fencing will protect access to live electrical equipment.	
Bushfire risk	Ignition of a bushfire through construction and operational activities Bushfire ignition as a result of lightning strike	E	2	High	A Bushfire Risk Management Plan will be prepared in consultation with the NSW Rural Fire Service. Alternative access and egress routes exist for most turbine sites should they be required in an emergency. Contractors will be required to comply with all legislation. Native vegetation may be required for removal where in excess of 100 millimetres high at access tracks and work site locations. A mobile water tank will be kept on-site for fire fighting purposes, and fire fighting tools will be kept at each work station. Work will be limited on high bushfire risk days.	Low
Electric and Magnetic Fields	Health impacts associated with high voltage transmission lines	E	4	Low	Potential impacts have been considered of EMF and project design has avoided proximity of electrical equipment to dwellings. Location of turbines and substations are in areas not frequented by public. Construction and operation will be in accordance with relevant electrical safety codes.	Low
OTHER ASPECTS						
Property values	Potential for wind farm to affect land and property values in surrounding area	C	4	Moderate	Review of available studies suggest that wind farms do not have a measurable impact upon property values.	Low
General, Administrative and Consultation Commitments	Development varies from approval and commitments	C	4	Moderate	The proponent has a commitment to all general, specific and consultative measures as outlined within this document, and the draft Statement of Commitments. Legislative requirements for environmental management will be adhered to. Ongoing reporting and monitoring for various aspects is required to the Director-General.	Low

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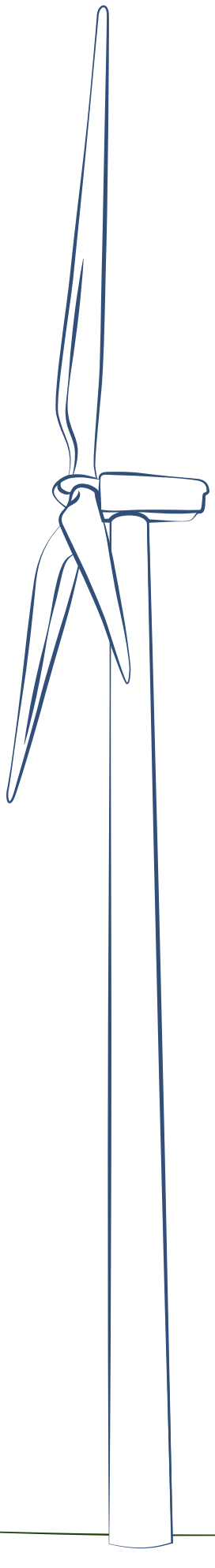

Chapter 19

Conclusions

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CHAPTER 19 – CONCLUSIONS

The following provides an overview for the acceptability of the environmental and other impacts of the proposal, as detailed throughout this EA. Specifically, this Chapter addresses the following requirement of this EA as per the Director-General's Requirements:

Director General's Requirements:

> *"A conclusion justifying the project taking into consideration the environmental, social and economic impacts of the project, the suitability of the site, and the public interest."*

The Bodangora Wind Farm is being developed as a commercially viable project. At a national level, the project will contribute to Australia's economic health through reduced reliance on non-renewable resources. The Bodangora Wind Farm will provide close to an additional 333 Gigawatt hours (GWh) every year over the operating life of the wind farm; enough to provide clean electricity to an estimated 35,000 homes annually. The project will have a direct and tangible contribution to the Australian Government's Renewable Energy Target, and to the commitment to achieving a 20 percent share of renewables in Australia's electricity supply by 2020.

Emissions savings as a result of the wind farm are expected at up to 333,000 tonnes of greenhouse gases each year, representing 2.6 million tonnes of greenhouse gas emissions by 2020. This emission savings will directly assist the achievement of state, national and global targets for reduced greenhouse gas emissions. Renewable energy sources have a greater degree of insulation to global energy prices and global instability.

The project area comprises 8,469 hectares; the majority of which is used for grazing. Of the total project area, approximately 3.0 percent of the land will be utilised for the wind farm development. Accordingly, existing land uses can largely continue without effect. The project generally complies with the relevant provisions of the Environmental Planning and Assessment Act, State Environmental Planning Policies, and the Wellington Local Environmental Plan.

The project has been designed to avoid vegetated areas which provide important habitat as far as possible, and micro-siting of project elements will further assist in avoiding vegetated areas. It is expected that almost no clearing of trees will occur, although some ground cover will require removal. Impacts on avifauna have been assessed and the project is not expected to cause effect to any threatened species which occur, or may occur within the project area. The proposal is unlikely to diminish biodiversity values of the region, and in particular has been assessed as unlikely to impact threatened species/communities identified within the project area including the long-term viability of the White Box - Yellow Box - Blakely's Red Gum Woodland, the Spotted-tail Quoll, the Superb Parrot, the Grey-crowned Babbler, or the Yellow-bellied Sheathtail Bat.

Depending on the final amount of vegetation clearance required to facilitate the development and in consultation with DECCW, a vegetation off-set strategy may be required. The 'worst case' scenario of vegetation removal is a maximum of 1.32 hectares. The off-set locations will be determined in consultation with a Biobanking accredited ecologist, and determination of a suitable metric will be undertaken in accordance with the requirements of the Office of Environment and Heritage. The quantum of vegetation to be preserved is likely to be in the order of four times the area of vegetation removed, and will be adequately fenced from grazing stock. There are ample opportunities on the associated wind farm properties to cater for a vegetation offset area of this size.

Although the project will be visible over a broad area, as the viewing distance increases, the scale and visual impact of the wind farm decreases. The wind farm is not expected to be detrimental to the landscape and wider amenity of the region. There are no visually sensitive or scenic areas in the region. No views in the region have been assessed with an impact greater than 'moderate', and no views from neighbouring dwellings have been assessed with an impact greater than 'low', with the majority having a 'nil-low' impact or no views altogether. Vegetation screen planting at various dwellings and along roadsides will further assist in reducing views of the turbines. Turbines 8, 9, 28, 40 and 47 have been removed from the project layout, primarily to minimise visual impact following the results of the community consultation. There are no turbines proposed within 2.0 kilometres of any neighbouring dwelling.

The expected project noise has been assessed during both operation and construction phases of the project. For the worst-case scenario during operation, the turbines and substation noise is predicted to be within the noise criteria set by the relevant guidelines for all dwellings in the locality. Accordingly, the operation of the project requires no noise mitigation measures.

Noise generated during the construction of the project has been identified as a potential issue as the predicted noise is slightly higher of the noise criteria set by the relevant guidelines. A range of mitigation measures, plus noise monitoring during construction are proposed in order to reduce the potential impact to neighbouring dwellings. This includes a range of engineering measures (such as installing noise barriers), administration measures (such as ensuring heavy vehicle movements occur within designated times), the implementation of an equipment and monitoring regime, and a thorough community information programme.

There are unlikely to be any unreasonable impacts to soil, water and air quality as a result of the project, as the project has been designed according to the physical features of the project area. A range of mitigation and management measures will be incorporated into the Construction Environmental Management Plan in particular, to minimise airborne dust events, erosion, and soil discharge into watercourses.

An Aboriginal and non-Aboriginal heritage survey was undertaken for the project area in consultation with the relevant parties. Several areas of heritage significance, including Aboriginal and non-Aboriginal heritage places were identified. Measures and procedures have been proposed which will ensure the project layout either avoids disturbing heritage places altogether, or will not diminish the value of any heritage places.

The construction phase of the project will result in increased traffic to and from the site including the movement of restricted access vehicles. A Traffic Management Plan will be prepared as part of the Construction Management Plan to ensure the works can be undertaken safely and with minimal disruption to local traffic. Once operational, the traffic entering the wind farm site will be negligible.

The potential for interference to the various telecommunication systems in the area has been reviewed, and the current layout is not expected to cause any interference with telecommunication systems. There is a low level risk of interference to analogue television reception, which should largely be mitigated through the installation of digital television in the region in 2013. Should interference be detected, mitigation options are available and will be applied.

The potential for bushfire risks, physical safety issues and aircraft safety have also been reviewed, and management measures proposed as necessary. Following the implementation of management measures, these risks are expected to be 'low'. A Bushfire Management Plan will be prepared as part of the Operational Environmental Management Plan.

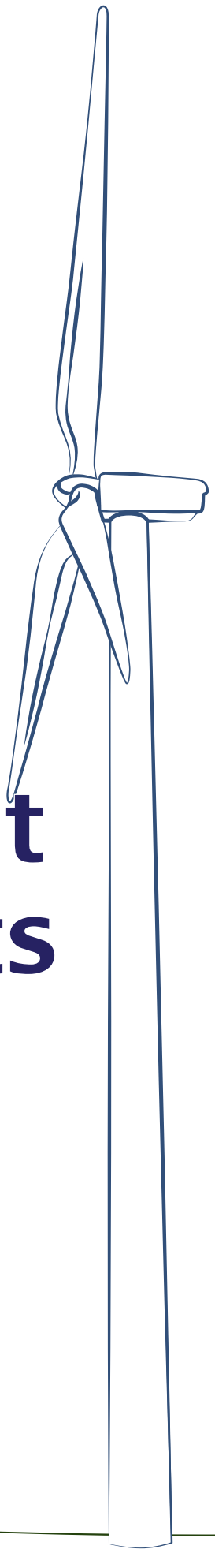
The majority of responses from the public consultation process have expressed a positive regard to the project. The favourable association with renewable energy, net savings in greenhouse gas emissions, and the integration with the existing rural activities are considered to reduce concerns regarding the visibility of the wind turbines. The proponent is aware of the necessity for an effective and genuine public consultation programme, and has outlined a methodology for continued meetings with neighbours and community stakeholders, updates to local media providers, notices to community, and liaison with local government in regards to the future stages of the project.

The project will provide for a range of flow-on economic effects, particularly during the construction phase of the project, including income to local service providers, employment to a large temporary workforce, improvements to local infrastructure, and benefits related to the financial agreements of the land owners within the project area. Bodangora Wind Farm Pty Ltd has also established a contractors' register list, which identifies local tradesman for use within the project. Large contractors for the project will be encouraged to employ local tradesman for suitable construction where possible.

In a broader sustainability sense and with consideration of the broader 'public interest', the project can be implemented with minimal environmental impacts to the project area and its location, and is a sustainable energy development. The wind farm will assist in addressing global concerns about climate change, and assists in inter-generational and social equity through reducing society's consumption of finite resources.

Significant environmental impact has occurred in the vicinity of the project area since European settlement, including the clearing of native vegetation, the introduction of pastoral activities, and human settlements. Whilst the development of the wind farm will result in further change to the character of the locality, assessments have determined that through the implementation of mitigation measures, the wind farm is not expected to cause any additional impact on the environment at this location. The proponent has given thorough consideration of all potential and perceived general environmental risk factors, based upon all other operating and permitted wind farm projects.

Whilst there will be some effects to the region as a result of the wind farm, these are generally limited to short term transport and construction effects, which will be managed through Construction and Operational Environmental Plans. The wind farm is located in a sparsely settled area. The cumulative impact of all known developments are well within the capacity of the locality to absorb without detrimental social, environmental or economic consequences. The Bodangora Wind Farm will be a significant development, is a worthy environmental initiative, and represents an important contribution to future renewable energy generation capability in NSW. Overall, it is considered that any adverse impacts will be relatively minor and will be outweighed by the positive longer term environmental, social and economic benefits of the project.



Chapter 20

Draft Statement of Commitments

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CHAPTER 20 - DRAFT STATEMENT OF COMMITMENTS

20.0 INTRODUCTION

This chapter of the EA documents the measures for environmental mitigation, management and compliance monitoring for the project, including mechanisms for reporting outcomes and procedures for rectifying non-compliance. The content of this chapter has been informed through the various investigations undertaken and reported within the Environmental Assessment.

Specifically, this chapter of the EA provides the following details, as per the Director-General's requirements (DGRs):

Director-General's Requirements:

> *"A draft Statement of Commitments detailing measures for environmental mitigation, management and monitoring for the project."*

The Statement of Commitments (Commitments) relate to overall project management and specific measures, during final design and pre-construction planning, construction, operation, and decommissioning. Infigen will work with all stakeholders during compliance reviews and if by chance there is non-compliance, measures will be taken to rectify the problem.

The Statement of Commitments will be finalised to address the Minister's Conditions of Approval (CoA, if granted). Implementation of the Commitments and the performance of the project's environmental management system will be subject to periodic reviews and corrective action, where necessary.

This chapter is structured as follows:

- General and Project Management Measures:
  - Table 20.1 – General and Administrative Conditions;
  - Table 20.2 – Reporting Requirements; and
  - Table 20.3 – Community and Consultation Measures;
- Design and Miscellaneous Measures:
  - Table 20.4 – Design and Miscellaneous Measures;
- Construction Environmental Management Plan:

- Table 20.5 - Flora and Fauna Management;
- Table 20.6 – Heritage Management;
- Table 20.7 – Noise Management;
- Table 20.8 – Soil and Water Management;
- Table 20.9 – Management of Pollution Sources;
- Table 20.10 – Traffic Management;
- Table 20.11 – Greenhouse and Energy Management;
- Table 20.12 – Bushfire Risk Management;
- Table 20.13 – Physical Safety Management;

• Operational Environmental Management Plan:

- Table 20.4 - Measures for Incorporation into the Operational Environmental Management Plan.

20.1 GENERAL AND PROJECT MANAGEMENT MEASURES

The following commitments of Bodangora Wind Farm Pty Ltd (BWFPL) relate to General and Project Management commitment measures for the project.

Table 20.1 – General and Administrative Commitments

ISSUE	COMMITMENT	RESPONSIBLE PARTY	TIMING
Scope of development	BWFPL will carry out the development generally in accordance with the information contained within this EA and in compliance with the Minister's Project Conditions of Approval (CoA).	BWFPL	Ongoing
Minimising harm to the environment	BWFPL will implement all practicable measures to prevent and minimise any harm to the environment that may result from the construction, commissioning, operation, maintenance and decommissioning of the development.	BWFPL	Ongoing
Statutory requirements	BWFPL will ensure compliance with all relevant environmental requirements and ensure that all necessary approvals, licences and permits are obtained and are kept up to date as required throughout the life of the development. Copies of these documents will be maintained at the Site Office and Environmental Management Plans (EMP's) will include measures to ensure compliance.	BWFPL	Ongoing
Compliance	BWFPL will notify in writing the Director-General (DG) of the start of the project's construction and operation phases. Notification will be provided at least two weeks before the relevant start date.	BWFPL	Prior to project start
	BWFPL will bring attention to any matter that may require further assessment by the DG.	BWFPL	As required
	BWFPL will comply with any requirements of the DG arising from the assessment of any reports, plans or correspondence that are submitted to satisfy the CoA, and the implementation of any actions or measures contained in such reports, plans or correspondence.	BWFPL	As required
Environmental Management Representative	BWFPL will request the DG's approval for the appointment of an EMR. In the request, the following will be identified: • appropriate qualifications and experience for an environmental auditor; • authority and independence from the proponent and contracts including details of the proponent's internal reporting structure; and • resourcing of the EMR role. The EMR will be available: • for sufficient time to undertake and EMR role, as agreed by BWFPL and advised to the DG;	BWFPL	Approval of EMR required at least eight weeks prior to construction commencing or as agreed.

ISSUE	COMMITMENT	RESPONSIBLE PARTY	TIMING
	• at any other time as requested by the DG; • during any construction activities identified in the CEMP which require attendance; and • for the duration of construction.		
	The EMR is authorised to: • consider and advise the DG and BWFPL on matters specific in the CoA and compliance with such; • determine whether work falls within the definition of 'construction' where clarification is requested by BWFPL; • review the CEMP; • periodically monitor BWFPL's activities to evaluate compliance with the CEMP, including fortnightly site inspections of active work sites; • provide a written report to BWFPL of any non-compliance with the CEMP observed or identified by the EMR. Non-compliance must be managed as identified in the CEMP; • issue a recommendation to BWFPL to stop work immediately if in the view of the EMR an unacceptable impact on the environment is occurring or is likely to occur and recommend reasonable actions to avoid or minimise the adverse impacts; • review corrective and preventative actions to monitor the implementation of recommendations made from audits and site inspections; • certify that minor revisions to the CEMP are consistent with the approved CEMP; and • provide regular reports to the DG as requested on matters relevant to the EMR role. The EMR must immediately advise BWFPL and the DG of any incidents relevant to these conditions.	EMR	During construction.
	The DG may at any time revoke the approval of an EMR appointment by providing written notice to BWFPL. Interim arrangements for EMR responsibility following the revocation must be agreed in writing between the DG and BWFPL. The DG may at any time conduct an audit of any actions undertaken by the EMR. BWFPL will: • facilitate and assist the DG in any such audit; and • include in the conditions of the EMR's appointment the need to facilitate and assist in the DG in any such audit.	Department of Planning	If required.
Decommissioning	At the end of its economic life, all equipment will either be replaced with comparable new equipment, or the wind farm will be decommissioned. Replacement may be subject to new approvals. Decommissioning would involve dismantling or removal of all equipment, and site rehabilitation.	BWFPL	Upon decommissioning.

ISSUE	COMMITMENT	RESPONSIBLE PARTY	TIMING
	Turbine footings would be retained at a level below the ground surface, as acceptable to the land owner. Access tracks may be retained depending on the land owners' wishes. Any overhead wires no longer required will be removed.		

Table 20.2 – Reporting Requirements

Issue	Commitment	Responsible Party	Timing
Pre-Construction Compliance Reports (PCCRs)	BWFPL will submit PCCRs to the DG. The PCCR will include: • details of how the CoA are to be addressed prior to construction; • the time when each relevant CoA was complied with, including dates of submission of any required reports and/or approval dates; and • details of any approvals or licences required to be issued by relevant Government Departments before construction commences.	BWFPL	Two weeks prior to construction or as agreed.
Construction Compliance Reports (CCR)	BWFPL will submit CCRs to the DG. The Environmental Management Representative (EMR) must review the CCRs before it is submitted to the DG and must bring any shortcomings to the attention of the DG. The CCR will be made publically available. Each CCR will include the following: • compliance with the CEMP and CoA; • compliance with any approvals and licences issued by relevant Government Departments for construction; • the implementation and effectiveness of environmental controls, based on a comparison of actual impacts and performance criteria identified in the Construction Environmental Management Plan (CEMP); • environmental monitoring results, presented as a results summary and analysis; • the number and details of any complaints, including a summary of main areas of complaint, action taken, response given and intended strategies to reduce recurring complaints; • details of any review and amendments to the CEMP resulting from construction during the reporting period; and • any other matter relating to compliance with the CoA as required by the DG.	BWFPL EMR	Staged CCR (see below)

Issue	Commitment	Responsible Party	Timing
	Timing: the first CCR must be submitted within six weeks of the first six months of the project operation or as agreed. The second and subsequent CCR must be submitted at maximum intervals of six months from the date of submission of the first CCR or as agreed for the duration of construction.	BWFPL EMR	Every six months following the submission of the first CCR
Pre-Operation Compliance Report (POCR)	BWFPL will submit a POCR to the DG. This must include: • details of how the CoA required to be addressed prior to operation; • the time when each relevant Condition of Approval was complied with, including dates of submission of any required reports and/or approval dates; and • details of any approvals or licences issued by relevant Government Departments for the project's operation.	BWFPL	Two weeks prior to operation or as agreed.
Environmental Impact Audit Report (EIAR) – Construction	An EIAR – Construction will be submitted to the DG and to other Government Departments upon the request of the DG. This report will: • identify the major environmental controls used during construction and an assessment of their effectiveness; • summarise the main environmental management plans and processes implemented during construction and an assessment of their effectiveness; • identify any innovations in construction methodology used to improve environmental management; and • discuss the lessons learnt during construction, including recommendations for future projects.	BWFPY	Maximum three months following completion of construction or as agreed.
Environmental Impact Audit Report (EIAR) – Operation	An EIAR – Operation will be submitted to the DG and to other Government Departments upon the request of the DG. This report will: • be prepared by an independent certifier, with the DG advised of the certifier prior to the preparation of the documentation; • compare the operation impacts with the predictions made in the EA, Submissions Report, and any other supplementary studies; • assess the effectiveness of the implemented mitigation measures; • assess compliance with the systems for operation maintenance and monitoring; • discuss the results of consultation with the local community, particularly any feedback or complaints; and • be made publically available.	BWFPL	Maximum 24 months following commissioning or as agreed.

Issue	Commitment	Responsible Party	Timing
Construction Environmental Management Plan (CEMP)	A CEMP will be prepared and implemented in accordance with all relevant legislation. The CEMP will be approved by the DG prior to construction commencing. The CEMP will be provided to the NSW Office of Water for review prior to project commencement. The CEMP will: • be reviewed by the EMR before approval is sought; • ensure that relevant measures identified within this EA are incorporated into the CEMP or any sub-plan of the CEMP; and • be prepared in accordance with the Department's Guideline for the Preparation of Environmental Management Plans (2004).	BWFPL	Approval required prior to construction commencing
Operation Environmental Management Plan (OEMP)	An OEMP will be prepared and implemented in accordance with all relevant legislation. The OEMP will be approved by the DG prior to construction commencing. The OEMP will: • ensure that the mitigation measures identified in this EA are incorporated into the OEMP or the relevant sub-plan; and • be prepared in accordance with the Department's Guideline for the Preparation of Environmental Management Plans (2004).	BWFPL	Approval required prior to operation commencing

Table 20.3 – Community Consultation

Issue	Commitment	Responsible Party	Timing
Notice of construction activities	BWFPL will ensure that the local community and businesses are advised of construction activities that could cause disruption prior to those activities occurring. Communication methods will be detailed within the CEMP. Information will include: • details of traffic disruptions and controls; • construction of temporary detours; and • work approved to be undertaken outside standard construction hours, particularly noisy works.	BWFPL	Prior to disruptive works.

Issue	Commitment	Responsible Party	Timing
Periodic project updates	The following will be updated to local media providers, as update newsletters circulated to local papers: • periodic updates of work progress, consultation activities, and planned work schedules when significant changes in noise or traffic impacts are expected.	BWFPL	As required
Establishment of a project website	BWFPL will establish a project website prior to construction commencing. The website will be maintained until construction ends. The website will contain: • periodic updates of work progress, consultation activities, and planned work schedules when significant changes in noise or traffic impacts are expected. The website will indicate the date of the latest update and expected frequency of updates; • a description of the relevant approval authorities and their areas of responsibility; • project reports and plans that are publically available for download; • contact names and phone numbers of relevant communications staff; and • a 24 hour toll-free complaints contact telephone number.	BWFPL	Prior to construction commencing
Construction noise communication requirements	Prior to the commencement of construction, neighbours to the wind farm site will be informed of the construction works, the nature and duration of components of the construction phase, the potential impacts and contact details for registering components or enquires. The developer will provide noise and vibration elements into the community consultation process. The aim of consultation will be to ensure adequate community awareness and notice of expected construction noise. Consultation will include: • regular community information newsletters providing details of the construction plan and duration; • a site notice board in a community location (such as Wellington) providing copies of the newsletters, updated construction programme details, contact details of the project team members, and an ability to register for email updates of the newsletter; • a feedback mechanism for the community to submit questions to the construction team and for the construction team to respond; • regular updates on the construction activities to local authorities to assist in complaint management if necessary; and • contact details of the project manager and/or site 'environmental representative'.	BWFPL	Prior to construction commencing and as required
Complaints management	Prior to construction commencing, BWFPL will ensure the following is available: • a postal and email address to which written complaints can be sent; and	BWFPL	Prior to construction

Issue	Commitment	Responsible Party	Timing
	• a 24 hour telephone contact line. BWFPL will keep record of a Complaints Register for a period of at least four years after the complaint was made. This will include: • the date and time of the complaint; • whether the complaint was via mail, email or telephone; • any personal details provided (if any) or a note if no details were provided; • the nature of the complaint; • any action(s) taken by BWFPL in relation to the complaint, including follow-up; and • if no action was taken in relation to the complaint, the reason(s) why. The Complaints Register will be made available for inspection upon request of the DG.		commencing
Additional consultation requirements: telecommunications	Additional consultation for the telecommunication aspects of the project is to include the following: • Telstra; • Optus; • Murray Regional Telecommunications; • operators of point to point radio systems which cross the project area; • operators of point to multi-point operators which cross the project area; • Commercial Television Station operators in the area, Broadcast Australia for the ABC and SBS networks; and • Airservices Australia.	BWFPL	Prior to construction commencing

20.2 DESIGN AND MISCELLANEOUS MEASURES

Table 20.4 outlines the design and miscellaneous measures for commitment as part of the project, particularly with reference to the final detailed design stages of the project.

Table 20.4 – Design and Miscellaneous Measures

Issue	Commitment	Responsible Party	Timing
Project layout	BWFPL's project design is based upon the layout shown in Figure 1.4 and incorporates 33 turbines. The actual turbine model and number to be installed may vary slightly dependant on the final design conditions. Micro-siting of individual turbine locations up to 100 metres is proposed, however any micro-siting changes will be consistent with project approval, otherwise a modification will be sought. Adjustment will take into account relevant sensitivities of the location and be subject to review by the EMR to ensure consistency with the Project Approval. The final design will be subject to Approval Authority review as part of the Construction Certificate Application process.	BWFPL	Prior to construction commencing
	Cable routes will be generally between turbines and where practical will be located alongside access tracks to minimise site disturbance.	BWFPL and contractor	During construction
	BWFPL will require the design of facilities and services buildings to incorporate the collection of roof drainage and have a small septic system of composting toilet that complies with Council requirements.	BWFPL and contractor	Prior to construction commencing
	BWFPL will confirm arrangements for the temporary construction site office.	BWFPL and contractor	Prior to construction commencing
	If the project contractor wishes to install a temporary concrete batching plant, the contractor will be required to select a suitable site distant from neighbouring residences, undertake an environmental assessment and obtain land owner agreement and planning approval.	BWFPL and contractor	Prior to construction commencing
	Permanent tracks will be located to achieve suitable grades on stable slopes and design to that they will not exacerbate erosion. Location will be chosen to minimise visual impact from the surrounding countryside as far as possible. Earth batters on any tracks that are benched into slopes will be revegetated to prevent erosion and to reduce visibility of the constructed tracks.	BWFPL and contractor	Prior to construction commencing

Issue	Commitment	Responsible Party	Timing
Visual impact measures	Measures to mitigate the visual impact of the project will include: • turbines to be a matt white finish and a three-bladed design; • underground cabling will be used throughout the wind farm wherever practical; • areas of existing native vegetation will be preserved as far as possible; • earthworks will be restored as soon as practical following the completion of construction; • cable trenches will be backfilled as soon as practical; and • access roads will be selected according to the pattern of existing tracks within the project area and to reduce visual impact.	BWFPL and contractor	During construction
	Visual screen planting will: • be located in the following locations including: • along the northern side of Mudgee Road; • along the eastern and southern sides of Driel Creek Road; and • along the southern side of Wadrona Lane; • be species selection typical of the local area; and • avoid clearing areas of existing native vegetation. Additional screen planting will be undertaken subject to land owner and neighbour's requests;	BWFPL and contractor	During construction
	A project viewing area will be constructed along Mudgee or Gillinghall Road to provide for the provision of educational information about the wind farm. Appropriate approvals to be obtained.	BWFPL	During construction
Telecommunication mitigation measures	Prior to construction, BWFPL will ensure that the final turbine layout is assessed in terms of their potential impact on fixed path radio links in the locality to ensure services are not disrupted or degraded. Where necessary, the relevant communication service operator will be contacted to confirm operational details.	BWFPL	Before construction commences
	If there is any additional movement of construction cranes outside of the rotor diameter, then movements will be in accordance with Fresnel clearance requirements.	BWFPL and construction	During construction
Aviation safety	Final details of the height and location of each wind turbine will be provided to CASA, Department of Defence, AirServices Australia and the Aerial Agricultural Association of Australia.	BWFPL	Before erection of the wind turbines
Access track design	The routing of access tracks will take into account the following considerations: • minimisation of the length of tracks; • location along the routes of existing tracks where possible;	BWFPL and contactor	Before construction commences

Issue	Commitment	Responsible Party	Timing
	• location where clearing of vegetation is minimised; • construction with due regard to safety, erosion, sediment control and drainage; and • position and design, as far as possible, to reduce visual impacts.		
Electrical design	Safe conditions will be achieved by ensuring that the design of plant and equipment are achieved in accordance with the relevant standards, or approval obtained for an alternative specification if necessary. Standards include the following: • AS/NZS 4853 – Electrical Hazards on Metallic Pipelines; • AS 3000 – Australian SAA Wiring Rules; • IEC 61024-1 – Protection of Structures against lightning – Part 1: General Principles; • IEEE STD 80 – Guide for Safety in AC Substation Grounding; • IEC 60034 – Rotating Electrical Machines; • BS 4999 – General Requirements for Rotating Electrical Machines; • BS 5000 – Specification for Rotating Electrical Machines of Particular Types or for Particular Applications Compliance with BS 5000 subject to review; • IEC 60076-1 – Power Transformers: Part 1 General; • IEC 60146.1.1 Semiconductor converters – General requirements and line commutated converters; • IEC 62271.100 High-voltage switchgear and control gear – High-voltage alternating-current circuit-breakers; • IEC 60282.1 – HV Fuses (for Rated Voltages greater than 1,000 volts); • IEC 62271.200 High-voltage switchgear and control gear – AC metal-enclosed switchgear and control gear for rated voltages above 1.0 kV and up to and including 52 kV; • IEC 60529 – Degrees of Protection Provided by Enclosures; • IEC 60947 – Low Voltage Switchgear and Control gear; • IEC 60439.1 – Low Voltage Switchgear and Control Gear Assemblies; and • IEC 60269.1 – Low Voltage Fuses - General Requirements. •	BWFPL, project engineers and contactors	During electrical design
	The following also relate to the safe operation of electrical equipment for the project: • protective equipment will be installed to detect faults and disconnect faulted equipment; • the substation will be equipped with an underground earth grid which will extend for a	BWFPL, project engineers and	During electrical design

Issue	Commitment	Responsible Party	Timing
	distance of 1.0 metre beyond the perimeter fence; • public access to live electrical equipment will be prevented by a perimeter fence of chain and barbed wire or palisade steel construction to a height of 2.4 metres; • the substation will be protected by surge diverters, lightning masts and an underground earth grid; • the effects of lightning strike will be reduced by the following turbine design features: • metallic conductors running throughout the turbine blades and electrically connected to the metal structure; • supporting structures to be sufficiently well earthed to limit the voltage rise during a lightning strike; and • internal electrical equipment to be protected against voltage rises due to lightening.	contactors	
Bushfire Risk Management: Design Components	The potential fire risk associated with electrical failure will be managed by the following measures: • use of fully enclosed electrical equipment on turbine structures and pad-mount transformers; • extensive use of underground cabling between turbines; • design of any overhead lines in accordance with industry standards; • exclusion of vegetation from within the substation enclosure; and • use of circuit breakers and fuses to interrupt any electrical fault.	BWFPL, project engineers and contactors	During project design

20.3 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

The following provides information to be incorporated into the Construction Environmental Management Plan for the project.

Table 20.5 – Flora and Fauna – CEMP

Issue	Commitment	Responsible Party	Timing
Flora and Fauna Management Sub-Plan	A Flora and Fauna Management Sub-Plan will be prepared as part of the CEMP.	BWFPL	Approval prior to construction commencing
	The Sub-Plan will include the following: • tree clearing should be avoided wherever practical. Micro-siting of turbines and infrastructure to avoid areas of woodland and native trees will occur: - an ecologist will assist in determining the best possible routing of access tracks and cables to assist in avoiding hollow-bearing trees, creeks, woodland, and rocky outcrops in cleared areas; and - where turbines are proposed to be located among rocky outcrops which cannot be avoided, the excavated rock should be deposited nearby in a 'natural' formation to re-create rocky habitat; • where tree clearing cannot be avoided: - an ecologist will be engaged to develop an appropriate tree clearance protocol; and - a vegetation clearance register be maintained, including tree locations, type, size and numbers; • in order to minimise the likelihood of impact to birds of prey: - no turbine will have perching places; - dead animals within 200 metres of a turbine will be removed as soon as possible, including road kill on wind farm access tracks; - no night lighting on turbines; and - buildings, poles or other structures should not be constructed within 200 metres	BWFPL	Approval prior to construction commencing

Issue	Commitment	Responsible Party	Timing
	of turbines as they may provide perching opportunities for birds of prey. • Prior to construction, the option of a field survey for the Superb Parrot to determine whether the species is only a winter visitor to the area. The following methods would be employed in the survey: - undertaken during the breeding season (September to December); - local land owners will be interviewed to gain information about where the parrots have been seen, particularly in the current season; - general observations in the areas where the parrots were seen on previous visits; - targeted surveys along those ridges and other places where trees may be removed by the wind farm infrastructure; - where Superb Parrots are observed, intensive surveying to determine if they are nesting in the trees that may be removed; - if nest trees are located in the target area, documentation and marking of trees, and discussions with the Office of Environment and Heritage to determine the required mitigation measures; and - a report to the Department of Planning for forwarding to the Office of Environment and Heritage, outlining investigations, consultation and findings; - where possible no large dams should be constructed within 1.0 kilometre of turbines; and - monitoring of barotrauma during the first year of operation of the Bodangora Wind Farm, and the results reported to the Department of Planning and DECCW. Monitoring the impact of blade strike to birds can occur by on-site staff recording birds found during their day to day work and the results reported to the Department of Planning and DECCW.		
	Weed control measures will be implemented to ensure invasive weed problems are not exacerbated, particularly in the avoidance of the spreading of invasive weeds as previously listed.	BWFPL and contractor	Before, during and after construction, as required.
	Measures to be taken to ensure construction of tracks, cable routes and hardstands should not cause excessive erosion. Construction should be monitored by a qualified environmental auditor to ensure the following: • permanent tracks should be stabilised as soon as practical; • temporary tracks and buried cable routes will be rehabilitated as soon as practical following, with back-filling of trench;	BWFPL and contractor	During construction

Issue	Commitment	Responsible Party	Timing
	• care taken on steep slopes to ensure that erosion does not occur, with any problems should be rectified as soon as practical; • on-site maintenance crew will be responsible for regularly checking the cable routes for erosion until the routes have been stabilised and satisfactorily revegetated; • the property owners and/or Government authority will be contacted to identify a suitable cover crop for sites requiring seeding to accelerate revegetation; • advice on micro-siting of wind farm components; and • creation of rocky habitat where rock is excavated.		
	If trees and other plants are planted around buildings and other facilities, these should be locally indigenous species.	BWFPL	During construction
	If required, a vegetation off-set strategy will be developed in consultation with DECCW. Final figures for clearance will be determined when the final project design is available. The off-set locations will be determined in consultation with a Biobanking accredited ecologist. The determination of a suitable metric for off-set will be according to the requirements of the Office of Environment and Heritage. The quantum of vegetation to be preserved is likely to be in the order or four times the area of vegetation removed.		

Table 20.6 – Heritage Management – CEMP

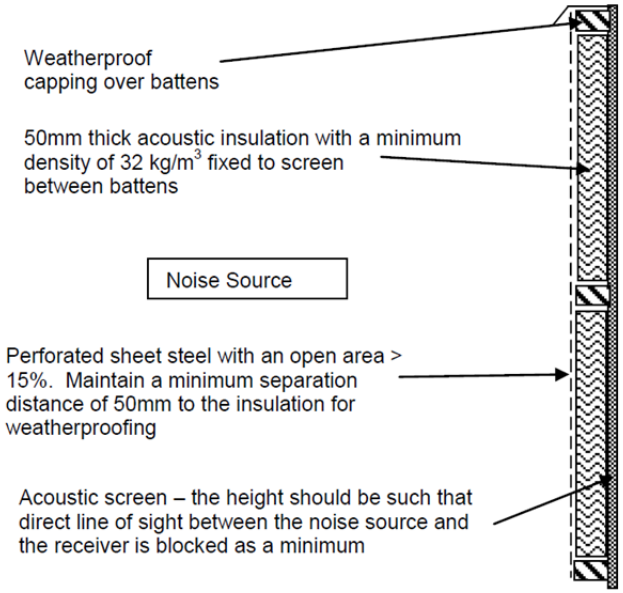
Issue	Commitment	Responsible Party	Timing
Cultural Heritage Management Sub-Plan	A Cultural Heritage Management Sub-Plan will be prepared as part of the CEMP.	BWFPL	Approval prior to construction commencing
	The Sub-Plan must incorporate the following management measures to manage the impacts to Aboriginal places within the project area: • stone procurement artefact area SU18/L1: - a Conservation Strategy will be developed to detail the avoidance of artefact SU18/L1 by design; and	BWFPL and contractor	During construction and as required

Issue	Commitment	Responsible Party	Timing
	- impact will be avoided by the diversion of the proposed access road around this object; • ground disturbance impacts associated with the proposal will be kept to a minimum and to defined areas to ensure minimal impact to unlisted or unrecorded Aboriginal items; • an additional archaeological survey will be conducted in any area that is proposed for development that have not been previously surveyed; • where any additional, unrecorded Aboriginal objects are encountered during construction, works shall cease immediately and DECCW will be notified immediately of any such finds; • a Cultural Heritage Management Protocol will document procedures required for impact avoidance or mitigation, developed in consultation with an archaeologist, the relevant Aboriginal communities and the NSW Office of Environment and Heritage; and • persons involved in the construction and management phases of the project will be trained in procedures to implement recommendations relating to cultural heritage. •		
	The Sub-Plan must incorporate the following management measures to manage the impacts to non-Aboriginal places within the project area: • the Kaiser Mine will be identified as a restricted area during wind farm construction through the erection of fencing, to ensure the items associated with the site are not inadvertently impacted; and • where any additional historic items are encountered, works shall cease immediately to allow an assessment of the object by an archaeologist, and the archaeologist may need to consult with the Heritage Branch of the Department of Planning regarding the significance of the finds.	BWFPL and contractor	During construction and as required

Table 20.7 – Noise Management – CEMP

Issue	Commitment	Responsible Party	Timing
Construction Noise Management Sub-Plan	A Construction Noise Management Sub-Plan will be prepared for the construction phase of the project to mitigate adverse noise impacts that could affect nearby residents.	BWFPL	Approval prior to construction commencing
	The Sub-Plan must incorporate the following management measures as identified within Chapter 11 of this EA: • the proponent will implement all 'feasible and reasonable' noise control strategies to minimise noise during construction; • engineering measures will include the following: - temporary acoustic barriers/screens to be constructed around fixed noise sources including for the fixed crushing and screening plant, concrete batching plant and percussions drilling rigs wherever these noise sources are located within 1,200 metres of a non-associated dwelling and do not have direct line of sight blocked to that dwelling. Temporary acoustic barriers/screens are to be installed in accordance with the following requirements: a) located as close as practical to the noise source; b) constructed from mounding using excavated soil from the site, or a material with a minimum surface density of 10 kilograms per square metre, such as 1.2 millimetre thick sheet steel or 9.0 millimetre thick compressed fibre cement sheeting; c) constructed to a minimum height that blocks direct line of sight between the noise source and any received within 1,200 metres; d) constructed such that there are no air gaps or openings at joints; e) extended such that the length is at least five times greater than its height or so that it is bent around the noise source; and f) if barriers (rather than mounding from excavated soil) are constructed, then include acoustic installation facing into the noise source in accordance with the following detail:	BWFPL	Approval prior to construction commencing

Issue	Commitment	Responsible Party	Timing



- the site topography, and other shielding features eg large stationary machines, mounds of topsoil and piles of materials should be used to an advantage in terms of increased shielding when locating fixed noise sources within 1,200 metres;
- proprietary enclosures will be used around compressors and generators;
- use of silencers;
- the proponent will investigate and implement alternative processes were feasible and practical, such as hydraulic or chemical splitters as an alternative to impact rock breaking, or the use of broadband reversing alarms[11] in lieu of high pitched devices. The fitting of a broadband alarm will be subject to an appropriate risk assessment, with the construction team being responsible for ensuring the alarms

[11] A broadband reversing alarm emits a unique sound which addresses the annoyance from the high pitched devices.

Issue	Commitment	Responsible Party	Timing
	are installed and operated in accordance with all relevant occupational, health and safety legislative requirements; - the fitting of broadband reversing signals; and - fixed noise sources (for example a crushing and screening plant, concrete batching plant, percussion drilling rigs and generators and compressors) will be located at the maximum practical distance to the nearest dwellings, and where possible will use existing landforms to block the line of sight between the equipment and nearby dwellings. • administrative measures: - regular inspections will be undertaken by the proponent and the EMR to ensure measures are taking in accordance with these requirements; - construction works, including heavy vehicle movements into and out of the site will be restricted to between 7.00am and 6.00pm Monday to Friday, and 8.00am to 1.00pm on Saturday; - works undertaken outside of the designated working hours will only entail works that do not cause noise emissions to be audible at any nearby residences not located on the site; or the delivery of materials as requested by Policy or other authorities for safety reasons; or emergency work to avoid the loss of lives, property and/or to prevent environmental harm; - other works additional to those as described above will require the consent of the New South Wales Office of Environment and Heritage; and - training to be provided to establish a noise minimisation culture for the works; • site management practices will include the following: - centralised site activities and material stores will be located as far from noise sensitive receivers as possible; - care will be taken not to drop materials, such as rock, to cause peak noise events, including materials from a height into a truck. Site personnel will be directed as part of an off-site training regime to place material rather than drop it; - plant known to emit noise strongly in one direction, such as the exhaust outlet of an attenuated generator set, will be orientated so that the noise is directed away from noise sensitive areas if practicable; - machines that are used intermittently will be shut down in the intervening periods between works or throttled down to a minimum; and		

Issue	Commitment	Responsible Party	Timing
	- work site induction training and education for staff will be implemented; • an equipment and vehicle monitoring regime will be implemented to ensure the following: - equipment will have Original Equipment Manufacturer (OEM) mufflers installed; - equipment will be well maintained and fitted with adequately maintained silencers which meet the OEM design specifications and inspection will be part of a monitoring regime; - silencer and enclosures will be inspected to ensure they are intact, and rotating parts are balanced, loose bolts are tightened, and frictional noise is reduced through lubrication and cutting noise reduced by keeping equipment sharp; - power necessary only for the task required will be used; and - plant and equipment will be inspected as part of the monitoring regime, to determine if it is noisier than other similar machines and to replace and rectify as required; • prior to construction, activity occurring within 1,200 metres of a non-associated dwelling, significant construction traffic periods, impacts on local road conditions, or blasting activity, the following will occur: - the local community potentially affected by the proposed works will be contacted and informed by letter of the proposed work, the location of the work, the date(s), day(s), times(s) of the works; - this contact will occur a reasonable time before the proposed commencement of the work; and - the letter will provide the contact details of the project manager and/or site 'environmental representative'. • Construction Traffic Management: - the daytime criterion provided by the ECRTEN is an equivalent (LAeq, 1 hour) noise level of 55 dB(A) during any given hour, which is expected to be achieved at a distance of 10 metres from the road side for 10 passenger vehicle movements and three heavy vehicle movements in one hour; - the number of movements can double at twice the distance from the roadside and continue to achieve the 55 dB(A) criterion; - care will be taken to avoid the acceleration of trucks and the use of truck engine		

Issue	Commitment	Responsible Party	Timing
	breaks in close proximity to dwellings; - communication will occur with the affected community in accordance with the provisions outlined previously; - a route will be established and maintained to the site so that heavy vehicles do not enter noise sensitive areas for access where practicable; - drivers will be informed of the approved route to access the site and the need to mitigate impacts through driver operation at certain locations; - construction traffic deliveries will be evenly dispersed as far as practical; and - construction traffic will be restricted to daytime operating hours, subject to the scheduling of caveats in the Construction Noise Management Plan; • monitoring of blasting activities will occur in accordance with a Monitoring Blasting Scheme to ensure compliance with the Blasting Guidelines; and • monitoring will occur to construction activities where they occur within 100 metres of a sensitive receiver, to ensure vibrations are compliant with the Technical Guidelines.		

Table 20.8 – Soil and Water Management Plan – CEMP

Issue	Commitment	Responsible Party	Timing
Soil and Water Management Sub-Plan	As part of the CEMP, a Soil and Water Management Sub-Plan will be prepared by BWFPL in consultation with relevant Government Departments and the Wellington Council. The Sub-Plan will be designed to: • divert surface run-off away from earthwork areas and soil stockpiles; • reduce the energy of surface flows in areas of potential erosion; • prevent sediment-laden or contaminated water leaving construction areas; • provide containment for sediment entrained in surface flows; and • reduce susceptibility of disturbed areas to erosion and include prompt revegetation of disturbed areas. The Sub-Plan will: • be consistent with the RTA's Guidelines for the Control of Erosion and Sedimentation in Roadworks; • identify the construction activities that could cause soil erosion or discharge sediment or water pollutants from the site; • describe management methods to minimise soil erosion, discharge sediment and water pollutants from the site; • describe the location and capacity of erosion and sediment control measures; • identify the timing and conditions under which construction stage controls will be decommissioned; • identify how the effectiveness of the sediment and erosion control system will be monitored, reviewed and updated; and • include contingency plans to be implemented for events such as fuel spills.	BWFPL	Approval prior to construction commencing
Soil scientist engaged	An appropriately qualified soil scientist will be consulted according to a schedule identified in the Soil and Water Management Sub-Plan. The results of inspections by this soil scientist will be reported in the CCRs. The soil scientist will: • undertake inspections of temporary and permanent erosion and sediment control devices; • ensure that the most appropriate controls are being implemented; and • check that controls are being maintained in efficient conditions.	BWFPL	During construction and as required

Issue	Commitment	Responsible Party	Timing
Soil and water mitigation measurement (Chapter 14)	Mitigation measures to be incorporated within the Soil and Water Management Sub-Plan as provided in Chapter 14 of the EA include: • earthworks: - rolling and wetting of access tracks with water as necessary to compact loose soil exposed during track formation; - the application of an approved wetting agent to exposed soils during dry and windy periods; - the capping of access tracks with gravel to suit the track usage requirements and to limit dust generation; - the stabilisation of exposed soils and stockpiles; - the placement of stockpiles in locations sheltered from wind and surface water flows as necessary; and - the rehabilitation of disturbed areas as soon as possible; • a full geomorphic assessment will be conducted on any watercourses where crossings are required. The design of the crossings will ensure geomorphic stability of the watercourse; • local water supplies will be used for dust control management measures, and will be balanced between the amount of available water supply and the severity of dust events, in consultation with the Wellington Shire Council and the DECCW Guidelines; • all construction vehicles will be registered vehicles that are required to maintain the necessary emission controls; • with regard to drilling for rock anchor installations: - rock anchors may be required to ensure stability of the turbine footings; - air blast drilling in preparation for rock anchors will be subject to controls to avoid dust plumes; and - dust filters and/or mist sprays will be applied to control any dust resulting from the air blast drilling; • where access tracks cross any alluvium filled creek valleys, the thickness of road base material will provide suitable drainage measures as necessary; • all turbines and access tracks will be constructed in accordance with relevant engineering standards;	BWFPL	Approval prior to construction commencing

Issue	Commitment	Responsible Party	Timing
	• typical erosion and sediment control measures to be utilised include the following as necessary and practical: - construction of drains and check dams; - construction of diversion banks, perimeter banks and level spreader sills; - use of sediment traps; - sediment fences around stockpiles and areas of earthworks; - stabilisation of temporary and permanent batters; - straw bale and geotextile filter fabric sediment traps and filers; and - minimisation of periods in which disturbed soil remains exposed; • disturbed areas will be stabilised according to the following: - temporary vegetation or mulch will be applied to all disturbed areas, including soil stockpiles that remain exposed for a period of 30 days or more; - all temporary diversion banks and sediment basin embankments will be seeded and fertilised as soon as practicable after construction, and take into account the growing seasons; and - stabilisation of all batters will be commenced within one week of completion of formation; • topsoil suitable for stripping and re-use in revegetation will be stockpiled: - stockpiles will be clearly identified; - stockpile locations will be selected free of traffic and away from drainage lines and watercourses; - stockpiles will be managed to minimise erosion and loss of topsoil, with surface stabilisation to prevent wind erosion where necessary; • erosion and sediment devices will be inspected regularly following each rain period and during periods of prolonged or heavy rain, and any defects will be rectified promptly; • all sediment control devices will be maintained in satisfactory working order until such time that disturbed areas have been stabilised to the satisfaction of Bodangora Wind Farm Pty Ltd and the respective land owners; • at the conclusion of construction, all temporary tracks and areas disturbed by construction work, including cable routes and hardstand areas surrounding the wind turbines will be reinstated and revegetated;		

Issue	Commitment	Responsible Party	Timing
	• all temporary control measures will be removed when revegetation has established on formerly disturbed areas, and will be disposed of in a satisfactory manner. Follow up maintenance will be undertaken until the areas are satisfactorily stabilised and restored; • priority to the use of overhead 33kV cables at sensitive locations, including the creek crossings as identified above in order to minimise ground disturbance and erosion risk; • where cables are to be installed across watercourses, cable installation should be in accordance with the NSW Office of Water *Controlled Activities: Guidelines for Laying Pipes and Cables in Watercourses* Guideline): - cables should be situated on the downstream side of channel bedrock outcrops, or across a straight section of the watercourse (ie avoiding bends); - backfilling needs to restore the channel shape and bed level to preconstruction condition; - the trench is to be open for minimal length of time only; - water flows should be continuous both during and after construction (ie avoiding or minimising 'stopping' the flow); and - measures taken to prevent potential water quality issues (turbidity, spills); • culverts or pipes are to be installed underneath new roadways to ensure that the natural drainage of the watercourse is not impacted; • culverts or pipes should be designed in accordance with the *Why do Fish Need to Cross the Road; Fish Passage; Requirements for Waterway Crossings* document (Fairfull and Witheridge, 2003); and • any interception or the use of groundwater may require a licence under relevant NSW water legislation. All proposed groundwater works including bores for the purpose of investigation, extraction, dewatering, testing or monitoring will be identified and approval obtained from the NSW Office of Water prior to installation.		

Table 20.9 – Management of Pollution Sources – CEMP

Issue	Commitment	Responsible Party	Timing
Management of Pollution Sources Sub-Plan	As part of the CEMP, a Fuel and Oil Management Sub-Plan will be prepared by BWFPL in consultation with relevant Government Departments and Wellington Council. The following mitigation measures will be included: • if oil filled generator transformers are used, containment measures will be incorporated to prevent any oil loss reaching local watercourses; • BWFPL will require the design of the substation to incorporate provision for containment of any oil spillage or leakage from the 33kV/132kV transformers including secondary containment; • in the case of areas of oil or fuel storage on-site, BWFPL will provide sufficient containment to contain any spillage that may occur at the location. Such sites will be monitored periodically for integrity of containment and adequacy of handling procedures. For the substation, containment measures will also include a secondary containment dam down-slope of the substation; • wastewater septic system: - installation and management will be in accordance with all relevant standards and guidelines, and consents obtained for discharge; and - the Operation Environmental Management Plan will require routine inspection to ensure effective maintenance; • storage and use of oils, fuels and chemicals generally: - procedures for the maintenance and handling of oils, fuels and chemicals will be documented and followed by construction and maintenance staff; - procedures will address waste oil removal from site and appropriate disposal or recycling; and - staff will be trained in emergency response and clean-up procedures should these be required, this will include waste oil removal and appropriate disposal or recycling; • management of spills/leakages at transformers at the substation: - bunds for the oil storage areas at transformers will be designed to contain any	BWFPL	Approval prior to construction commencing

Issue	Commitment	Responsible Party	Timing
	spill or leak for the maximum volume of contained substances; - secondary containment will be provided in the form of an earth dam to contain the maximum total containment volume; and - spill response equipment will be maintained on-site and the site will maintain a site-specific emergency response plan; • management of spills/leaks at wind turbine transformers: - oil will be stored in containers within internal bunding measures; - any leakage which has escaped the containment would only affect a relatively small and localised area around the generator transformer that could be effectively remediated; and - regular inspection of the transformers and turbine equipment will be undertaken to ensure the equipment remains in good working and leak-free condition; • small quantities of oil stored for turbine equipment will be situated within specifically designed containment devices within the turbines, and will include spill recovery equipment and materials; and • battery storage at the substation will incorporate containment measures, and the condition of batteries will be monitored through routine checking and adjustment of electrolyte levels and replacement as necessary.		
Waste Management and Re-use Sub-Plan	A Waste Management and Re-use Sub-Plan will be prepared for the CEMP to address the management of wastes during construction in accordance with the NSW Government's *Waste Reduction and Purchasing Policy*. The Sub-Plan will identify the following requirements for the construction period: • the application of the waste minimisation hierarchy principles of avoid/reduce/reuse/recycle/dispose; • specific details for the handling, storage and disposal of wastes, including cleared vegetation, contaminated materials, glass, metals and plastics, hydrocarbons (lubricants and fuels) and sanitary wastes; • any waste material that is unable to be re-used, re-processed or recycled must be disposed at a facility approved to receive that type of waste;	BWFPL	Approval prior to construction commencing

Issue	Commitment	Responsible Party	Timing
	• surplus topsoil will be spread on the site to blend in with the natural landform and will be revegetated; • surplus excavated material will be disposed of on the relevant property at one or more locations as agreed with the property owner. Disposal sites will be finished with topsoil and revegetated. Where feasible, existing erosion areas will be selected for backfill and treatment; • subject to the Council's agreement, it is proposed to dispose of packaging material, general construction debris and all other waste at the Blayney waste disposal area. Where feasible, recyclable items such as metals, glass or timber will be separated and directed to an appropriate local facility. Any putrescible general waste material will be stored in sealed containers until it is removed from site; and • disposal of sullage from any of the contractor's pump out toilet facilities will be to the local Blayney treatment plant or other suitable facilities as agreed with Council.		
Spoil and fill management	For the purposes of the development, BWFPL will ensure that any imported fill: • will be 'Virgin Excavated Natural Material' as defined within the Environmental Protection Authority's guideline: Assessment, Classification and Management of Liquid and Non-Liquid Wastes; and • will not introduce weeds that are not currently present at the locations where the fill will be used.	BWFPL	Ongoing as part of maintenance programme during construction

Table 20.10 – Traffic Management – CEMP

Issue	Commitment	Responsible Party	Timing
Construction Traffic Management Sub-Plan	A Construction Traffic Management Sub-Plan will be prepared for the CEMP, in consultation with Wellington Council, the RTA and the NSW Police.	BWFPL	Approval prior to construction commencing

Issue	Commitment	Responsible Party	Timing
Construction Traffic Mitigation Measures	A Construction Traffic Management Sub-Plan will incorporate the following measures identified within Chapter 12 of this EA: • The site access from public roads will be via entrances constructed as agreed by BWFPL, the property owners and Wellington Council to ensure safe negotiation by large vehicles access and minimise disruption to local traffic. A lockable gate will be installed at a point setback from the road at each entrance point. • Measures will be incorporated to ensure the safety of all road users, including the use of traffic control personnel, pilots and police escort will be provided during delivery of RAV with specific control arrangements for difficult or potentially unsafe manoeuvres on public roads. Signage and flashing lights, and temporary speed restrictions may also be used. • The timing of the delivery of large equipment and materials will be restricted to mitigate local impacts, including: - RAV movements will be restricted to avoid passing schools during school drop off-pick up periods to avoid RAV movements conflicting with school bus operations (including schools at Dubbo); and - local deliveries to the site will be during daylight hours only to mitigate safety problems on local roads and to reduce disturbance for residences near to the access roads. • An inspection and maintenance programme for local road access will be established to ensure local road conditions are maintained in a safe state for heavy and RAV access. • Road access/occupation permits will be obtained as upgrade works are required for the public road network. • On-site speed restrictions will be implemented for the project area. • On-site access will be restricted to defined tracks. • The detailed design, construction, and remediation of access track routes in proximity to environmentally and heritage sensitive areas with direct involvement and guidance from relevant specialists. • Implementation of a proactive Erosion and Sediment Control Plan during the construction of new access roads, including the following: - regular water spraying during construction to suppress dust;	BWFPL	Approval prior to construction commencing

Issue	Commitment	Responsible Party	Timing
	- at the conclusion of the construction phase, any tracks not required for subsequent operation will be restored and revegetated to the satisfaction of the Office of Environment and Heritage and the land owner; - all works to watercourses will be subject to sedimentation and erosion control measures; - where underground cables are required to cross Gillinghall Road, they will be buried and protected in accordance with Council standards and AS3000. Construction works will be carried out in the road reserve under permit (Section 138) with the appropriate traffic controls in place; and - the overhead line crossing of Mudgee/Goolma Road will be designed and constructed in accordance with the applicable RTA and Council standards.		

Table 20.11 – Greenhouse and Energy Management – CEMP

Issue	Commitment	Responsible Party	Timing
Greenhouse and Energy Management Strategy	A **Greenhouse and Energy Management Strategy** will be prepared prior to construction commencing, to ensure the use of non-renewable resources during construction is minimised.	BWFPL	Approval prior to construction commencing

Table 20.12 – Bushfire Risk Management – CEMP

Issue	Commitment	Responsible Party	Timing
Bushfire Risk Management Sub-Plan	A Bushfire Risk Management Sub-Plan will be prepared prior to construction commencing, in consultation with the NSW Rural Fire Service (RFS), based upon the *Planning for Bushfire Protection Guidelines* (RFS, 2006). The Sub-Plan will include the following: • at the commencement of building works the property around the wind turbines to a distance of 20 metres shall be maintained as an inner protection area; • details of the bushfire hazards and risks associated with the development; • mitigation methods including contingency plans; • procedures and programmes for liaison and regular drills with the RFS; and • procedures for regular fire prevention inspections by the RFS and implementation of any recommendations. • The following measures are for incorporation into the Bushfire Risk Management Sub-Plan during operation: • the contractor will be required to comply with all relevant sections of the *Bush Fires Act 1954* and the *Fire Brigades Act 1942* and will be required to liaise with the Rural Fire Service; • where necessary, native vegetation may be required for removal where in excess of 100 millimetres high at access tracks and work sites locations; • construction vehicles will use diesel fuel; • a mobile 1,000 litre water tanker unit complete with motor-driven pump, hose and nozzle will remain at the site during construction work; • knapsack sprays and McLeod tools (handheld fire fighting tools) will be kept at each work station; • where welding is undertaken, flame cutting or grinding will be carried out in the open during periods of fire danger, and an observer will be required to hold a knapsack spray on hand; • the contractor will be required to maintain the exhaust systems of all vehicles on-site in sound condition and to avoid any build-up of dry vegetation under vehicles; and • on days of high bushfire risk, the use of explosives will not be allowed.	BWFPL and contractor	Approval prior to construction commencing

Table 20.13 – Physical Safety Management – CEMP

Issue	Commitment	Responsible Party	Timing
Physical safety	Physical safety as part of the wind farm will be ensured by meeting the following relevant standards: • AS/NZS 1170.2 - Structural Design Actions - Wind Loads; • AS/NZS 1170.4- Structural Design Actions - Earthquake Actions; • AS 2550 - Cranes - Safe Use; • AS 3600 - Concrete Structures; • AS 4100 - Steel Structures (except tower); • Steel Tower – DIN 18 800; • IEC 61400-1 Wind Turbine Generator Systems - Safety Requirements; and • all construction works will be carried out in accordance with all relevant requirements of the WorkCover Authority and other statutory requirements. The following measures undertaken to reduce the risk of accidents for mobile plant to vehicles leaving the track area will include the following: • the identification of steep areas prior to the construction period commencing; • the 'benching' of steep access locations into the slope to provide for safe trafficable passage; • the installation of barriers, warning signs and/or tapes where steep areas have been identified to alert drivers of the hazard; • construction periods during daylight periods only; and • monitoring of working conditions.		During construction

20.4 OPERATIONAL ENVIRONMENTAL MANAGEMENT PLAN

The following measures are for incorporation within the Operational Environmental Management Plan.

Table 20.14 – Measures for Incorporation into the Operational Environmental Management Plan

Issue	Commitment	Responsible Party	Timing
Fuel and Oil Management Sub-Plan	The following measures will be undertaken: • regular inspection of the transformers and associated turbine equipment will be carried out to ensure good working and leak-free condition; and • procedures for maintenance will be documented and followed by maintenance staff.	BWFPL	Ongoing as part of maintenance programme
Waste Management and Re-Use Sub-Plan	A Waste Management and Re-Use Sub-Plan will be prepared for the CEMP to address the management of wastes during operation in accordance with the NSW Government's *Waste Reduction and Purchasing Policy*. The Sub-Plan will identify the following requirements: • the application of the waste minimisation hierarchy principles of avoid/reduce/reuse/recycle/dispose; • specific details for the handling, storage and disposal of wastes, including contaminated materials, glass, metals and plastics, hydrocarbons (lubricants and fuels) and sanitary wastes; • any waste material that is unable to be re-used, re-processed or recycled must be disposed at a facility approved to receive that type of waste; and • any waste oil arising from equipment servicing will be stored in sealed containers in a covered and bunded area until it can be removed off-site to a suitable waste oil facility.	BWFPL	Prior to operation commencing
Greenhouse and Energy Management Strategy	A Greenhouse and Energy Management Strategy will be prepared prior to construction commencing, to ensure the use of non-renewable resources during operation is minimised.	BWFPL	Prior to operation commencing
Bushfire Risk Management Sub-Plan	A Bushfire Risk Management Sub-Plan will be prepared prior to operation commencing, in consultation with the NSW Rural Fire Service (RFS), based upon the *Planning for Bushfire Protection Guidelines* (RFS, 2006). The Sub-Plan will include the following: • details of the bushfire hazards and risks associated with the development; • mitigation measures, contingency plans; • procedures and programmes for liaison and regular drills with the RFS; and	BWFPL	Prior to operation commencing

Issue	Commitment	Responsible Party	Timing
	• procedures for regular fire prevention inspections by the RFS and implementation of any recommendations.		
	Specific mitigation measures during the operation of the wind farm will include the following: • the property around the wind turbines to a distance of 20 metres shall be maintained as an inner protection area; • suitable buffers between vegetation and installed equipment and working areas will be maintained; and • alternative access tracks are to be maintained where existing.	Contractor	During operation
Telecommunications interference	Where degraded FM or TV broadcasting services are reported to the proponent, the following measures will be undertaken until the service is improved to a reasonable quality: • replacement of the exiting antenna system with a higher gain, and more directive model; • repositioning of the antenna in height or horizontally on the dwelling; • installation of an antenna elsewhere on the property and the provision of a cable to the dwelling; • changing the orientation of the existing antenna to receive an alternative station if available; • the provision of an alternative satellite service, eg the proposed Viewer Access Satellite Television (VAST) or Austar pay TV service; or • the installation of a TV or FM repeater station to provide service to groups of residents in a shadow zone (this is likely to only be justified for higher density population areas and other measures will be utilised first).	BWFPL	During operation as required
Operating Noise Contingency Strategy	In the event that the commissioned turbine noise exceeds the noise predictions, the noise of turbines will be reduced through the use of lower noise modes for use under certain operating conditions, which produce lower noise levels in accordance with the required standards.	BWFPL	As required
Aviation safety	Where location details are provided prior to construction commencing then the 'as constructed' details will also be provided prior to the completion of turbine erection.	BWFPL	Following construction
Heritage	Ground disturbance impacts associated with the project during operation will be kept to a minimum and to defined areas to ensure minimal impact to unlisted or unrecorded Aboriginal items.	BWFPL	During operation