

GULLEN RANGE  
WIND FARM

# Operational Environmental Management Plan (GR-PM-PLN-0017\_NGRWF1)

GULLEN RANGE WIND FARM



OCTOBER 2016



## Document Verification

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## GLOSSARY

AEMR	Annual Environmental Management Report
CoA	Conditions of the Project Approval
DECCW	Refer to OEH
DG	Director General
DoPI	(NSW) Department of Planning and Infrastructure
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EPA	Environmental Protection Agency
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i> (Cwth)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
ER	Environmental Representative
ESAM's	Environmentally Sensitive Area Maps
GRWF	Gullen Range Wind Farm Pty Ltd
JSEA	Job Safety and Environmental Analysis
km	kilometres
L&ECO	Land and Environmental Court Order
m	Metres
MSDS	Material Safety Data Sheet
NES	Matters of National environmental significance under the EPBC Act ( <i>c.f.</i> )
NPW Act	<i>National Parks And Wildlife Act 1974</i> (NSW)
NSW	New South Wales
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water
OEMP	Operational Environmental Management Plan
ONMP	Operational Noise Management Plan
Operator	Manage day to day operations, including routine and non-routine maintenance on behalf of the owner
Owner	Owner of the Wind Farm. Responsible for the all aspects of the environmental performance of the project.
PPE	Personal Protective Equipment
SEWPAC	(Cwth) Department of Sustainability, Environment, Water, Population and Communities
TSC Act	<i>Threatened Species Conservation Act 1995</i> (NSW)
WPMP	Weed and Pest Management Plan

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# 1 COMPLIANCE PLANS DOCUMENT MAP

	Stage 1	FINANCIAL CLOSE	Stage 2	CONSTRUCTION	Stage 3	OPERATION
Documents Required Before Construction	Community Information Plan		Compliance Tracker			
	Complaints Procedure		Community Enhancement Program		CEP approval	
	Stakeholder Communications Plan (Ref)		CEMP- TMP			
	Website		CEMP- SWMP			
	Compensatory Habitat Package		CEMP- WMP			
	Bird and Bat Management Plan		CEMP- NMPC (and BMP)			
	Powerful Owl Management Plan		CEMP- FFMP			
			CEMP- CHMP			
		Lease Arrangements for Decom.	TV & Radio SSMP	Bushfire Risk Management Plan	OEMP- RNP	
				Aviation Management Plan	OEMP- NOS	
Documents Requirements Before Operation					OEMP- NCP	
					OEMP- LMP	
					Safety Management System	
Other Documents			Land Acquisition Progress Documents		Shadow Flicker	
				Detailed Design	Commissioning Documents	
		Master List of Management Plans		Project Management Documents	Operation and Maintenance Documents	
		Turbine Supply Agreement			Construction Certificates	
		Project Schedule				
		Final Layout (WTG)				
		Layout Drawings				
	Consistency Review					
Ongoing Document						
						Reference Document

## 1.1 DOCUMENT REFERENCE NUMBERS

Document Name	Document Reference Number
Operational Environmental Management Plan	GR-PM-PLN-0017_NGRWF1
Landscape Management Plan	GR-PM-PLN-0018 Substation landscaping 284-4C-RB, 284-5-RA, 284-6-RA, 284-8-RE
Operational Noise Management and Noise Compliance Plan	GR-PM-PLN-0022 Revised Noise Impact Assessment Rp 002 R06 2012154SY
Safety Management System (Contained within Operational Management Plan)	GR-PM-PLN-0023
Environmental Policy	NGRWF_POL_001
Compensatory Habitat Package	GR-PM-PLN-0014
Bird and Bat Monitoring Plan	GR-PM-PLN-0012 GR-PM-PLN-0013 (Powerful Owl)
TV & Radio Survey	GR-PM-PLN-0015

## 2 INTRODUCTION TO THE PROJECT

### 2.1 BACKGROUND

This OEMP is a revised version of the OEMP approved by the DoPE in December 2013. The OEMP approved in December 2013 was prepared by **NGH** Environmental with input from Goldwind Australia. This revised document has been prepared by New Gullen Range Windfarm Pty Ltd.

The Gullen Range Wind Farm project involves the operation of 73 wind turbines at Gullen Range in the Southern Tablelands region of NSW. An Environmental Assessment (EA) to assess the potential environmental impacts of the wind farm was undertaken by **NGH** environmental in 2008. In accordance with the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and *State Environmental Planning Policy (Major Projects) 2005*, the proposal was considered to be a major project and was assessed under Part 3A of the EP&A Act. The Gullen Range Wind Farm was approved by the NSW Land and Environment Court (L&ECO) on the 4<sup>th</sup> of August 2010 following assessment under Part 3A of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act).

Pursuant to the Project Conditions of Approval (CoA) 7.4 and 7.5, this Operational Environmental Management Plan (OEMP) has been prepared to assist in the management of environmental impacts during the operation and routine maintenance of the Wind Farm.

Gullen Range Wind Farm entered its operational phase on 23<sup>rd</sup> December 2014.

In July 2015, a modification (MOD1) was granted by the NSW Department of Planning and Environment (DoPE). MOD1 related to the movement of 69 of the 73 turbines from their original consented locations by a distance of between 1 and 187m. The Project Approval (ref 07\_0118) was updated at this time, including condition 7.6, requiring update of this OEMP within 3 months of the MOD1 approval date.

The Gullen Range Wind Farm is located along a north-south running ridge system of the Great Dividing Range between Gunning, Crookwell and Goulburn in NSW's southern tablelands (Figure 2-1). The wind farms boundaries fall across four different precincts. All four precincts where infrastructure is installed (Kialla, Bannister, Pomeroy and Gurrundah) are located on private property within and adjacent to agricultural areas used for sheep and cattle grazing. In addition, residential dwellings and two commercial operations (chicken farms) are located nearby. In general, the precincts can be characterised as grassland ridges and flats with woodland patches on slopes and in gullies. The nearest townships are those of Grabben Gullen and Bannister, with larger towns including Crookwell, Gunning, Breadalbane and Goulburn in the region.

### 2.2 OPERATIONAL ACTIVITIES

The Gullen Range Wind Farm is operated as a manned electricity generator providing up to 165.5MW of renewable power at full capacity into the 330kV network owned by TransGrid. The following activities are likely to occur during the operation of the Wind Farm:

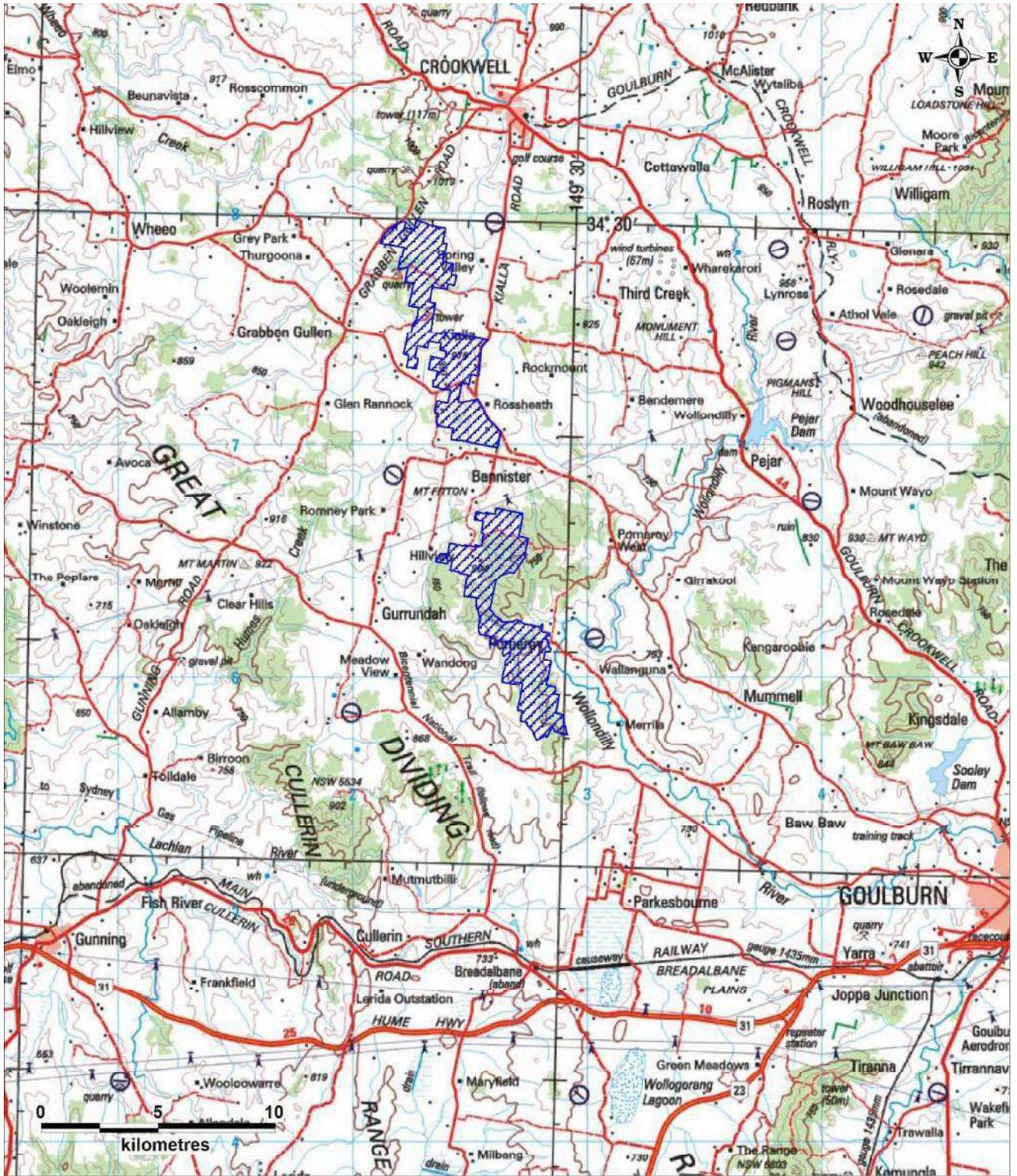
- Generation of electricity
- Switching turbines on/off depending on the suitability of the wind resource in generating electricity
- Maintenance of turbines, nacelles, blades and towers

- Maintenance of substation (part of which will be owned and managed by TransGrid as a separate facility and will have its own OEMP which is developed in accordance with this OEMP)
- Maintenance of other electrical infrastructure, including underground cables
- Maintenance of access roads and other civil infrastructure

Additionally, a number of environmental obligations are relevant to the operational phase of the project. These obligations will be met by the implementation of specific sub-plans (discussed further in Sections 3 and 4).

The wind farm is owned by New Gullen Range Wind Farm Pty Ltd (NGRWF). NGRWF has subcontracted the operation of the wind farm to Goldwind Australia Pty Ltd (GWA).

Figure 2-1: Site location (hatched in blue)



## 2.3 COMMENCEMENT OF OPERATION

Gullen Range Wind Farm entered its operational phase on 23<sup>rd</sup> December 2014. This date is used as the anniversary date where specified in this OEMP.

# 3 INTRODUCTION TO THE OEMP

## 3.1 PLANNING CONTEXT AND CONDITIONS OF APPROVAL

The Gullen Range Wind Farm was approved by the NSW Land and Environment Court on the 4<sup>th</sup> of August 2010 following assessment under Part 3A of the NSW Environment Planning and Assessment Act 1979 (EP&A Act). A modification to the Project Approval (MOD1) was granted by the DoPE on 7<sup>th</sup> September 2015.

A summary of the DoPE Conditions of Project Approval that apply to the operational phase of the project are as follows:

**Land and Environmental Court Order Nos 1.1, 1.2, 1.3, 1.7 and 1.10.** These define the administrative conditions of the project including Terms of Approval, Modifications to the Scope of the Project, Limits of Approval, Statutory Requirements and Decommissioning.

**Land and Environmental Court Order Nos 2.1, 2.2, 2.3, 2.3A, 2.4, 2.5, 2.6, 2.7, 2.15, 2.18, 2.19, 2.20, 2.22 to 2.24, 2.33, 2.35, 2.36, 2.37, 2.42, 2.43, 2.44, 2.45, 2.46, 2.47, 2.55, 2.56, 2.57, 2.62, 2.63, 3.1, 3.2, .** These cover specific requirements governing various environmental issues during the operational phases of the project. These issues relate to visual amenity, noise, land acquisition, flora and fauna, aviation, bushfire risk, bunding and spill risk, safety management, traffic and transport, electromagnetic interference, soil and water, heritage and waste generation.

**Land and Environmental Court Order No 3.3 and 6.1b) to 6.1g).** Covers independent environmental auditing requirements.

**Land and Environmental Court Order Nos 5.1, 5.2, 5.3, 5.4, 5.5, 5.6 and 5.7.** These two conditions cover the requirements of the project in regards to community information, consultation and involvement. These include the establishment, maintenance and online accessibility of a complaints register, the requirements for community enhancement and establishment and operation of a Community Consultative Committee (CCC).

**Land and Environmental Court Order No 6.1a).** This covers the requirement for an Annual Environmental Management Report (AEMR).

**Land and Environmental Court Order No 7.1.** This covers the requirement for an Environmental Representative.

**Land and Environmental Court Order No 7.4 to 7.6.** This covers the preparation and implementation of an *Operational Environmental Management Plan* (OEMP) and sub-plans, and a review of the OEMP within three years of commencement of operation of the project or 3 months of the approval of any modification application.

**Land and Environmental Court Order Nos 8.1 to 8.2.** These cover the requirements of the proponent in regards to incident reporting.

Conditions relevant to decommissioning will become important at the end of the Operational phase of the wind farm. Arrangements for complying with these conditions will be stated under the Decommissioning Management Plan to be produced in accordance with condition 7.7.

In addition to the L&ECO conditions, recommendations contained within the *Submissions Report Statement of Commitments* are to be implemented. Full conditions are detailed in Appendix A.

Specific to the preparation of this OEMP and sub-plans, Condition 2.55 of the Project Approval stipulates:

*The Proponent shall undertake reasonable and feasible mitigation to rectify any television/radio transmission problems reasonably attributable to the project at any residential dwelling located within five kilometres of a wind turbine. Such measures may include:*

- a) modification to or replacement of receiving antenna;*
- b) installation and maintenance of a parasitic antenna system;*
- c) provision of a land line between the affected receiver and an antenna located in an area of favourable reception; or*
- d) other feasible measures;*
- e) if interference cannot be overcome by the measures outlined in a) to d), the Proponent shall negotiate with the impacted landowner about installing and maintaining a satellite receiving antenna.*

*Any requested works shall be completed within three months of the completion of the relevant television and/or radio reception assessment, unless otherwise agreed by the landowner. The Proponent shall be responsible for all reasonable costs associated with undertaking the mitigation measures.*

Condition 2.47 of the Project Approval stipulates the Proponent must prepare and implement the following:

*At least two months prior to the commencement of commissioning, the Proponent shall prepare a report outlining a comprehensive Safety Management System, covering all on-site systems related to ensuring the safe operation of the project. The report must clearly specify all safety related procedures, responsibilities and policies, along with details of mechanisms for ensuring adherence to the procedures. Records must be kept at the Site and must be available for inspection by the Department upon request. The Safety Management System must be developed in accordance with the Departments Hazardous Industry Planning Advisory Paper No. 9, Safety Management and should include: a) procedures and programs for the maintenance and testing of the safety related equipment to ensure its integrity over the life of the project; and b) an outline of a documented procedure for the management of change.*

Condition 3.1 of the Project Approval stipulates the Proponent must prepare and implement a Bird and Bat Adaptive Management Program prior to the commencement of construction, which:

*The Proponent shall prepare and implement a Bird and Bat Adaptive Management Program for the project to the satisfaction of the Secretary. This program must be submitted to the Secretary for approval prior to construction, and be updated by 31 December 2015, unless otherwise agreed by the Secretary. The program must be prepared in consultation with OEH, and take into account the bird/bat monitoring methods identified in the current editions of AusWEA Best Practice Guidelines for the Implementation of Wind Energy*

*Projects in Australia and Wind Farm and Birds: Interim Standards for Risk Assessment. The Program shall be implemented by a suitably qualified expert, approved by the Secretary. The Program shall incorporate Monitoring, and a Decision Matrix that clearly sets out how the Proponent will respond to the outcomes of monitoring. It must:*

*incorporate an ongoing role for the suitably qualified expert;*

*set out monitoring requirements in order to assess the impact of the project on bird*

*and bat populations, including details on survey locations, parameters to be*

*measured, frequency of surveys and analyses and reporting. The monitoring*

*program must be capable of detecting any changes to the population of birds and/ or bats that can reasonably be attributed to the operation of the project, that is, data may be required to be collected prior*

*to the commencement of construction. The requirements must also account for natural and human changes to the surrounding environment that might influence bird and/ or bat behaviour such as changes in land use practices, and significant changes in water levels in nearby water bodies;*

*incorporate a decision making framework that sets out specific actions and when they may be required to be implemented to reduce any impacts on bird and bat*

*populations that have been identified as a result of the monitoring;*

*identify 'at risk' bird and bat groups such as the Powerful Owl, the Little Eagle, the Common Bent-wing Bat, the Large-footed Myotis and the Eastern False Pipistrelle and include monthly mortality assessments and periodic local population censuses and bird utilisation surveys;*

*identify potential mitigation measures and implementation strategies in order to*

*reduce impacts on birds and bats such as minimising the availability of raptor*

*perches, swift carcass removal, pest control including rabbits, use of deterrents, and sector management including switching off turbines that are predicted to or have had an unacceptable impact on bird/ bat mortality at certain times; and*

*identify matters to be addressed in periodic reports in relation to the outcomes of monitoring, the application of the decision making framework, the need for mitigation measures, progress with implementation of such measures, and their success.*

*The Reports referred to under part f) shall be submitted to the Secretary on an annual basis, from the commencement of operation, and shall be prepared within two months of the end of the reporting period. The Secretary may vary the reporting requirement or period by notice in writing to the Proponent.*

*The Proponent is required to implement reasonable and feasible mitigation measures as identified under part e) where the need for further action is identified through the Bird and Bat Adaptive Management Program, or as otherwise agreed with the Secretary.*

Condition 7.4 of the Project Approval stipulates the OEMP must include:

- a) *The Proponent shall prepare and implement an Operation Environmental Management Plan in accordance with the Department's publication entitled Guideline for the Preparation*
- b) *of Environmental Management Plans (2004) or its latest revision. The Plan shall include but*
- c) *not necessarily be limited to:*
- d) *identification of all statutory and other obligations that the Proponent is required to fulfil in relation to the operation of the development, including all consents, licences, approvals and consultations;*

- e) *a management organisational chart identifying the roles and responsibilities for all relevant employees involved in the operation of the project;*
- f) *overall environmental policies and principles to be applied to the operation of the*
- g) *project;*
- h) *standards and performance measures to be applied to the project, and means by which environmental performance can be periodically reviewed and improved, where appropriate;*
- i) *management policies to ensure that environmental performance goals are met and to comply with the conditions of this approval;*
- j) *the Management Plans listed under condition 7.5 of this approval; and*
- k) *the environmental monitoring requirements outlined under this approval.*
- l)
- m) *The Plan shall be submitted for the approval of the Secretary no later than one month prior to the commencement of Operation of the project or within such period as otherwise agreed by the Secretary. Operation must not commence until written approval has*
- n) *been received from the Secretary. Upon receipt of the Secretary's approval,*
- o) *the Proponent shall make the Plan publicly available as soon as practicable.*

Condition 7.5 of the Project Approval stipulates the Proponent must prepare and implement, but is not limited to, the following Management Plans:

- a) *a Noise Management Plan to outline measures to minimise noise emissions from the operation of the project. The Plan must include, but not necessarily be limited to:*
- b) *details of procedures to ensure ongoing compliance with the operational noise limits specified in condition 2.15 as they apply to identified receptors. This should include identification of monitoring requirements;*
- c) *identification and implementation of best practice management techniques for minimisation of noise emissions where reasonable and feasible;*
- d) *measures to be undertaken to rectify annoying characteristics resulting from the operation of the project such as, but not limited to, infrasound or adverse mechanical noise from component failure; and*
- e) *procedures and corrective actions to be undertaken if non-compliance is*
- f) *detected.*
- g) *a Landscape Management Plan to outline measures to ensure appropriate development and maintenance of landscaping on the site to address the visual impacts arising from the project including, turbines, site access roads, substation and control*
- h) *and facilities building, as far as is reasonable and feasible. The Plan must be prepared*
- i) *by a qualified landscape architect and meet the requirements of Council, should there*
- j) *be any. The Plan must include, but not necessarily be limited to:*
- k) *measures associated with the biodiversity offset package required under*
- l) *condition 2.35 and any remnant vegetation onsite;*
- m) *details of landscaping to be undertaken at the site including locations for planting;*
- n) *maximisation of use of flora species that are native to the locality and with low maintenance requirements;*
- o) *a program for the removal of weeds introduced or spread as a result of the development at the site; and*
- p) *A program for maintenance of all landscaped areas on the site to ensure these areas are kept in a tidy, healthy state.*

Condition 7.6 of the Project Approval stipulates requirements for the review of the OEMP:

*Within 3 years of the commencement of the operation of the project, or within 3 months of the approval of any modification to this approval, the Proponent shall review, and if necessary, revise the OEMP to the satisfaction of the Secretary. Following approval, the Proponent shall implement the updated OEMP to the satisfaction of the Secretary.*

This document sets out the above mentioned requirements in a manner that facilitates the implementation of these requirements and their monitoring, to ensure compliance.

## 3.2 SCOPE AND PURPOSE OF THIS DOCUMENT

The OEMP is an overarching plan written to sit aside other management documents. It provides the environmental management details for the operational phase of this project and applies to all activities including those undertaken by subcontractors.

The OEMP contains environmental detail sufficient to ascertain project:

- Governance – the OEMP establishes a framework for management and control of activities with environmental aspects and key risks identified
- Assurance – the OEMP is the key plan describing how the Wind Farm Owner and its contractors will control the environmental aspects of project execution and how appropriate reviews will be carried out
- Verification and validation – the OEMP provides a framework to assure environmental quality and performance outcomes can be verified and validated

### 3.2.1 Scope

The scope of the OEMP coincides with the operational phase of the Gullen Range Wind Farm project. Operation includes the management of specific environmental components, as set out in the following management sub-plans that complement the CEMP:

- Operational Noise Management Plan (Appendix J)
- Landscape Management Plan (Appendix G and G1)
- Weed & Pest Management Plan (Appendix J)
- Bird and Bat Management Plan (Appendix I)
- Compensatory Habitat Strategy (Appendix H)
- Pre-Construction Television and Radio Assessments (Appendix L)
- Safety Management Plan (Appendix M)

The scope of this OEMP comprises all operational activities, including environmental management commitments, switching turbines on/off and maintenance of turbines, nacelles, towers, substation, other electrical infrastructure, access roads and other civil infrastructure. The OEMP, sub-plans and work method statements will be applicable to all site workers throughout the entire operational phase. Copies of the OEMP will be made available to any member of the public, on request. The OEMP will also be available on the Gullen Range Wind Farm website after it has been approved by the DoPE.

The purpose of this OEMP is to ensure that the potential environmental impacts associated with the operational phase of the Gullen Range Wind Farm are managed in accordance with statutory obligations and the Conditions of the Project Approval (CoA). The objectives of the OEMP are:

- To enable commercial operation of the Gullen Range Wind Farm in an environmentally responsible manner
- To provide operational staff with a clear, concise and practical environmental management plan
- To identify and detailed monitoring requirements associated with operation
- To identify environmental management responsibilities and management structure
- Present the regulatory framework within which operation occurs
- To meet the CoA in relation to the OEMP and ongoing environment monitoring requirements

### 3.2.2 Structure of the OEMP

The ongoing environmental management during the operation of the Gullen Range Wind Farm has two key aspects which could have environmental impact:

1. Impacts from the operation of the wind farm for energy generation, including the need for any monitoring programs
2. Impacts from maintenance activities including civil and structural works to maintain the wind farm infrastructure (routine and non-routine maintenance)

In response to these aspects, this OEMP has been structured to clearly identify between what is an operational management (Section 4) requirement and what is a maintenance management requirement (Section 5).

## 3.3 ORGANISATIONAL ACCOUNTABILITY, RESPONSIBILITY AND AUTHORITY

A range of personnel will be involved in the environmental management of the operation of the Gullen Range Wind Farm. All site staff have responsibilities and authorities in relation to environmental management including:

- The right to stop work or refuse to work in a situation that may cause environmental harm
- Duties and responsibilities to prevent pollution
- Obligations to respond to environmental incidents, including their prevention, cleanup and reporting

These, and other general obligations, are included in the site induction (see Section 7). Persons with specific environmental responsibility are detailed in Table 3-1.

**Table 3-1** Personnel with specific environmental responsibilities

Role	Responsibility	Authority
Owner's management team	Ensure Environmental Policy is communicated throughout business  Responsible for providing the required resources to complete the required tasks and to facilitate company	Authority to limit and stop works

Role	Responsibility	Authority
	<p>corporate support. Resources being financial, technical and includes external resources</p> <p>Develop and implement objectives and targets for environmental and safety management</p> <p>Delegates to Project Manager – Owners Representative</p>	
<p>Asset Manager – Owner’s Representative (Located onsite and remotely)</p>	<p>Oversee the implementation of all environmental management plans and monitoring programs required under the planning approval</p> <p>Determining sequence and interaction of staff, resources and processes</p> <p>Ensure communications and reporting framework in place</p> <p>Ensure the goals of the OEMP (and sub-plans) are achieved and maintained</p> <p>Report incidents to agencies</p> <p>Ensure mitigation plans are appropriate and resourced</p> <p>Make changes to OEMP and communicate to relevant stakeholders</p> <p>Communication with stakeholders including agencies, public and other identified stakeholders</p> <p>Reviews OEMP</p> <p>Manages environmental compliance obligations (set out in Section 4) and any consultants required in relation to this work</p> <p>Designs and Implements environmental induction</p>	<p>All aspects of the environmental performance of the project.</p> <p>Authority to update OEMP and implement upon DoPE/Agency Approval</p> <p>Stop Work orders</p>
<p>Operational Manager (Located onsite and remotely)</p>	<p>Responsible for delivery of operational activities including routine and non-routine maintenance works.</p> <p>Ensure inductions and training are completed in accordance with the OEMP and sub-plans</p> <p>Ensure environmental impacts are minimised and environmental obligations set out in the OEMP and sub-plans are met</p> <p>Approves EWMS &amp; JSEA’s</p> <p>Ensures records are maintained</p> <p>Delegates to Operational Site Supervisor and Health and Safety Manager</p> <p>Reports incidents to agencies</p>	<p>Authority to stop works</p>

Role	Responsibility	Authority
<p>Operational Site Supervisor (located on site full-time)</p>	<p>Responsible for implementing the OEMP in relation to maintenance activities (set out in Section 5)</p> <p>Ensure all activities on site are undertaken in accordance with the OEMP, sub-plans and Safety Management Plan</p> <p>Reporting of environmental incidents</p> <p>Ensure management measures relating to wind farm performance are maintained</p> <p>Responsible for ensuring any subcontractors engaged in relation to this project are inducted and the OEMP (and sub-plans) are implemented.</p> <p>Identifies all environmental and safety risks associated with maintenance works</p> <p>Creates /reviews EWMS and JSEAs for operational staff and contractors</p> <p>Reports incidents to agencies</p> <p>Maintains site records</p>	<p>Authority to limit and stop works</p>
<p>Project Services Manager - Health, Safety and Quality Manager (Located onsite and remotely)</p>	<p>Ensures goals of Safety Management Plan are achieved</p> <p>Ensure that environmental auditing is undertaken in accordance with all relevant project Environmental Management Systems and Safety Management System and their associated ISO standards (where applicable)</p> <p>Reports incidents to agencies</p>	<p>Authority to limit and stop works</p>
<p>Environmental Representative (Located remotely with regular site visits as required)</p>	<p>Be the principal point of advice in relation to the environmental performance of the project</p> <p>Oversee the implementation of all environmental management plans and monitoring programs required under the planning approval, and the Proponent upon the achievement of these plans/programs</p> <p>Consider and advise the Proponent on its compliance obligations against all matters specified in the conditions of the planning approval and the Statement of Commitments and all other licences and approvals related to the environmental performance and impacts of the project</p> <p>Ensure that environmental auditing is undertaken in accordance with all relevant project Environmental Management Systems</p> <p>Be given the authority and independence to require reasonable steps be taken to avoid or minimise</p>	<p>Authority to require environmental actions to be undertaken.</p>

Role	Responsibility	Authority
	unintended or adverse environmental impacts, and failing the effectiveness of such steps, to direct that relevant actions be ceased immediately should an adverse impact on the environment be likely to occur.	
Consultants / Nominated experts (Located onsite and remotely as required)	Provide specialist input and advice on environmental matters Design and assist in implementing monitoring programs Undertake surveys and inspections Preparation of environmental reports Ensure environmental impacts are minimised and environmental obligations are met Undertake activities in accordance with the relevant JSEA's and agreed procedures Report any activity that has resulted, or has the potential to result in an environmental incident	Suggest Stop Work orders <i>(stop work permitted if action deemed unsafe)</i> Recommend actions to the owner to address compliance issues

The following figures illustrate:

- The Gullen Range Wind Farm management structure: high level
- The Gullen Range Wind Farm management structure: detail
- The Project Management Team
- Environmental reporting and management hierarchy

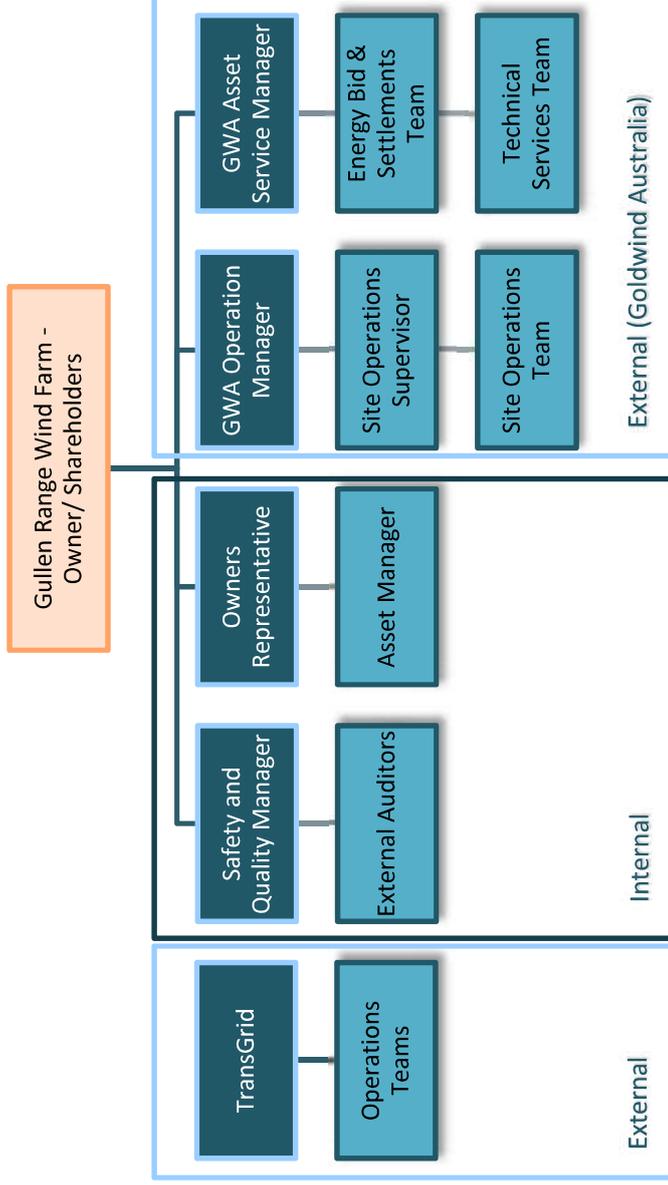


Figure 3-1 Gullen Range Wind Farm management structure: high level

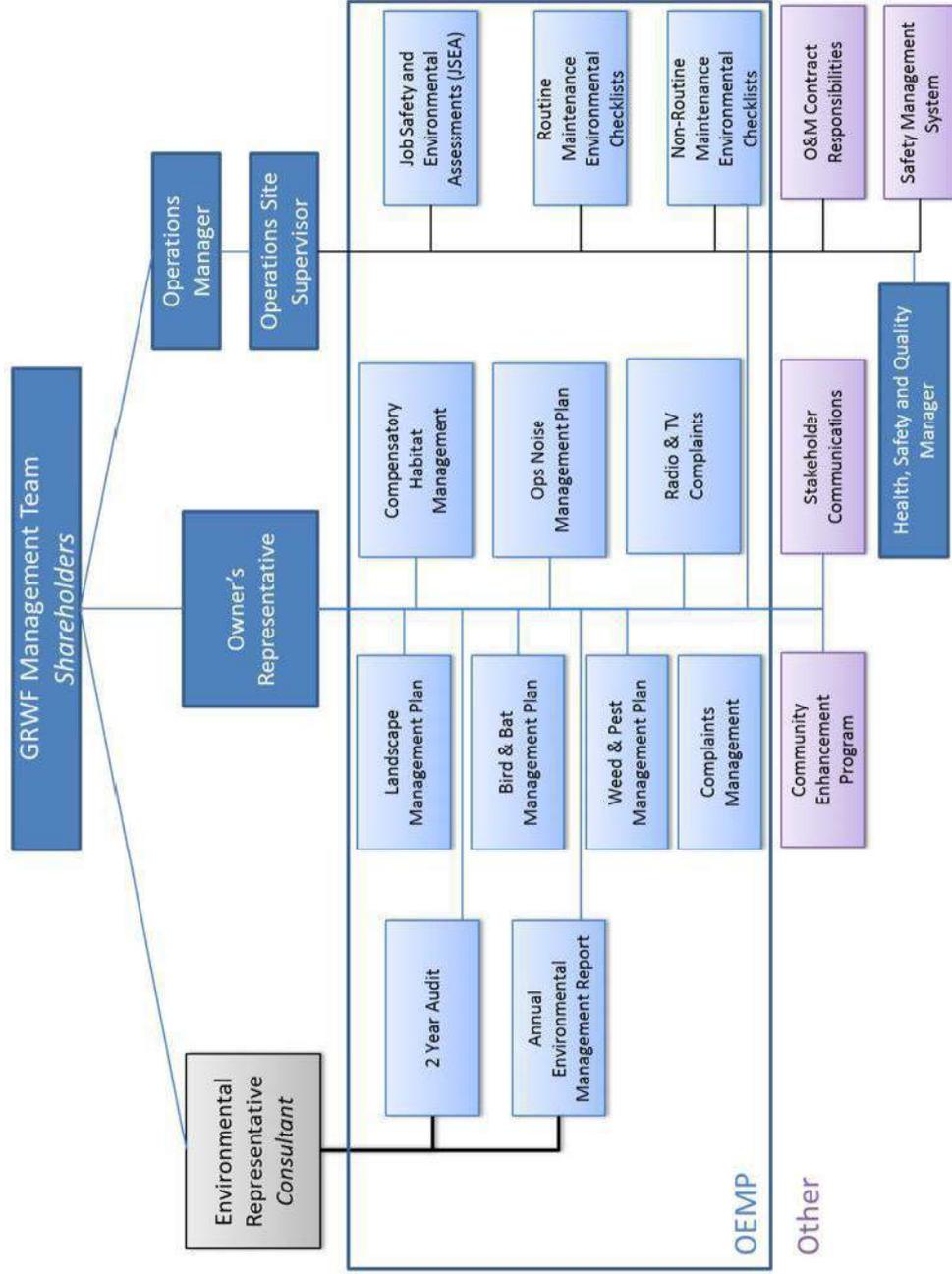


Figure 3-2 Gullen Range Wind Farm management structure: detail

WTG: Wind Turbine Generator

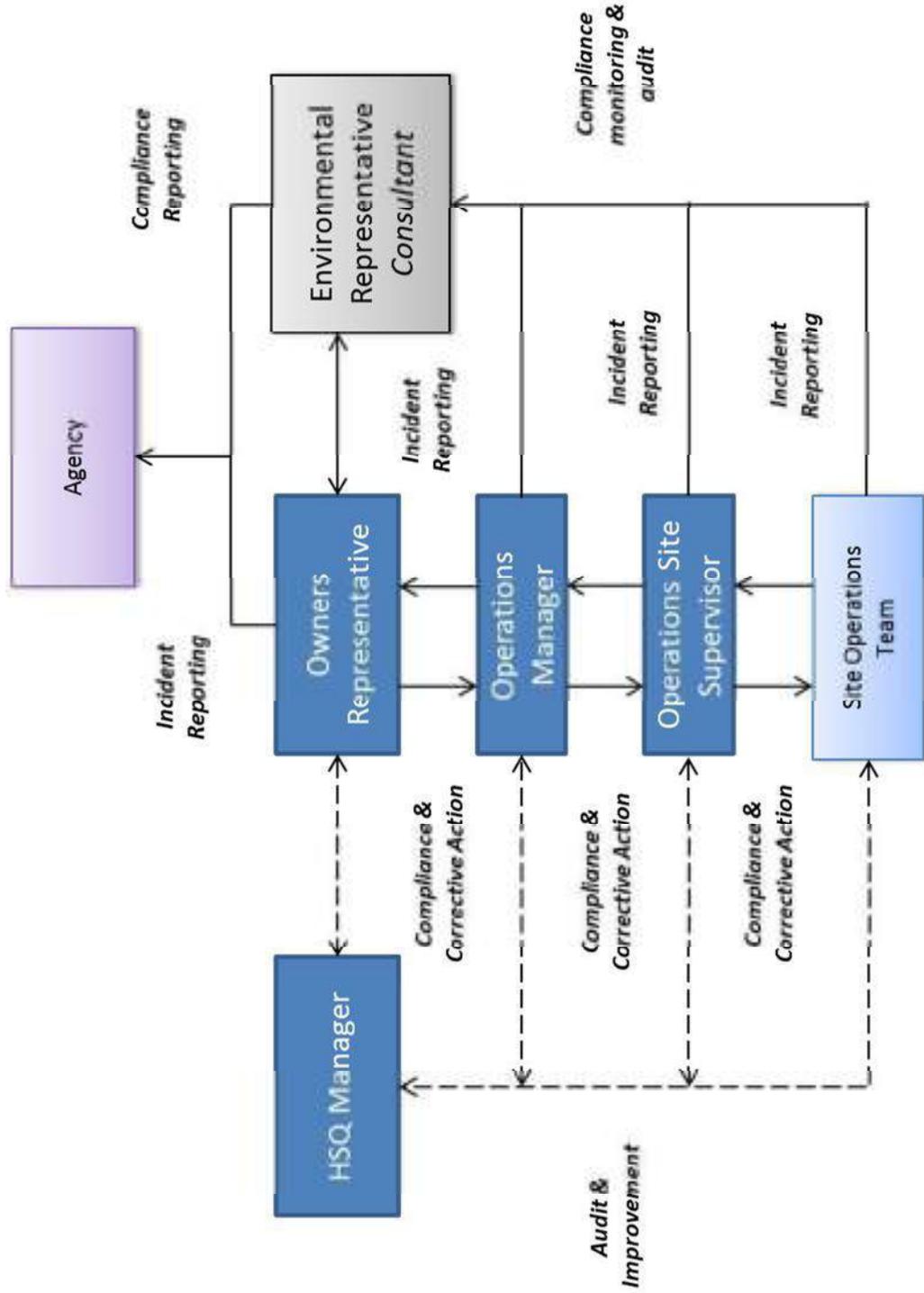


Figure 3-3 Project compliance reporting hierarchy

### 3.4 MANAGEMENT OF LICENSES, PERMITS AND APPROVALS

Part 3A of the *EP&A Act* integrates the assessment and approval regime for Major Projects. As such, many authorisations are not required.

An Environmental Protection Licence is required for the operation of wind farms in NSW under Protection of the Environmental Operations Amendment (Scheduled Activities) Regulation 2013 which commenced on 28<sup>th</sup> June 2013. A licence has been obtained by the Proponent (no 20365) and it will be maintained by the Owners Representative throughout the life of the project. Monitoring/compliance actions will be undertaken in accordance with the conditions of the EPL.

There are no other environmental licences (other than the CoA) of relevance to the operation of the Wind Farm. Whilst it is not envisaged that any would be required throughout the life of the project, advice will be obtained from the Environmental Representative upon the necessity of further approvals.

### 3.5 DOCUMENTATION CONTROL AND RECORDS MANAGEMENT

Document control is a fundamental aspect of an environmental management system. For this project, document control for the OEMP and sub-plans is managed through the Document Control Table found at the front of each document. The document control table will identify the revision status of documents.

Documents will be controlled to ensure that obsolete and un-released documents are not inadvertently used.

All changes to documents must be reviewed and approved by Project Manager – Owner’s Representative. All records will be legible and stored in hard copy or electronically on site.

### 3.6 OEMP REVIEW

The OEMP will be formally reviewed within three years of the commencement of operation and at least every three years thereafter. It will also be reviewed within three months of the approval of the approval of any modification to the Project Approval. The review will ensure the OEMP is up to date and all changes to procedures and practices since the previous review have been fully incorporated into the Plan.

The OEMP will be formally reviewed in accordance with the Internal Audit schedule (see Section 9.2). The OEMP review will involve site management staff, Project Manager – Owner’s Representative and the Operations Manager. It will include:

- A review of all audit findings, including the independent audit (Refer to Section 9.2)
- A review of the operation of environmental procedures, processes, forms, checklists and any other documents called for in the OEMP
- A review of environmental incidents and community complaints
- Modifications to the OEMP as required

The OEMP will be amended, as required, based on the outcomes of these and any other matters requiring review. All changes made to the OEMP will be controlled, with copies forwarded to the Controlled Copies holders identified in the front of this document.

Where changes are required outside the formal review framework, revised documentation will be forward to the Controlled Copies holders. Only the Project Manager – Owner’s Representative is authorised to make

changes to the OEMP. The procedure for altering the OEMP and all related documentation is described below.

The NSW Department of Planning and Environment (DoPE) will be provided a copy of the final OEMP and sub-plans for approval, no later than one month prior to commencement of operation. It is acknowledged that minor changes to the OEMP may occur on a regular basis during operation. As such, only significant or substantial version changes would be submitted to the DoPE for information purposes. Significant or substantial is defined as being:

- a substantive change to the scope or goals of the OEMP, the implementation methodology, monitoring requirements or requirements for implementing corrective actions, that would or could have an impact upon meeting the CoA of approval.

Advice would be sought from the Environmental Representative on whether changes to the OEMP require approval from DoPE.

**Table 3-2:** OEMP review procedure

<b>Procedure for Making Changes to the OEMP</b>
1. Need for change is identified
2. The Operations Manager is notified in writing by the Project Manager - Owner's Representative
3. The Project Manager - Owner's Representative are notified in writing
4. The Project Manager instigate the changes to the OEMP
5. For minor changes, the Project Manager - Owner's Representative issues the changes to the Controlled Copies holders
6. For major changes as determined by the Project Manager - Owner's Representative issues the changes to the Controlled Copies holders including DoPI
7. Records of changes tracked within the compliance reporting mechanism, document control and communications control
8. Records of training updates where required will be logged in the training records and will be monitored as per the audit process

## 4 OPERATIONAL ENVIRONMENTAL MANAGEMENT

This section documents the background and broad-level strategic details of the management of operational environmental issues. The information provided below outlines the specific environmental management plan that will be used to manage key environment issues:

### 4.1 OPERATIONAL NOISE MANAGEMENT PLAN

<b>Objectives</b>	To monitor ongoing operational noise and respond to any exceedences of the noise criteria during operation, and to respond to any noise complaints beyond that time.  This plan includes a Noise Impact Assessment. The Noise Impact Assessment was updated at the request of the EPA in December 2014. The updated version is also attached in Appendix K.
<b>Legal and other Requirements</b>	CoA 7.5 <i>Protection of the Environment Operations Act 1997</i>
<b>Potential Impacts</b>	Noise-related disturbances on nearby receivers
<b>Target</b>	Undertake effective noise monitoring and respond accordingly to any breaches in noise criteria  Address any noise complaints systematically, objectively and to the satisfaction of government agencies

### 4.2 LANDSCAPE MANAGEMENT PLAN

<b>Objectives</b>	To provide an appropriate landscape plan for the site, specific local roads and residences taking into account visual amenity goals, vegetation management and soil stabilisation requirements.  This includes substation landscaping and lifetime maintenance as required by CoA 2.3A.
<b>Legal and other Requirements</b>	CoA 7.5 CoA 7.3A
<b>Potential Impacts</b>	Visual amenity impacts Deterioration of offset habitat area and remnant vegetation onsite
<b>Target</b>	Achieve a landscape management program which provides a practical and reasonable response to visual impact

### 4.3 WEED & PEST MANAGEMENT PLAN

<b>Objectives</b>	Categorise areas for management, identify weed/pest removal techniques and undertake monitoring and corrective actions where required
<b>Legal and other Requirements</b>	CoA 7.5
<b>Potential Impacts</b>	Out-compete native plants or animals

	Reduce natural diversity Increase fire hazard
<b>Target</b>	Prevent spread and incidence of weeds within operational work area Removal of weeds introduced as a result of wind farm development at site No new invasive weeds species introduced to operational work area

#### 4.4 BIRD AND BAT MANAGEMENT PLAN

<b>Objectives</b>	To monitor the impacts on bats and birds from the operation of the wind farm, and provide a response framework to manage identified impacts. <i>This plan is currently being updated in consultation with OEH. The OEMP will be updated when the updated plan has been approved by the DoPE.</i>
<b>Legal and other Requirements</b>	Protection of the Environment Operations Act 1997 Threatened Species Conservation Act 1995
<b>Potential Impacts</b>	Bird and bat strikes from the operation of the wind farm
<b>Target</b>	Minimise the impact of the Wind Farm operation on avian fauna Effectively respond to any issues identified by the monitoring program

#### 4.5 COMPENSATORY HABITAT PACKAGE

<b>Objectives</b>	To provide guidance on how the offset site should be managed to maintain or improve biodiversity value This plan has been approved by DoPE under CoA 2.35. A PVP is now in the process of being approved by LLS. Management of the PVP will then commence in accordance with the CHP.
<b>Legal and other Requirements</b>	CoA 2.35 SoC 16
<b>Potential Impacts</b>	Habitat loss Deterioration in habitat quality Reduction in landscape connectivity Potential disturbance to turbine foundations
<b>Target</b>	Achieve a 'like for like' or 'like for better' offset Areas will be as connected and enhance landscape connectivity as much as possible. This will reduce the degradation of edge effects as well as improve usage of the areas as corridors Ensure improvements to habitat value in the offset site

#### 4.6 PRE-CONSTRUCTION TELEVISION AND RADIO ASSESSMENT

<b>Objectives</b>	To undertake reasonable and feasible mitigation to rectify television/radio transmission problems attributable to the project at any residential dwelling within 5km of a wind turbine
<b>Legal and other Requirements</b>	CoA 2.44 and 2.55

<b>Potential Impacts</b>	TV and radio transmission interference
<b>Target</b>	To address any TV and radio complaints systematically To undertake reasonable and feasible mitigation that are attributable to the project at any residential dwelling with 5km of a wind turbine within 3 months

#### 4.7 SAFETY MANAGEMENT PLAN

<b>Objectives</b>	Ensure the health and safety of all staff and provide guidance on emergency planning and response. <i>This plan has been developed by Goldwind Australia as NGRWF's Operations Contractor.</i>
<b>Legal and other Requirements</b>	CoA 2.47
<b>Potential Impacts</b>	Refer to Safety Management Plan (SMP)
<b>Target</b>	Refer to Safety Management Plan (SMP)

These subplans are appended to the OEMP.

## 5 MAINTENANCE WORKS DURING OPERATION

Maintenance works during operation can be divided into two types:

1. Routine Maintenance
2. Non-Routine Maintenance

All maintenance works, whether routine or non-routine, will be managed through activity level risk assessments such as JSEA's.

Standard JSEA's will be developed for routine maintenance activities that are periodic and predictable. Routine maintenance JSEA's will be reviewed prior to the commencement of that activity to ensure the JSEA is revised as the scope of that activity changes or where additional risks have been identified.

The scope of works for each non-routine maintenance activity will be finalised and used to develop an activity specific JSEA's prior to commencement of works. Refer to the procedure for developing a JSEA (Section 6.1) and the SMP.

### 5.1 ROUTINE MAINTENANCE

Routine maintenance is to occur monthly during the life of the project and will be managed by the Operations Manager. Routine maintenance could include activities such as:

- Inspection of turbines
- Inspection of roads and pads
- Inspection of stormwater controls and erosion management
- Replacement of broken or faulty parts and equipment
- Minor cleaning and repairs

As part of routine maintenance, the Routine Maintenance Environmental Checklist would be completed (Appendix D) to identify areas of environmental impact that require mitigation.

The checklists shall be filed in the Owner's and Operator's document management system and immediate corrective actions shall be undertaken where practical. The completed checklists shall be reviewed by the Operations Manager who will provide advice and direction any other actions as appropriate.

### 5.2 NON-ROUTINE MAINTENANCE

It is envisaged that some non-routine maintenance civil and electrical works could be required during the operational phase of the project. Non-routine works would be mainly undertaken by subcontractors and the operations team and supervised by the Operations Manager. Such works could include:

- Civil works to correct failures/deficiencies in the road network, drainage or other infrastructure
- Electrical works, including trenching, re-cabling and testing
- Structural works on turbine towers, nacelles or blades, or other components of the wind turbines
- Maintenance such as replacing infrastructure, washing, painting, welding etc.

In all instances the management sub-plans included in this OEMP will be followed where applicable to manage anticipated environmental impacts from such activities. Additional environmental management measures for non-routine maintenance works may be required. These management measures would be

addressed through the Non-Routine Maintenance Environmental Checklist (Appendix E) and included in the Job Safety and Environmental Analysis (JSEA) for that activity.

The environmental performance of maintenance activities will be monitored through a number of processes outlined in **Table 5-1**.

**Table 5-1:** Environmental monitoring of maintenance activities

Inspector	Inspection Type	Protocol	Timing
Project Manager – Owner’s Representative	Compliance Inspection – field work	OEMP	Randomly during selected maintenance activities
Project Manager – Owner’s Representative	Compliance Audit May be entirely desktop or include field component	OEMP	At least annually

Appendix E provides protocols for management of environmental impacts during non-routine works. When assessing non-routine works this list should be referred to for assistance in developing an environmental management protocol for that specific work. The relevant controls (Refer **Table 5-2**) will be included in the JSEA.

**Table 5-2:** Generic environmental controls specific to operation activities

General
<ul style="list-style-type: none"> <li>• Undertake an environmental induction to make all personnel aware of the environmental management controls for the works to be undertaken</li> <li>• Wherever practical, no new access tracks are to be created for the works. If required, the ground surface shall be returned to its pre-existing condition</li> <li>• Parking of vehicles and storage of plant/equipment is to occur on existing roads and pads only</li> </ul>
Erosion & sedimentation
<ul style="list-style-type: none"> <li>• Erosion and sediment control measures are to be implemented and maintained to:                             <ul style="list-style-type: none"> <li>○ Prevent sediment moving off-site and sediment-laden water entering any water course, drainage lines, or drain inlets</li> <li>○ Reduce water velocity and capture sediment on site</li> <li>○ Minimise the amount of material transported from site to surrounding pavement surfaces;</li> <li>○ Divert clean water around the site</li> </ul>                             (in accordance with the Landcom/Department of Housing <i>Managing Urban Stormwater, Soils and Construction Guidelines</i> -the Blue Book).                         </li> <li>• Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request</li> <li>• Erosion and sediment control measures are not to be removed until the works are complete or areas are stabilised</li> <li>• Work areas are to be stabilised progressively during the works</li> <li>• Stockpiles are to be protected with sediment fence on the downslope side</li> </ul>
Water quality

- Works are not to be undertaken adjacent to water courses unless appropriate ERSED controls are in place.
- ERSED controls will be maintained to ensure run-off is limited.
- Any clean run-on water will be protected from contamination by works, including stockpiles, by diverting it away from the works/stockpile area until any affected areas of disturbance are stabilised
- Wastewater generated from the works is to be treated to prevent the release of dirty water into drainage lines and/or waterways
- Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills
- Water quality control measures are to be used to prevent any materials (e.g. concrete, grout, sediment etc.) entering drain inlets or waterways
- All fuels, chemicals and liquids are:
  - to be stored in an impervious bunded area a minimum of 50 metres away from creeks or any areas of concentrated water flow.
  - flooded or poorly drained areas; and
  - Slopes above 10%.
- The bund must be able to contain a bund volume of 150% of the volume of the largest single stored
- Refuelling of plant and equipment is to occur only on roads and pads
- Vehicle wash down and/or cement truck washout is to occur in a designated bunded area or in a suitable area offsite
- An emergency spill kit is to be kept on site at all times. All staff are to be made aware of the location of the spill kit and trained in its use

#### Air Quality

- Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust where required
- Vehicles are to be maintained to a high standard.
- Stockpiles of soil and vegetation are to be located away from exposed areas and be covered where practical.
- Works (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely, and where these would affect adjacent amenity or ecological values
- Vegetation or other materials are not to be burnt on site
- Vehicles transporting waste or other materials that may produce odours or dust, or from which waste could escape, are to be covered during transportation

#### Noise & Vibration

- Works are to be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public holidays is to minimise noise impacts
- All works must be carried out in accordance with the Operational Noise Management Plan

#### Flora & Fauna

- Any intrusive works (those involving the removal of vegetation) will be surveyed by a qualified ecologist prior to undertaking works

- The Catchment Management Authority will be notified of any disturbance to the PVP area.
- Areas of adjacent EEC are to be delineated and avoided
- There is to be no disturbance or damage to any native trees without written authority from Project Manager – Owner’s Representative
- Works are not to harm any fauna
- Declared noxious weeds are to be managed according to requirements under the *Noxious Weeds Act 1993* (refer to Weed and Pest Management Plan, Appendix I)
- **As practical, machinery and vehicles shall be inspected and if necessary, cleaned to remove any soil or plant material prior to entry and egress to the wind farm to control noxious weeds.**

#### Traffic

- The volume of traffic will be kept to the absolute minimal necessary to undertake the works
- There is to be no disruption to offsite traffic without prior permission by the local councils (Upper Lachlan Shire and Goulburn Mulwaree Council) and/or the RMS where impacts are identified.
- All vehicles used during operations and maintenance will be driven in a manner and at a speed compatible with the conditions
- Onsite speed limit of 40Km/h will be adhered to by all staff and contractors
- All applicable road occupancy licences will be obtained prior to road possession if required
- All vehicles and equipment will be restricted to designated tracks and roads
- All vehicles where reasonable and feasible are to be maintained to a high standard and fitted with noise reducing equipment e.g. broad band reversing alarms.
- Vehicles are to avoid noxious weed infested areas where practical.
- Fuel for vehicles will be kept on site in a trailer-mounted tank unit (if necessary). Under no circumstances will vehicles be left unattended during refuelling operations
- Oils to be kept in solid 20 litre drums stored and locked safely within the site transport containers. Waste oils will be recycled where possible.

#### Non-Aboriginal Heritage

- If non-indigenous archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and Operations Manager contacted immediately.
- Works will cease until written confirmation from the Operations Manager has been obtained by the contractors.

#### Aboriginal Heritage

- If Aboriginal heritage artefacts are uncovered during the works, all works in the vicinity of the find will cease and Operations Manager contacted immediately.
- Unidentified artefact will be reported to OEH
- Should human remains be discovered OEH and the local police will be notified and the area of the find will be isolated.
- Works in the vicinity of the find must not re-commence until clearance has been received from Owner and the OEH

#### Waste Management

- Resource management hierarchy principles are to be followed:
  - Avoid unnecessary resource consumption as a priority
  - Avoidance is followed by resource recovery (i.e. reuse materials if possible, including reprocessing, recycling and energy recovery)

- Disposal is undertaken as a last resort

(in accordance with the *Waste Avoidance & Resource Recovery Act 2001*)

- All personal waste shall be disposed of in a designated waste disposal unit. An appropriate Waste Disposal Contractor shall be used to manage waste disposal from site and disposed of in accordance with statutory requirements
- Waste is not to be burnt on site
- Waste is to be securely stored, while storage onsite is required, so that pollution of surrounding areas does not occur
- Waste material is not to be left on site once the maintenance works have been completed
- Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day

#### Land-use

- Farmers will be consulted prior to works being undertaken that may disturb farming operations or livestock
- It is expected that grazing animals will be removed from the area during the erection works. Where animals are found in the area, they shall be managed appropriately by site manager to avoid injury to any animal and personnel.
- Gates are to be left as they are found. In general, gates shall be presumed to be closed unless directed otherwise.

#### Fire Control

- CFA permits must also be gained by the Site Supervisor during periods of advertised fire bans.
- Only diesel powered vehicles allowed to access the WTG's to minimize the risk of fire caused by sparks coming from the exhaust system of petrol driven vehicles.
- No fires are permitted on site and smoking is only allowed in designated smoking areas, great care needs to be exercised during the dry summer months. Smoking is strictly prohibited in the WTG's.
- Various fire suppressing systems are maintained on site including fire extinguishers and a water cart.
- All activities which have the potential to cause heat, sparks and/or fire are controlled using the Hot Work Permit.

## 6 ACTIVITY SPECIFIC RISK MANAGEMENT

Risk management for this project would be undertaken at the activity level with impacts being identified through JSEA's or similar risk assessments (Refer to SMP). Environmental controls and mitigation measures (set out in Appendix D and E) would be included in the JSEA's as required.

### 6.1 PROCEDURE FOR DEVELOPING JSEA

JSEA's are key environmental management application for the workforce and detail the 'how to' and 'do's and don'ts' for the implementation of controls, management and mitigation measures.

They provide a comprehensive and informative means of communicating environmental management requirements to site personnel and often form the basis for direct and specific workforce education through toolbox sessions/talks.

#### A. Scope the works

A clear and precise scope of works would be included in the JSEA including:

- A step by step description of each activity
- The purpose of each step
- Areas that works would be undertaken in
- Potential interactions with the environment

#### B. Complete a risk assessment

The JSEA would include a risk assessment for each step involved in the activity. A risk assessment table would be completed using a risk matrix to identify the likelihood, consequence and risk of each activity. The outcome of this risk assessment will derive the methodology for mitigating potential environmental impacts.

#### C. Provide a site diagram

Environmentally Sensitive Area Maps (ESAMs) are developed for the Project as a tool to identify existing sensitive receivers and any areas of environment, community and/or heritage significance.

The ESAMs identify/illustrate the following:

- The existing and new access tracks
- The location of turbines, compounds, substation and other facilities
- The project impact area boundary
- Sensitive noise receivers including residential homes
- Environmentally sensitive areas/zones e.g. EEC
- Areas of noxious weeds

#### D. JSEA signed off by site management

JSEA must be signed off by Operations Manager prior to commencement of operational activities.

## 7 PERSONNEL, TRAINING AND INDUCTION

### 7.1 LEADERSHIP AND COMMITMENT

All employees shall receive appropriate environmental induction and training to ensure that they are aware of their responsibilities and are competent to carry out the work. Environmental requirements will be explained to employees during the site induction on on-going training via tool box meetings, briefings and notifications as required.

All employees (including subcontractors) shall receive induction/training in the following:

- NGRWF Environmental policy (Refer Appendix C)
- This OEMP and its intended purpose, including its relationship to and method of use of the associated sub-plans
- Site environmental objectives and targets
- Understanding individual authorities and responsibilities
- Site environmental rules

To demonstrate and foster a culture of commitment to the policy there will be:

- Participation of senior management to ensure the rationale, adoption and management of the OEMP has a clear line of commitment 'from top to bottom'
- Regular communication of project environmental performance
- Sharing of environmental lessons
- Identification and management of environmental risks
- Incident investigation
- Closing out environmental actions and recommendations

### 7.2 ENVIRONMENTAL INDUCTION & TRAINING

All site staff will be appropriately qualified and trained for the specific role they are to undertake. Training records will be kept on site in accordance with the document control and records management protocols outlined in Section 3.3. If training is required for any site staff, this training would be completed prior to the commencement of work.

**Table 7-1:** Training requirements have been identified below for permanent staff and contractors.

Personnel requiring training	Training requirement	Type	Schedule and timing of training
All permanent staff	Environmental Education	Induction	At commencement of work
All	Job Safety & Environmental Analysis Erosion and Sedimentation Control Operational Noise Management Plan Landscape Management Plan Weed & Pest Management Plan Bird & Bat Management Plan Compensatory Habitat Strategy Pre-Construction Television and Radio Assessments	Covered in induction and site awareness poster	Prior to commencement of work

### 7.3 ENVIRONMENTAL INDUCTION

The Environmental Induction will be integrated into the site induction. The Environmental Induction will as a minimum include:

- A copy of the Environmental Management Plans and discussion of the key environmental risks and constraints
- An outline of the OEMP structure
- A discussion of the environmental component of JSEA's
- The roles and responsibilities of staff, including contractors, in relation to environmental management
- An outline of the environmental Incident Management Procedure

### 7.4 MAINTENANCE PLANNING MEETINGS (TOOL BOX TALKS)

It is anticipated that a tool box talk would be held at the commencement of each day, or at the commencement of new maintenance activities. The aims of the tool box talks are to identify the specific proposed work activities that are scheduled for that day. In addition, the necessary work method statements and sub plans would be identified and discussed prior to the commencement of the activities.

- Site meetings would be held on a regular basis involving all site personnel. The objectives of the site meetings is to discuss the coming weeks proposed activities and identify the relevant risks, work method statement requirements and sub plans that will be relevant to that week's activities.
- Any non-compliances will also be discussed and actions to address and close issues will be undertaken.

### 7.5 SUBCONTRACTOR MANAGEMENT

Subcontractors likely to be utilised during the works include:

- Civil works contractor
- Electrical contractor
- Turbine cleaning contractor
- Environmental consultants

All subcontractors (including consultants) will be required to work under this OEMP and sub-plans. Prior to commencing any work, subcontractors are required to:

1. Be inducted to the appropriate level
2. Develop a JSEA or equivalent in accordance with the requirements of this OEMP, or work under an existing routine maintenance JSEA if applicable (refer to Appendix D)
3. A Non-Routine Maintenance Environmental Checklist or equivalent must be completed to assist in the preparation of the JSEA if the work is non-routine (refer to Appendix E)
4. If preparing a JSEA, have it approved by the Operations Manager

## 7.6 ENVIRONMENTAL MONITORING OF ACTIVITIES

Environmental monitoring will be undertaken to ensure that activities are being managed as identified in JSEAs (Section 5, Appendices D and E).

## 7.7 ENVIRONMENTAL REPRESENTATIVE (ER)

Land and Environmental Court order 7.1 states that: *Prior to the commencement of the construction, operation or decommissioning of the project, the Proponent shall nominate for the approval of the Secretary a suitably qualified and experienced Environmental Representative(s) independent of the construction, operation or decommissioning personnel.*

Broadly, the ER's roles and responsibilities include:

- Being the primary contact in relation to the environmental performance of the project;
- Being responsible for overseeing, auditing and if required suggesting changes to all management plans and monitoring programs required;
- Being responsible for considering and advising on matters specified in the conditions of approval, including all other licences and approvals related to the environmental performance and impacts of the project;
- Being an advisory point in dealing with complaints;
- Having the authority to require that reasonable steps be taken to avoid or minimise unintended or adverse environmental including stop operations notices if required

## 8 COMMUNICATION

The communications strategy for the Gullen Range Wind Farm is built around the following fundamental principles:

1. Provision of relevant information to specific stakeholder groups during operation (website, newsletters, local media, letter drops).
2. Provision of a 24 hour complaints line during operation.
3. Operation of a Community Consultative Committee (CCC) in accordance with relevant guidelines published by the DoPE.
4. Quarterly meetings with host landowners

To this extent, local residents would have targeted access to information about the Wind Farm, including formal and informal opportunities to find out about operations, and to provide feedback to the Wind Farm operators. Relationships with local residents have been established throughout the planning and development phases of the project. The relationships and communication methods used in the past would be continued throughout operation as appropriate and as needed.

The broader community will be kept informed of the project through general media, including newspaper advertisements and press releases, and through the local Council.

The website will also be used to post information in accordance with Planning Approval Condition 5.2.

The regularity of these communications is defined as follows:

- Where operational activities adjacent to or in close proximity of these stakeholders is likely to impact upon them in some way.
- CCC meetings on a quarterly frequency (commencing January 2016)
- Newsletters on a quarterly frequency

### 8.1 INTERNAL COMMUNICATION

The Operator will engage a number of subcontractors during the project. The Owner has also engaged an Environmental Representative for the duration of the project.

To ensure that environmental requirements are met effective communication between all parties must be achieved, Project Manager – Owner’s Representative would act as the single point of contact between all parties identified for all matters relating to environmental performance, including roles and responsibilities. Please refer to diagram 5-4 for the management and interaction structure. Effective dissemination of information would be provided by the Operations Manager to the identified points of contact as detailed below.

### 8.2 EXTERNAL COMMUNICATIONS

#### 8.2.1 Stakeholder and Community Consultation

The Project Manager – Owner’s Representative and Operations Manager will ensure all relevant stakeholders are consulted at appropriate times during operations. Specific communication actions are required during operation of the Wind Farm. Where these are relevant to local residents and the broader

community, they have been identified and summarised in **Table 8-1**. Roles outlined in the responsibility columns are defined in the OEMP.

Table 8-1 Operational communication requirements

Operational Activities					
Issue	Stakeholder	Objective	Methods of Consultation	Timing trigger	Responsibility
<b>Operation activities</b>	Local residents Broader community	To advise of: <ul style="list-style-type: none"> <li>Works being undertaken on the wind farm including working hours, duration and a general description of activities</li> <li>Works which interact with the community or stakeholders</li> <li>A contact number, regarding the operation of the Wind Farm</li> <li>Complaints avenues</li> </ul>	Website Information Advertisement in local media Newsletters CCC Letter drops	As required	Project Manager – Owner’s Representative Operations Manager
<b>Radio and TV reception</b>	Local residents	To advise of procedures to notify relevant landowners of the process available to review potential impacts on radio and television transmission.	In person consultation.	Prior to commissioning	Project Manager – Owner’s Representative
<b>Operational Noise Limits</b>	Local residents	To minimise noise emissions where reasonable and feasible and mitigate against annoying characteristics resulting from the operation of the Wind Farm	In person consultation.	Pre-operation noise assessment and as specified by the ONMP	Project Manager – Owner’s Representative Operations Manager
<b>Landscaped Area Maintenance</b>	Local residents	To advise of pesticide use as required. Refer to WPMP.	In person consultation.	Prior to pesticide use	Operations Manager
<b>Landscaping of Properties for visual impact mitigation</b>	Local residents	To agree installation and maintenance of landscape screening	Letters advising of eligibility In person consultation Telephone conversation	Prior to landscaping and during 2 year maintenance period	Project Manager – Owner’s Representative
<b>Aviation</b>	Air Services Australia CASA Department of Defence Users of Crookwell Aerodrome, Kings and Ashwell Airstrips	To advise of the final layout and AOD height of installed WTGs and associated infrastructure	NOTAM Layout diagram Email	Prior to Operation	Project Manager – Owner’s Representative
<b>Emergency Services</b>	RFS Police Ambulance RFS	To advise and inform of operational activities	Onsite meeting and drills Layout and access diagrams	Lifetime of project	Project Manager – Owner’s Representative Operations Manager QHSE Manager

### 8.2.2 Government Agency Consultation

Consultation with a range of government agencies may be required through the operation of the Wind Farm. The Project Manager – Owner’s Representative will consult and cooperate with all relevant regulatory agencies in meeting the project environmental requirements and will permit those agencies to audit operational activities for regulatory compliance.

A list of relevant contact names and details for the operation of the Wind Farm will be maintained by the Operations Manager.

The Operations Manager or his delegate will be available to the EPA on a 24 hour basis and has the authority to take immediate action to shut down any activity or to effect any pollution control measure as directed by the authorised officer of the EPA.

## 8.3 EMERGENCY RESPONSE

The following contacts are to be utilised for emergency contact purposes. The numbers will also be present on induction materials.

Emergency Contact / Organisation	Contact Details
Police	000
Ambulance	000
NSW Rural Fire Service	000
Wind Farm Community Info Line (24h)	1800 509 711
OEH Environment Line	131 555
Goulburn Mulwaree Council	02 4823 4444
Upper Lachlan Shire Council	02 4830 1000
EPA	131 555
DoPI	02 9228 6555

## 9 ENVIRONMENTAL COMPLIANCE AND REPORTING

All environmental compliance and reporting will be the responsibility of the Owner, however may be completed by the Operations team.

### 9.1 IMPLEMENTATION OF THE OEMP

The OEMP will be implemented on site during the entire operational period. The implementation of the OEMP will be reviewed and audited throughout the operation phase as detailed in Section 3.6.

### 9.2 ENVIRONMENTAL AUDITING

The operation phase of the project will be subject an independent audit within two years of the commencement of operation of the project, and then, as may be directed by the Secretary (Refer to Table 9-1). The audit will be undertaken by an independent person or team commissioned by Owner. This is in accordance with CoA condition 3.3.

Audits will be conducted in accordance with *ISO 19011:200 - Guidelines for Quality and/ or Environmental Management Systems Auditing*.

**Table 9-1** Environmental auditing program

Auditor	Audit scope	Audit protocol	Timing
<b>Environmental Representative or an independent audit body</b>	Project compliance to CoA Project compliance to OEMP Project compliance to SoC	CoA 3.3	Within 2 years of the commencement of operation

Audits to comply with both the OEMP and the CoA will be carried out using the same scope and focus as outlined below unless a specific non-conformance is identified.

Audits will:

- Assess compliance with the requirements of the CoA, and other licenses and approvals that apply to the project
- Assess the environmental performance of the project against the predictions made and conclusions drawn in the documents referred to under L&ECO condition 1.1
- Review the effectiveness of the environmental management of the project, including any environmental impact mitigation works
- Review the adequacy of the Proponent's response to any complaints made about the project through the Complaints Register required under L&ECO condition 5.5

An Environmental Audit Report will be submitted for comment to the DG within two months of completion of the audit, detailing the findings and recommendations of the Audit and including a detailed response from the Owner to any of recommendations contained in the report.

## 9.3 COMPLIANCE MANAGEMENT

Compliance tracking will be undertaken on a yearly basis during operation and will be formally reported to DoPI through the Annual Environmental Management Report (AEMR).

An electronic compliance management system has been established. The compliance management system allows for tracking of compliance during distinct phases of the project. A summary report can be prepared at any time upon request.

## 9.4 REPORTING

### 9.4.1 Pre-Operation Compliance Report

A pre-operation compliance report will be prepared and submitted to the DoPI prior to the commencement of operation of the wind farm. Note that a commissioning and testing phase will be required prior to operation. The report will clearly demonstrate compliance with:

- All L&ECOA relevant to the pre-operational phase of the project.
- Any licence, permit or other approval requirement relevant to the pre-construction phase.
- Operational performance measures and targets

The Compliance Report will be reviewed, endorsed and issued by Owner.

### 9.4.2 Annual Environmental Management Report (AEMR)

An AEMR will be prepared and submitted to the DG through the operational life of the Wind Farm. The AEMR will review the performance of the Wind Farm against the OEMP, the conditions of approval and other licences and approvals relating to the Wind Farm project. The AEMR anniversary date will be 12 months from the commencement of Operation (which falls on 23<sup>rd</sup> December). The AEMR will report on each 12 month period of operation within three months of the finish of that 12 month period.

### 9.4.3 Annual Evaluation and Adaptive Management (EAM) Reports

The EAM reports are used to identify matters to be addressed in relation to the outcomes of bird and bat monitoring, including implementation of mitigation measures and their success.

The EAM report would be provided by expert consultants to the Operator at 6 month intervals from the commencement of operational monitoring. The EAM reports would provide the basis for the Annual reports that would be prepared by the Expert. The annual report will be submitted to the DG by the Operator within 2 months of the end of the reporting period. Refer to the Bird and Bat Management Plan for further details (Appendix I).

## 10 COMPLAINTS AND INCIDENT MANAGEMENT

### 10.1 COMMUNITY COMPLAINTS PROTOCOL

A complaints procedure is included as Appendix B of the Community Information Plan. This protocol addresses the following conditions of consent:

- Requirement to maintain a complaints register (CoA).

In accordance with Project Approval condition 5.3, the Community Information Plan will be updated in early 2016.

#### 10.1.1 Complaints Management Procedure

##### Provision of phone, mail and email contacts for complaints

The following avenues are provided for community complaints for the life of the project:

##### Website:

A project website is provided at the following address:

[www.gullenrangewindfarm.com](http://www.gullenrangewindfarm.com)

The website provides:

- A contact form to accept emailed complaints
- A postal address to accept mailed complaints
- A 24hr phone line to accept phone message complaints

Email Address: [info@gullenrangewindfarm.com](mailto:info@gullenrangewindfarm.com)

##### Advertisement:

An advertisement will be placed in local newspapers (such as The Voice, Goulburn Post, The Land) communicating the website address, email, postal address and telephone number for complaints once prior to commencement of operations.

##### Onsite signage:

A sign clearly visible to the public will be placed on public roads, nearest to the official operational entry.

Signage will display:

- An email address to email complaints
- A postal address to accept mailed complaints
- A 24hr phone line to accept phone message complaints

##### 24 hour phone line

- A phone line will be available during operation
- The current contact number is 1800 509711
- Contacts will be updated as necessary during the operational phase

### Maintenance of a complaints register

1. The complaints register template is provided in Appendix F. In addition to this a register will be maintained using the Consultation Manager program which is an online tool that can be accessed remotely in order to capture complaints and comments as well as being a critical tool in the reporting mechanism
2. The register will be maintained by the Project Manager - Owners Representative through the life of the Wind Farm. It will include all complaints received by phone, mail or email
3. During Operation the complaints register will be maintained and used as a response and audit tool.
4. The register will be made available to the Secretary:
  - a) In compliance reports (pre-operation compliance reports)
  - b) At other times, when requested by the Secretary, for the life of the project

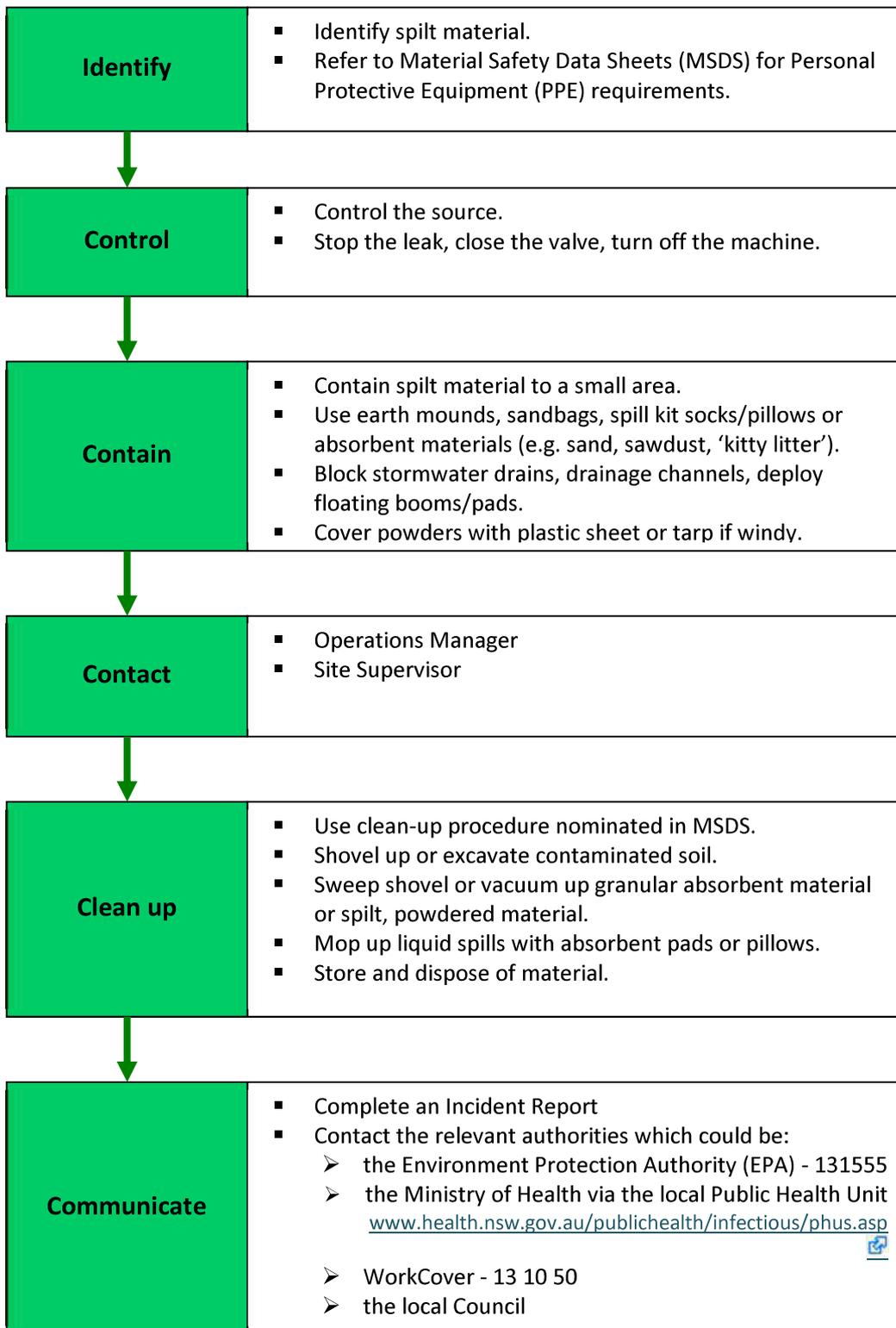
#### **Procedure for managing complaints relating to environmental issues**

1. Complaint is received
2. Complaints are registered on Complaints Register
3. The following people would be notified:
  - Operations Manager
  - Project Manager – Owner’s Representative
4. The complaint would be responded to by an appropriate staff member
5. The outcome of the complaint would be documented and the above people would be notified of the outcome in writing

All TV and radio complaints would be managed as per the Pre-Construction Television and Radio Assessments and TV and Radio Complaints Protocol detailed in Appendix L.

## 10.2 EMERGENCY PLANNING AND RESPONSE

### 10.2.1 Spill response procedure



1 -

### 10.2.2 Agency Notification Requirements

Call 000 if the incident is:

- *the actual or potential harm to the health or safety of human beings or ecosystems is not trivial; or*
- *the actual or potential loss or property damage (including clean-up costs) associated with a pollution incident exceeds \$10,000.*

Fire and Rescue NSW, the NSW Police and the NSW Ambulance Service are the first responders, as they are responsible for controlling and containing incidents.

If the incident does not require an initial combat agency, or once the 000 call has been made, notify the relevant authorities in the following order:

- the Environment Protection Authority (EPA) - 131555
- the Ministry of Health via the local Public Health Unit – see [www.health.nsw.gov.au/publichealth/infectious/phus.asp](http://www.health.nsw.gov.au/publichealth/infectious/phus.asp)
- the WorkCover Authority - phone 13 10 50
- the local Council
- Fire and Rescue NSW - 000

### 10.2.3 Emergency Contact Details

Name	Organisation	Role	Phone	Mobile
<b>Emergency Services</b>	Ambulance	-	000	000
	Police			
	Fire Brigade			
<b>Emergency Services</b>	State Emergency Services	-	132 500	132 500
	Upper Lachlan Shire Council	-	(02) 4830 1000	
	NSW Work Cover	-	13 10 50	13 10 50
	NSW EPA	-	131 555	131 555

# APPENDIX A OPERATIONAL CONDITIONS OF APPROVAL

COA	Description	Long Description	Stage	Reference to OEMP
1.1	Administrative condition	<p>The Proponent shall carry out the project:</p> <ul style="list-style-type: none"> <li>a) Generally in accordance with the EA;</li> <li>b) The statement of commitments; and</li> <li>c) Conditions of this approval.</li> </ul>	Ongoing	Section 3.1
1.2	Administrative condition	If there is any inconsistency between the documents referred to in condition 1.1, the most recent document shall prevail to the extent of the inconsistency. However, the conditions of this approval shall prevail to the extent of any inconsistency.	Ongoing	Noted
1.3	Administrative condition	<p>The Proponent shall comply with any reasonable requirement/s of the Secretary arising from the Department's assessment of:</p> <ul style="list-style-type: none"> <li>a) Any strategies, plans, programs, reviews, audits or correspondence that are submitted in accordance with the requirements in this approval;</li> <li>b) Any report, reviews or audits commissioned by the Department regarding compliance with this approval; and</li> <li>c) The implementation of any actions or measures contained in these documents.</li> </ul>	Ongoing	Noted
1.7	Licenses during operation	The Proponent shall ensure that all licences, permits and approvals are obtained and maintained as required throughout the life of the project. No condition of this approval removes the obligation for the Proponent to obtain, renew or comply with such licences, permits or approvals. The Proponent shall ensure that a copy of this approval and all relevant environmental approvals are available on the site at all times during the project.	Ongoing	Noted
1.10	Administrative conditions	If any wind turbine is not used for the generation of electricity for a continuous period of 12 months, it shall be decommissioned by the Proponent, unless otherwise agreed by the Secretary. The Proponent shall keep independently-verified annual records of the use of	Ongoing	Noted

COA	Description	Long Description	Stage	Reference to OEMP
2.1	Landscaping	<p>wind turbines for electricity generation. Copies of these records shall be provided to the Secretary upon request. The relevant wind turbine and any associated infrastructure is to be dismantled and removed from the site by the Proponent within 24 months from the date that the wind turbine was last used to generate electricity.</p> <p>Prior to the commencement of Operation, the Proponent shall consult with Council and the RMS in relation to the need to provide landscaping screening measures along public road reserves such as but not limited to Range Road, Storriers Lane, Bannister Lane and Grabben Gullen Road and shall report to the Secretary on the outcomes of this consultation. The Proponent shall implement landscaping screening measures in accordance with the Secretary's requirements.</p>	Operation (works complete)	Landscaping Plan and 4.2
2.2	Landscaping	<p>By December 2015, the Proponent shall notify in writing:</p> <ol style="list-style-type: none"> <li>all owners of existing or approved residential dwellings that are located within three kilometres of the project;</li> <li>all owners of approved subdivision allotment where there is an approved dwelling entitlement, where such subdivision allotments were approved by the date of approval of the project that are located within three kilometres of the project;</li> <li>the owners of Lot 55 of DP 754115;</li> <li>but excluding the owners of Lot 118 of DP 1116333 and Lot 121 of DP 754115 and the owners of Lots 143 and 303 of DP 754115, Lot 2 of DP 541500 and Lot 2 of DP 541499</li> <li>the owners of PW37</li> </ol>	Operation (complete)	N/A
2.3	Landscaping	<p>Upon receiving a written request from the landowner referred to in condition 2.2 to have landscaping treatments implemented on their property, the Proponent shall:</p> <ol style="list-style-type: none"> <li>Within fourteen (14) days of receiving the request, commission a suitably qualified person approved by the Secretary, to investigate reasonable and feasible measures to minimise the visual impacts of the project on the landowner's property using landscape treatments;</li> </ol>	Operation	Landscaping Plan and 4.2

COA	Description	Long Description	Stage	Reference to OEMP
		<p>b) Ensure that the qualified person provides a landscaping plan detailing the matters investigated and consequential recommendations within twelve (12) weeks of receiving such request; and</p> <p>c) Provide the landowner with a copy of the landscaping plan, including suggested landscape treatment measures, within fourteen (14) days of receiving the plan.</p> <p>If the parties agree on the landscaping plan, then the Proponent shall implement the agreed measures with all landscaping being completed within three months (where practical). The Proponent shall maintain these measures, at their cost, for a period of two years. Access and notification arrangements are to be negotiated between the parties.</p> <p>Landscape treatments shall include, but not be limited to, site preparation stock and rabbit-proof fencing, selection and planting of appropriate species decided by both parties, watering, weed control and the replacement of failed plants.;</p> <p>If the parties are unable to agree on the landscaping plan within three months of the plan being provided to the landowner, or there is a dispute about the implementation of any agreed landscaping treatments, then either party may refer the matter to the Secretary for resolution. The Secretary's decision on such a referral shall be final and binding on the parties.</p>		
2.3A	Landscaping	<p>By 31 December 2015, unless otherwise agreed by the Secretary, the Proponent shall implement:</p> <p>a) Landscaping treatments to screen the substation and associated switching station for the project; and</p> <p>b) Colour treatment to perimeter fencing for the substation and associated switching station for the project to minimise glare, to the satisfaction of the Secretary.</p> <p>The landscaping treatments referred to in 2.3A a) must employ all reasonable and feasible mitigation measures and utilise mature plantings to screen the substation and switching station from the surrounding non-associated property PW4. Following the installation of the landscaping treatments, the Proponent shall maintain them over the life of project.</p>	Operation	Appendix G

COA	Description	Long Description	Stage	Reference to OEMP
2.4	Wind turbine colour	Wind turbine generators shall be painted matte off-white/grey. The blades shall be finished with a surface treatment that minimises any potential for glare or reflection.	Operation in case of any replacement components	Noted
2.5	Wind turbine advertising	No advertising, signs or logos shall be mounted on the turbines, except where required for safety purposes. A corporate logo may be placed on the turbines provided it is not distinguishable by the naked eye from any publicly accessible location or from any properties not being an associated property.	Operation	Noted
2.6	Site lighting	No external lighting other than low intensity security night lighting of infrastructure associated with the project, including wind turbine generators is permitted; unless otherwise agreed or directed by the Secretary.	Operation	Noted
2.7	Shadow flicker	Shadow flicker arising from the operation of the project shall not exceed 30 hours/annum at any residence not being an associated residence.	Operation	Noted
2.15	Noise	<p>Subject to conditions 2.15 to 2.20 the Proponent shall design, operate and maintain the project to ensure that the equivalent noise level (LAeq (10-minute)) from the project does not exceed at each of the residential receiver locations identified in Section 5 of the Noise Impact Assessment prepared by Marshall Day Acoustics, dated 5 June 2008 (Section 3.2 of EA Attachments), or any other residential receiver in existence or the subject of a valid development consent at the date of this approval (but including PW37):</p> <ul style="list-style-type: none"> <li>a) 35 dB(A); or</li> <li>b) the existing background noise level (LA90 (10-minute)) correlated to the integer wind speed at hub height at the wind farm site by more than 5 dB(A).</li> </ul> <p>whichever is the greater, for each integer wind speed (measured at hub height) from cut-in to rated power of the wind turbine generator, when determined in accordance with the methodology provided in the Wind Farms: Environmental Noise Guidelines (SA EPA, 2003) ('SA Guidelines 2003') or as otherwise agreed with the EPA.</p>	Operation	Noted

COA	Description	Long Description	Stage	Reference to OEMP
2.18	Noise	Noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 20 metres of the dwelling, where the dwelling is more than 20 metres from the boundary, to determine compliance with the noise level limits in conditions 2.15 and 2.16. Under this Condition “dwelling” means one in existence or the subject of a valid development consent at the date of this approval.	Operation	Noted
2.19	Noise	For the purposes of conditions 2.15 and 2.16 of this approval, 5 dB(A) shall be applied to measured noise levels where tonality is present. The presence of tonality shall be determined using the methodology detailed in Wind Turbine Generator Systems- Part 11: Acoustic Noise Measurement Techniques IEC 61400-11:2002 or its latest edition or as otherwise agreed with the EPA.	Operation	Noted
2.20	Noise	Notwithstanding conditions 2.15 and 2.16 of this approval, the noise limits specified under those conditions do not apply to any residence where a noise agreement is in place between the Proponent and the respective owner(s) of those residences in relation to noise impacts and/or noise limits. For this condition to take effect, the noise agreements shall satisfy the requirements of Guidelines for Community Noise (WHO, 1999) and Section 2.3 of the SA Guidelines 2003 or as otherwise agreed by the Secretary.	Operation	Noted
2.21c) and d)	Noise compliance monitoring	<p>...                      c) a commitment that noise compliance monitoring will be undertaken within three months of the commissioning of the wind turbines. If prevailing meteorological conditions do not allow the required monitoring to be undertaken in this period, the Secretary shall be notified and an extension of time may be sought; and                      d) a requirement that all noise compliance monitoring results are submitted to the Secretary within one month of completion of the monitoring. The Secretary may request that additional noise compliance monitoring be undertaken and completed within a specified timeframe.</p> <p>The Noise Compliance Assessment shall be undertaken generally in accordance with the procedures presented in SA Guidelines 2003, except that all sounds power levels and wind speeds shall be referenced to hub height unless otherwise agreed with the EPA.</p>	Operation	4.1

COA	Description	Long Description	Stage	Reference to OEMP
2.22	Noise	In the event that the Noise Compliance Plan indicates that noise from the wind turbines exceeds the noise limits specified under conditions 2.15 and 2.16, as relevant, the Proponent shall investigate and propose mitigation and management measures to achieve compliance with the noise limits. Details of the remedial measures and a timetable for implementation must be submitted to the Secretary for approval within such period as the Secretary may require. Remedial measures shall include, in the first instance, all reasonable and feasible measures to reduce noise from the project, including but not necessarily limited to reduced operation of wind turbines. Once all reasonable and feasible source controls are exhausted, remedial measures may include offering building acoustic treatments and/or noise screening to affected residences, but may only be used to address noise limit exceedances at the absolute discretion of the relevant landowner. The Proponent shall also demonstrate that the relevant landowner/resident has been made fully aware of the noise and other implications of making any agreement.  If there is no such agreement with the relevant landowner, then the turbine(s) causing the exceedance(s) of the noise limits must be turned off until the turbine(s) can be operated in accordance with this approval.	Operation	Noted
2.23	Noise	The Proponent shall provide written notice to all landowners that are entitled to rights under condition 2.22 within 21 days of determining the landholdings to which these rights apply. For the purpose of condition 2.22, this condition only applies where operational noise levels have been confirmed in accordance with the conditions 2.15 and 2.16.	Operation	Noted
2.24	Noise	The Proponent shall bear the costs of any additional at-receiver mitigation measures implemented at an affected landowner or property.	Operation	Noted
2.33	Powerful Owl	The Proponent shall not operate wind turbines POM_03, POM_04, POM_06, and POM_07 between one hour before sunset and one after sunrise during the period 30 November to 31 March, unless the Proponent demonstrates to the satisfaction of the Secretary that operation during these periods will not adversely impact on Powerful Owl juvenile dispersion. In undertaking such a demonstration, the Proponent shall undertake the following:	Operation	POMS BBAMP

COA	Description	Long Description	Stage	Reference to OEMP
		<p>a) monitoring of the dispersion Powerful Owl juveniles in and around the site, to be conducted by an independent specialist approved by the Secretary;</p> <p>b) preparation of a report to be submitted to the Secretary presenting the outcomes of monitoring and impacts to the Powerful Owl juvenile dispersion in and around the site; and</p> <p>c) conclusively demonstrating to the satisfaction of the Secretary that the dispersion of Powerful Owl juveniles in and around the site will not be adversely impacted by the project.</p>		
2.35	Compensatory planting	<p>2.35 By the 31 December 2015, unless otherwise agreed with the Secretary, the Proponent shall revise the proposed compensatory habitat package to offset in perpetuity the value of habitat lost as a result of the project, in consultation with OEH, and to the satisfaction of the Secretary. Unless otherwise agreed to by the Secretary, the package shall comprise:</p> <p>a) a minimum of 2:1 'like for like' offset of the vegetation communities to be removed or otherwise disturbed on site utilising a "Worst Case Scenario" impact assessment;</p> <p>or</p> <p>b) the implementation of in kind management measures or funding for such measures as agreed to by OEH; or a combination of the measures specified in a) and b).</p> <p>Once the Secretary has endorsed the compensatory habitat package, the Proponent shall implement the package to the satisfaction of the Secretary.</p>	Operation	Compensatory Habitat Strategy
2.36	Powerful owl	<p>The Proponent shall make a financial contribution of \$1500.00 to the NSW Wildlife Information and Rescue Service for each death of a Powerful Owl that has reasonably been attributed to the carrying out of the project. The financial contribution must be paid by the Proponent within one month of the Proponent becoming aware of the death. The contribution must be adjusted to take account of any increase in the Consumer Price Index (All Groups Index for Sydney) over time, commencing at the September 2010 quarter.</p>	Operation	BBAMP
2.37	Wedge tailed eagle	<p>The Proponent shall make a financial contribution of \$1500.00 to the NSW Wildlife Information and Rescue Service for each death of the Wedge-tailed Eagle that has</p>		

COA	Description	Long Description	Stage	Reference to OEMP
		reasonably been attributed to the carrying out of the project. The financial contribution must be paid by the Proponent within one month of the Proponent becoming aware of the death. The contribution must be adjusted to take account of any increase in the Consumer Price Index (All Group Index for Sydney) over time, commencing at the September 2010 quarter.		
2.42	Notify airstrips of operational procedure changes	The Proponent shall notify all known users of the Crookwell, Ashwel and Kings' Airstrips of the location of the wind turbines and any changes to operational procedures.	Operation	Noted
2.43	Consultation with RFS	Throughout the life of the project, the Proponent shall regularly consult with the local RFS to ensure its familiarity with the project, including the construction timetable and the final location of all infrastructure on the site. The Proponent shall comply with any reasonable request of the local RFS to reduce the risk of bushfire and to enable fast access in emergencies.	Operation	Section 8
2.44	Firefighting	The Proponent shall: a) ensure there is appropriate fire-fighting equipment held on site to respond to any fires that may occur at the site during construction, operation and decommissioning of the project; and b) assist the RFS and emergency services as much as possible if there is a fire on-site during the project.	Operation	Section 8
2.45	Consultation with RFS	The Proponent shall prepare, in consultation with the local RFS, a Bushfire Risk Management Plan based on the guidelines Planning for Bushfire Protection (RFS, 2001 or its latest edition). The Plan shall include, but not necessarily be limited to: a) details of the bushfire hazards and risks associated with the project; b) mitigation measures including contingency plans; c) procedures and programs for liaison and regular drills with the local RFS; and	Operation	Bushfire Management Plan

COA	Description	Long Description	Stage	Reference to OEMP
2.46	Storage and handling of dangerous goods	<p>d) procedures for regular fire prevention inspections by the local RFS and implementation of any recommendations</p> <p>The Proponent shall store and handle all dangerous goods (as defined by the Australian Dangerous Goods Code) and combustible liquids, strictly in accordance with:</p> <ul style="list-style-type: none"> <li>a) all relevant Australian Standards;</li> <li>b) a minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund; and</li> <li>c) the EPA's Environment Protection Manual Technical Bulletin Bunding and Spill Management</li> </ul> <p>In the event of an inconsistency between requirements listed from a) to c) above, the most stringent requirement shall prevail to the extent of the inconsistency.</p>	Operation	Section 5
2.47	Safety Management System	<p>At least two months prior to the commencement of commissioning, the Proponent shall prepare a report outlining a comprehensive Safety Management System, covering all on-site systems related to ensuring the safe operation of the project. The report must clearly specify all safety related procedures, responsibilities and policies, along with details of mechanisms for ensuring adherence to the procedures. Records must be kept at the Site and must be available for inspection by the Department upon request. The Safety Management System must be developed in accordance with the Department's Hazardous Industry Planning Advisory Paper No. 9, 'Safety Management', and should include:</p> <ul style="list-style-type: none"> <li>a) procedures and programs for the maintenance and testing of the safety related equipment to ensure its integrity over the life of the project; and</li> <li>b) an outline of a documented procedure for the management of change.</li> </ul>	Operation	Section 1.1
2.55	TV and Radio	<p>The Proponent shall undertake reasonable and feasible mitigation to rectify any television/radio transmission problems reasonably attributable to the project at any residential dwelling located within five kilometres of a wind turbine. Such measures may include:</p>	Operation	Section 10 TV and Radio Survey

COA	Description	Long Description	Stage	Reference to OEMP
		<p>a) Modification to or replacement of receiving antenna;</p> <p>b) Installation and maintenance of a parasitic antenna system;</p> <p>c) Provision of a land line between the affected receiver and an antenna located in an area of favourable reception; or</p> <p>d) Other feasible measures.</p> <p>e) If interference cannot be overcome by the measures outlined in a) to d), the Proponent shall negotiate with the impacted landowner about installing and maintaining a satellite receiving antenna.</p> <p>Any requested works shall be completed within three months of the completion of the relevant television and/or radio reception assessment, unless otherwise agreed by the landowner. The Proponent shall be responsible for all reasonable costs associated with undertaking any mitigation measures.</p>		
2.56	Radio	<p>In the event that any issue with radio communication service links (installed before construction of the project) arise as a result of the project (such as obstruction of transmission paths), the Proponent shall consult with the operator and undertake appropriate remedial measures to rectify any issue. Such measures may include:</p> <p>a) modification to or relocation of the existing antennae;</p> <p>b) installation of a directional antennae; and/ or</p> <p>c) installation of an amplifier to boost the signal strength.</p>	Operation	Noted
2.57	Pollution	<p>Except as may be expressly provided by an Environment Protection Licence for the project, the Proponent shall comply with section 120 of the Protection of the Environment Operations Act 1997 which prohibits the pollution of waters.</p>	Operation	Noted
2.62	Waste	<p>The Proponent shall not cause, permit or allow any waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing, or disposal or any waste generated on site to be disposed of at the site, except as expressly permitted by a</p>	Operation	Appendix B Section 5

COA	Description	Long Description	Stage	Reference to OEMP
2.63	Waste	<p>licence under the Protection of the Environment Operations Act 1997, if such a licence is required in relation to that waste.</p> <p>The Proponent shall ensure that all liquid and / or non-liquid waste generated and / or stored on the site is assessed and classified in accordance with Waste Classification Guidelines Part 1: Classifying Waste (DECC, 2008), or any future guideline that may supersede that document.</p>	Operation	Appendix B Section 5
3.1	Bird and Bat Monitoring	<p>The Proponent shall prepare and implement a Bird and Bat Adaptive Management Program for the project to the satisfaction of the Secretary. This program must be submitted to the Secretary for approval prior to construction, and be updated by 31 December 2015, unless otherwise agreed by the Secretary. The program must be prepared in consultation with OEH, and take into account the bird/bat monitoring methods identified in the current editions of AusWEA Best Practice Guidelines for the Implementation of Wind Energy Projects in Australia and Wind Farm and Birds: Interim Standards for Risk Assessment. The Program shall be implemented by a suitably qualified expert, approved by the Secretary. The Program shall incorporate Monitoring, and a Decision Matrix that clearly sets out how the Proponent will respond to the outcomes of monitoring. It must:</p> <ul style="list-style-type: none"> <li>a) incorporate an ongoing role for the suitably qualified expert;</li> <li>b) set out monitoring requirements in order to assess the impact of the project on bird and bat populations, including details on survey locations, parameters to be measured, frequency of surveys and analyses and reporting. The monitoring program must be capable of detecting any changes to the population of birds and/ or bats that can reasonably be attributed to the operation of the project, that is, data may be required to be collected prior to the commencement of construction. The requirements must also account for natural and human changes to the surrounding environment that might influence bird and/ or bat behaviour such as changes in land use practices, and significant changes in water levels in nearby water bodies;</li> <li>c) incorporate a decision making framework that sets out specific actions and when they may be required to be implemented to reduce any impacts on bird and bat</li> </ul>	Operation	BBMP Appendix I

COA	Description	Long Description	Stage	Reference to OEMP
3.2	Noise compliance monitoring	<p>populations that have been identified as a result of the monitoring;</p> <p>d) identify 'at risk' bird and bat groups such as the Powerful Owl, the Little Eagle, the Common Bent-wing Bat, the Large-footed Myotis and the Eastern False Pipistrelle and include monthly mortality assessments and periodic local population censuses and bird utilisation surveys;</p> <p>e) identify potential mitigation measures and implementation strategies in order to reduce impacts on birds and bats such as minimising the availability of raptor perches, swift carcass removal, pest control including rabbits, use of deterrents, and sector management including switching off turbines that are predicted to or have had an unacceptable impact on bird/ bat mortality at certain times; and</p> <p>f) identify matters to be addressed in periodic reports in relation to the outcomes of monitoring, the application of the decision making framework, the need for mitigation measures, progress with implementation of such measures, and their success.</p> <p>The Reports referred to under part f) shall be submitted to the Secretary on an annual basis, from the commencement of operation, and shall be prepared within two months of the end of the reporting period. The Secretary may vary the reporting requirement or period by notice in writing to the Proponent.</p> <p>The Proponent is required to implement reasonable and feasible mitigation measures as identified under part e) where the need for further action is identified through the Bird and Bat Adaptive Management Program, or as otherwise agreed with the Secretary.</p>	Operation (complete)	Appendix K

COA	Description	Long Description	Stage	Reference to OEMP
3.3	Environmental Auditing	<p>Within two years of the commencement of Operation of the project, and then as may be directed by the Secretary, the Proponent shall commission an independent person or team to undertake an Environmental Audit of the project. The independent person or team shall be approved by the Secretary prior to the commencement of the Audit. The Audit must:</p> <ul style="list-style-type: none"> <li>a) be carried out in accordance with ISO 19011:2002 - Guidelines for Quality and or Environmental Management Systems Auditing;</li> <li>b) assess compliance with the requirements of this approval, and other licences and approvals that apply to the project;</li> <li>c) assess the environmental performance of the project against the predictions and conclusions drawn in the documents referred to under condition 1.1 of this approval;</li> <li>d) review the effectiveness of the environmental management of the project, including any environmental impact mitigation works; and</li> <li>e) review the adequacy of the Proponent's response to any complaints made about the project through the Complaints Register required under condition 5.4</li> </ul> <p>An Environmental Audit Report must be submitted for comment to the Secretary within two months of the completion of the Audit, detailing the findings and recommendations of the Audit and including a detailed response from the Proponent to any of the recommendations contained in the Report.</p>	Operation	Section 9.2
5.1	Availability of documents	<p>Subject to confidentiality, the Proponent shall make all documents required under this approval available for public inspection on request.</p>	Operation	Noted
5.2	Requirement for information on website	<p>The Proponent shall:</p> <ul style="list-style-type: none"> <li>a) make the following information publicly available on its website:</li> </ul>	Operation	

COA	Description	Long Description	Stage	Reference to OEMP
5.3	Community Information Plan	<ul style="list-style-type: none"> <li>• EA;</li> <li>• current statutory approvals for the project, including this project approval and any environment protection licence;</li> <li>• approved plans or programs required under the conditions of this approval;</li> <li>• a comprehensive summary of the monitoring results of the project, which have been reported in accordance with the requirements of the various plans and programs required under the conditions of this approval;</li> <li>• a complaints register, which is updated on a monthly basis;</li> <li>• any environmental audit of the project, including the Proponent's response to the recommendations in any audit report; and</li> </ul> <p>b) keep this information up to date, to the satisfaction of the Secretary.</p>	Operation	Section 8
		<p>The Proponent shall prepare and implement a Community Information Plan to the satisfaction of the Secretary. This plan must set out the community communications and consultation processes to be undertaken during the construction, operation and decommissioning of the project. The Plan must include but not be limited to:</p> <ul style="list-style-type: none"> <li>a) procedures to inform the local community of planned investigations and Construction or decommissioning activities, including blasting works;</li> <li>b) procedures to inform the relevant community of Construction or decommissioning traffic routes and any potential disruptions to traffic flows and amenity impacts;</li> <li>c) procedures to consult with local landowners with regard to Construction or decommissioning traffic to ensure the safety of livestock and to limit disruption to livestock movements;</li> <li>d) procedures to inform the community where work has been approved to be undertaken outside the normal Construction or decommissioning hours, in particular noisy activities;</li> </ul>		

COA	Description	Long Description	Stage	Reference to OEMP
5.4	Complaints Register	<p>e) procedures to inform and consult with those landowners who are eligible for landscaping on their property as determined under condition 2.2 of this approval; and</p> <p>f) procedures to notify relevant landowners of the process available to review potential impacts on radio and television transmission.</p>		
5.4	Complaints Register	<p>Prior to the commencement of construction of the project, the Proponent shall ensure that the following are available for community complaints for the life of the project (including construction, operation and decommissioning):</p> <ul style="list-style-type: none"> <li>a) a 24-hour telephone number on which complaints about construction, operation and decommissioning activities at the site may be registered;</li> <li>b) a postal address to which written complaints may be sent; and</li> <li>c) an email address to which electronic complaints may be transmitted.</li> </ul> <p>The telephone number, the postal address and the e-mail address must be advertised in a newspaper circulating in the locality on at least one occasion prior to the commencement of construction and at six-monthly intervals thereafter. These details must also be provided on the Proponent's internet site.</p>	Operation	Section 8
5.5	Complaints Register	<p>The Proponent shall record details of all complaints received through the means listed under condition 5.4 of this approval in an up-to-date Complaints Register. The Register shall</p> <p>record, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>a) the date and time, where relevant, of the complaint;</li> <li>b) the means by which the complaint was made (telephone, mail or email);</li> <li>c) any personal details of the complainant that were provided, or if no details were provided, a note to that effect;</li> <li>d) the nature of the complaint;</li> </ul>	Operation	Section 8

COA	Description	Long Description	Stage	Reference to OEMP
5.6	Community Enhancement Program	<p>e) any action(s) taken by the Proponent in relation to the complaint, including any follow-up contact with the complainant; and</p> <p>f) if no action was taken by the Proponent in relation to the complaint, the reason(s) why no action was taken.</p> <p>The Complaints Register shall be made available for inspection by the Secretary upon request.</p>	Operation	Plan external to OEMP
		<p>Prior to the commencement of construction of the project, the Proponent shall prepare and submit for the approval of the Secretary, a Community Enhancement Program, (as generally described in the Environmental Assessment referred to in condition 1.1a) of this approval, in so far as it is consistent with the terms contained in this condition) with the aim of funding community enhancement measures to the benefit of the local community that consists of the following components:</p> <ol style="list-style-type: none"> <li>1. a Clean Energy Program to support the installation of residential clean energy improvements, (as generally described in the Environmental Assessment referred to in condition 1.1a) of this approval, in so far as it is consistent with the terms contained in this condition); and</li> <li>2. a Community Fund, to provide funds to undertake initiatives which provide a direct benefit to the local community.</li> </ol> <p>The Community Enhancement Program shall be developed in consultation with the Upper Lachlan Shire Council, the Goulburn Mulwaree Council and the local community and provide details of:</p> <ol style="list-style-type: none"> <li>a) the process by which the program's funds would be administered, including mechanisms for accounting and reporting;</li> <li>b) how measures and initiatives to be funded by the program would be identified, assessed, prioritised and implemented over the life of the project; and</li> </ol>		

COA	Description	Long Description	Stage	Reference to OEMP
		<p>c) any other terms agreed to by the parties.</p> <p>The Proponent shall each year contribute the sum of \$1666 per constructed turbine to the Community Enhancement Program, commencing upon commissioning of the project until the end of its life. The contribution shall be adjusted to take account of any increase in the Consumer Price Index (All Groups Index for Sydney) over time, commencing at the September 2010 quarter.</p> <p>The Community Enhancement Program shall not require any financial contribution from any recipient of the scheme nor shall the program be conditional on the extent of government subsidies or rebates available for measures to be funded by the program.</p>		
5.7	Community Consultative Committee (CCC)	<p>The Proponent shall establish and operate a Community Consultative Committee (CCC) for the project to the satisfaction of the Secretary. The CCC must be operational by 31 December 2015, unless the Secretary agrees otherwise, and it must be operated generally in accordance with the guidance in Appendix C of the draft NSW Planning Guidelines Wind Farms (December 2011), or any equivalent guideline.</p>	Operation	Section 8
6.1	Compliance Tracking Program and AEMR	<p>Prior to the commencement of construction, the Proponent shall develop and implement a Compliance Tracking Program for the project, to track compliance with the requirements of this approval during the construction, operation or decommissioning of the project and shall include, but not necessarily limited to:</p> <p>a) provisions for an Annual Environmental Management Report (AEMR) that is to be prepared and submitted to the Secretary throughout the operational life of the project. The AEMR must review the performance of the project against the Operational Environmental management Plan, the conditions of this approval and other licences and approvals relating to the project.</p> <p>b) provisions for periodic reporting of the compliance status to the Secretary including at least prior to the commencement of construction of the project, prior to the</p>	Operation	Section 9

COA	Description	Long Description	Stage	Reference to OEMP
7.1	Environmental Representative	<p>commencement of operation of the project, and prior to the commencement of decommissioning,</p> <p>c) a program for independent environmental auditing in accordance with AS/NZ ISO 19011:2003 - Guidelines for Quality and/or Environmental Management Systems Auditing;</p> <p>d) procedures for rectifying any non-compliance identified during environmental auditing or review of compliance;</p> <p>e) mechanisms for recording environmental incidents and actions taken in response to those incidents;</p> <p>f) provisions for reporting environmental incidents to the Secretary during construction operation and decommissioning; and</p> <p>g) provisions for ensuring all employees, contractors and sub-contractors are aware of, and comply with, the conditions of this approval relevant to their respective activities</p>	Operation	Section 3.3
		<p>Prior to the commencement of the construction, operation or decommissioning of the project, the Proponent shall nominate for the approval of the Secretary a suitably qualified and experienced Environmental Representative(s) independent of the construction, operation or decommissioning personnel. The Proponent shall employ the Environmental Representative(s) for the relevant stage of the project, or as otherwise agreed by the Secretary. The Environmental Representative(s) shall be the Proponent's principal point of advice in relation to the environmental performance of the project and shall have responsibility for:</p> <p>a) overseeing the implementation of all environmental management plans and monitoring programs required under this approval, and advise the Proponent upon the achievement of these plans/programs;</p> <p>b) considering and advising the Proponent on its compliance obligations against all matters specified in the conditions of this approval and the Statement of Commitments as referred to under condition of this approval, permits and licences; and</p>		

COA	Description	Long Description	Stage	Reference to OEMP
7.4	OEMP	<p>c) having the authority and independence to recommend to the Proponent reasonable steps to be taken to avoid or minimise unintended or adverse environmental impacts, and, failing the effectiveness of such steps, to recommend to the Proponent that relevant activities are to be ceased as soon as reasonably practicable if there is a significant risk that an adverse impact on the environment will be likely to occur.</p> <p>The Proponent shall prepare and implement an Operation Environmental Management Plan in accordance with the Department’s publication entitled Guideline for the Preparation of Environmental Management Plans (2004) or its latest revision. The Plan shall include but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>a) identification of all statutory and other obligations that the Proponent is required to fulfil in relation to the operation of the development, including all consents, licences, approvals and consultations;</li> <li>b) a management organisational chart identifying the roles and responsibilities for all relevant employees involved in the operation of the project;</li> <li>c) overall environmental policies and principles to be applied to the operation of the project;</li> <li>d) standards and performance measures to be applied to the project, and means by which environmental performance can be periodically reviewed and improved, where appropriate;</li> <li>e) management policies to ensure that environmental performance goals are met and to comply with the conditions of this approval;</li> <li>f) the Management Plans listed under condition 7.5 of this approval; and</li> <li>g) the environmental monitoring requirements outlined under this approval.</li> </ul> <p>The Plan shall be submitted for the approval of the Secretary no later than one month prior to the commencement of Operation of the project or within such period as otherwise agreed by the Secretary. Operation must not commence until written approval has been</p>	Operation	Entire document

COA	Description	Long Description	Stage	Reference to OEMP
7.5	OEMP	<p>received from the Secretary. Upon receipt of the Secretary’s approval, the Proponent shall make the Plan publicly available as soon as practicable.</p> <p>As part of the Operation Environmental Management Plan required under condition 7.4, the Proponent shall prepare and implement, but is not limited to the following Management Plans:</p> <ul style="list-style-type: none"> <li>a) a Noise Management Plan to outline measures to minimise noise emissions from the operation of the project. The Plan must include, but not necessarily be limited to: <ul style="list-style-type: none"> <li>i) details of procedures to ensure ongoing compliance with the operational noise limits specified in condition 2.15 as they apply to identified receptors. This should include identification of monitoring requirements;</li> <li>ii) identification and implementation of best practice management techniques for minimisation of noise emissions where reasonable and feasible;</li> <li>iii) measures to be undertaken to rectify annoying characteristics resulting from the operation of the project such as, but not limited to, infrasound or adverse mechanical noise from component failure; and</li> <li>iv) procedures and corrective actions to be undertaken if non-compliance is detected.</li> </ul> </li> <li>b) a Landscape Management Plan to outline measures to ensure appropriate development and maintenance of landscaping on the site to address the visual impacts arising from the project including, turbines, site access roads, substation and control and facilities building, as far as is reasonable and feasible. The Plan must be prepared by a qualified landscape architect and meet the requirements of Council, should there be any. The Plan must include, but not necessarily be limited to: <ul style="list-style-type: none"> <li>i) measures associated with the biodiversity offset package required under condition 2.35 and any remnant vegetation onsite;</li> </ul> </li> </ul>	Operation	Appendix G and K

COA	Description	Long Description	Stage	Reference to OEMP
		<ul style="list-style-type: none"> <li>ii) details of landscaping to be undertaken at the site including locations for planting;</li> <li>iii) maximisation of use of flora species that are native to the locality and with low maintenance requirements;</li> <li>iv) a program for the removal of weeds introduced or spread as a result of the development at the site; and</li> <li>v) a program for maintenance of all landscaped areas on the site to ensure these areas are kept in a tidy, healthy state.</li> </ul>		
7.6	OEMP revision	<p>Within 3 years of the commencement of the operation of the project, or within 3 months of the approval of any modification to this approval, the Proponent shall review, and if necessary, revise the OEMP to the satisfaction of the Secretary. Following approval, the Proponent shall implement the updated OEMP to the satisfaction of the Secretary.</p>	Operation	Section 3.6
8.1	Notification incidents	<p>The Proponent shall notify the Secretary and any relevant Government authority of any incident with actual or potential significant off-site impacts on people or the biophysical environment as soon as practicable after the occurrence of the incident (“initial notification”). The Proponent must provide written details (“written report”) of the incident to the Secretary and any relevant Government authority within seven days of the date on which the incident occurred.</p>	Operation	Section 10
8.2	Incidents	<p>The Proponent shall meet the requirements of the Secretary to address the cause or impact of any incident, as it relates to this approval, reported in accordance with condition 8.1 of this approval, within such period as the Secretary may require.</p>	Operation	Section 10

## APPENDIX B LEGAL & OTHER REQUIREMENTS

Controlling legislation or regulation	Regulating Authority	Does the legislation apply to the Gullen Range Wind Farm?	Obligations imposed by the legislation
<b>COMMONWEALTH LEGISLATION</b>			
<b>Environmental Planning &amp; Conservation</b>			
<b>Environment Protection and Biodiversity Conservation Act 1999</b>	SEWPac	Applicable to environmental impacts on Commonwealth land and impacts on matters of national significance	Determined as not requiring EPBC approval
<b>NEW SOUTH WALES LEGISLATION</b>			
<b>Environmental Planning</b>			
<b>Environmental Planning &amp; Assessment Act, 1979</b>	Local Council Dept. of Planning & Infrastructure (DoPI) Department of Environment and Climate Change (OEH) NSW RMS	Project has been approved under Part 3A of the EP&A Act.	Any modification that is not consistent with the Approval must be approved as a Modification by the DoPI.  Operational works are required to adhere to the Approval.
<b>Protection of the Environment Operations Amendment (Scheduled Activities) Regulation 2013</b>	NSW Environmental Protection Authority	Applicable to wind farms in development, approved, under construction or operational after 1st July 2013	Obligation to obtain Environmental Protection Licence and adhere to conditions therein
<b>Heritage</b>			

Controlling legislation or regulation	Regulating Authority	Does the legislation apply to the Gullen Range Wind Farm?	Obligations imposed by the legislation
<b>Heritage Act 1977</b>	NSW Heritage Council DoPI (Heritage Office)	Approval under Part 4 or an excavation permit under Section 139 from the NSW Heritage Office.	Project exempt under 75(u) of the EP&A Act. However, requirements of the Heritage Act 1977 to be inducted to construction personnel and Heritage Office will be advised and consulted as required
<b>National Parks and Wildlife Act 1974</b>	SEWPaC OEH	Permit under Section 87 (investigation of Aboriginal objects) or a consent under Section 90 (destruction of aboriginal objects) from the National Parks and Wildlife Service	Project exempt under 75(u) of the EP&A Act, however personnel will be made aware of responsibilities and procedures under the National Parks and Wildlife Act 1974
<b>Waste Management</b>			
<b>Waste Avoidance and Resource Recovery Act 2001.</b>	SEWPaC OEH	Not applicable to the project.	General principle of Avoid, Recover, Reuse, Dispose. Refer to Waste section of Table 5-1
<b>Conservation</b>			
<b>National Greenhouse and Energy Reporting Act 2007</b>	OEH	Systems for reporting energy consumption and production data, greenhouse emissions, abatement actions	The Owner to determine NGRS reporting requirements for energised facility
<b>Noxious Weeds Act, 1993</b>	SEWPaC Local Council Western Lands Commissioner	Control noxious weeds on lands under the Projects control, in accordance with relevant control categories (s.13)	Noxious weeds, where identified on the site, must be prevented from spreading and their numbers and distribution reduced Refer to WPMP (Appendix J)
<b>National Parks and Wildlife Act 1974</b>	SEWPaC OEH	Sections 7 and 8 of the NPW Act protect fauna and flora. Native species including flora and fauna, must not be picked or harmed, except under a relevant license , as detailed in Section 9 of the Act.	No licenses are required, however personnel will be made aware of responsibilities not to harm native species and procedures in the OEMP developed to meet the requirements of the National Parks and Wildlife Act 1974
<b>Threatened Species Conservation Act, 1995</b>	SEWPaC OEH	Project Approved under Part 3A of the EP&A Act. No licences or Approvals required under this Act.	Threatened species and habitats occur on and adjacent to the site.

Controlling legislation or regulation	Regulating Authority	Does the legislation apply to the Gullen Range Wind Farm?	Obligations imposed by the legislation
<b>Fisheries Management Act 1994</b>	NSW Fisheries	Permit under Section 201 from Department of Primary Industries (Dredging and reclamation), 205 (marine vegetation) or 219 (fish passage)	No requirement has been identified
<b>Water Management Act 2000</b>	SEWPaC OEH	Permits and approvals required for water extraction from natural waterways.	Works Approval and/or Water Supply Approvals may be required if water is to be extracted from a natural waterway.
<b>Water Act 1912</b>	SEWPaC OEH	Potential for Bore Licence when dewatering requirement from excavations under Part 5 of the Water Act 1912. This will depend on Project activities and potential interaction with groundwater.	The Owner to determine water sources used on site and if applicable a permit will be applied for.
<b>Pollution</b>			
<b>Protection of the Environment Operations Act, 1997</b>	OEH	Duty to notify the OEH of any environmental harm	The Owner to notify OEH of any actual or potential environmental harm
<b>Dangerous Substances Act 2004</b>	OEH WorkCover	Relates to storage, handling and licensing of storage and/or transport of prescribed quantities of dangerous goods	The Operator to obtain licenses where storage of dangerous goods for construction is in licensable quantities
<b>Pesticides Regulation 2009</b>	SEWPaC OEH	The use, supply, preparation and possession of pesticides. Pesticides is a generic term that includes herbicides, fungicides, insecticides, timber preservatives, etc.  Note: inappropriate use of pesticides may lead to prosecution under the <i>Protection of the Environment Operations Act 1997</i> .	Use pesticides in an environmentally satisfactory manner. s12 and s13 prohibit the possession and use of an unregistered pesticide without a permit. s14 requires that you read, or have read to you, the label or permit for the pesticide. s15 requires that you use registered pesticide in accordance with instructions on the label. s16 pesticide container must have approved label attached.

Controlling legislation or regulation	Regulating Authority	Does the legislation apply to the Gullen Range Wind Farm?	Obligations imposed by the legislation
<b>Pesticides Regulation 1995</b>	Department of Environment and Conservation	The use, supply, preparation and possession of pesticides and the associated training and record keeping requirements.	<p>s17 prohibits the use or possession of any restricted pesticide unless authorised by a certificate of competency or a pesticide control order under the Act. You must comply with pesticide codes of practice. Refer to WPMP (Appendix J)</p> <p>An employee must not use a pesticide <b>unless</b> the employee holds a “prescribed qualification” or a licence under the Act</p> <p>A record must be kept of each occasion a pesticide is used</p> <p>the pesticide is ordinarily used for domestic purposes and</p> <p>The record must be made in legible writing in English as soon as possible (but must be within 24 hours). The record must be kept for at least 3 years by the person who made the record. The record must contain the specific information.</p> <p>Refer to WPMP (Appendix J)</p>

## **APPENDIX C ENVIRONMENTAL POLICY**

# New Gullen Range Wind Farm

## Environmental Policy

### *Document Revision History*

Revision	Date	Reason for Issue	Author	Checked	Approved
A	31/01/12	First Draft	HSE Support	JHG	HSE Support
0	23/5/12	For use			

# Environmental Policy

New Gullen Range Wind Farm Pty Ltd (NGRWF) is committed to caring for and protecting the natural environment. As an environmentally conscious and responsible company our aim is to integrate responsible environmental management into all that we do.

The workplace health and safety of our people and the preservation of the environment in which we operate are an integral part of our operations at NGRWF.

We ensure that our employees and contractors understand our environment policy and the significant environmental aspects of our activities. All staff members, including contractors and visitors, are to receive information about the policy during the induction. A copy of this policy will be displayed in all NGRWF office locations.

Consistent with this, NGRWF will strive to eliminate any impacts and harm that would be detrimental to the environment.

To achieve this, NGRWF have the following objectives:

- Comply with all environmental statutory requirements and other applicable environmental obligations.
- Continually improve its environmental performance, use resources efficiently, minimise the consumption of energy and water and minimise the generation of waste to the extent practicable.
- All NGRWF managed sites will adopt and ensure the disposal of all waste relating to the site is removed by certified organisations and in accordance with relevant environmental legislation, regulations and good industry practice.
- Promote throughout the company a strong environmental ethic as part of its culture.
- Providing visitors, staff and persons contracted by NGRWF with environmental education, training and resources appropriate to the activities that they will undertake.
- Strive for continuous improvement through setting targets, monitoring performance and alignment with our future corporate strategies.
- Investigating incidents, implementing preventative actions and sharing the learning's with all applicable parties to prevent reoccurrences.
- Consulting and communicating with staff and persons contracted by NGRWF to continually improve the environmental performance in our workplaces.
- Commit to ongoing sustainable management of environmental impacts within NGRWF operations.
- Commit to actively considering the use of alternative energy sources, and low emissions technology, as they become economically viable.
- Share best practices for environmental management across the business.

All visitors, staff and persons contracted by NGRWF are expected to comply with this policy.

## Responsibilities

Management (the employer, supervisor and/or manager) is responsible for:

- Providing and maintaining information and resources to meet the objectives outlined in this policy;
- Providing and maintaining sustainable systems of work, including any information, training and supervision needed to make sure that all employees are aware of their environmental responsibilities;
- Facilitating open consultation and communication among stakeholders.

Employees and persons contracted by NGRWF are responsible for:

- Comply with the requirements of this policy;
- Eliminating environmental impacts where able to do so;
- Reporting all environmental incidents and hazards;
- Complying with any reasonable directions given by management that relates to environmental management.
- Conducting routine environmental inspections throughout NGRWF run sites.

## APPENDIX D ROUTINE MAINTENANCE ENVIRONMENTAL CHECKLIST

### Routine Maintenance Environmental Checklist

Question	Answer (Yes, No, NA) and action required or comments.	Date completed
<b>GENERAL</b>		
Are works being conducted within "normal" working hours?		
<b>ERSED</b>		
Are catch drains and road drains in good condition (i.e. not scouring, rock checks in place)? Is any maintenance required such as additional rock checks?		
Is there evidence of erosion at the Wind Farm within the operational area?		
Are unacceptable levels of dust being generated from works? <i>* If so, consider mitigation measures such as a water cart or postponing works until weather is more favourable.</i>		
<b>WASTE &amp; HAZARDOUS MATERIALS</b>		
Are fuel/oil/chemicals stored appropriately on site (bundling)?		
Are any spills evidence? <i>*If yes, clean up immediately and report to Operations Manager</i>		
Are spill kits available on site during works?		
Has generated waste been removed from site and waste disposal records kept?		
<b>FLORA &amp; FAUNA</b>		
Is the extent of existing noxious weeds being contained?		
Are there any birds or bat carcasses located at the Wind Farm? <i>*If so, take a photo of the carcass and place the carcass in a plastic bag and leave it at the nearest compound. Remember to wear gloves. Please phone the Operations Manager to arrange for pick up ASAP</i>		
Has any vegetation clearing been undertaken? <i>*If yes, report to Operations Manager</i>		
Have any new noxious weeds emerged within the operational boundary?		
<b>COMMUNITY</b>		

Have there been any complaints during routine maintenance works?

NOTES:

**Review/System check**

Environmental Inspection Checklist has been reviewed. All necessary corrective action has been undertaken.

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Sign	Name	Position	Date
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# APPENDIX E NON-ROUTINE MAINTENANCE ENVIRONMENTAL CHECKLIST

## Non-Routine Maintenance Environmental Checklist

**THIS FORM IS TO BE USED FOR NON-ROUTINE MAINTENANCE WORKS. ROUTINE MAINTENANCE DOES NOT REQUIRE ADDITIONAL ENVIRONMENTAL RISK ASSESSMENT**

<b>Description of Works</b>	
<b>Location</b>	
<b>Planned start date</b>	

Tick if the issue applies to the works proposed		
Environmental issue	↓	Where an issue has been ticked, highlight the applicable controls contained on the following pages of this checklist
Erosion and sedimentation	<input type="checkbox"/>	If ticked, circle applicable controls & include in JSEA
Stockpile sites	<input type="checkbox"/>	If ticked, circle applicable controls & include in JSEA
Water pollution	<input type="checkbox"/>	If ticked, circle applicable controls & include in JSEA
Air pollution / odour	<input type="checkbox"/>	If ticked, circle applicable controls & include in JSEA
Noise and vibration	<input type="checkbox"/>	If ticked, circle applicable controls & include in JSEA
Community consultation	<input type="checkbox"/>	If ticked, circle applicable controls & include in JSEA
Flora and fauna	<input type="checkbox"/>	If ticked, circle applicable controls & include in JSEA
Heritage	<input type="checkbox"/>	If ticked, circle applicable controls & include in JSEA
Waste minimisation and management	<input type="checkbox"/>	If ticked, circle applicable controls & include in JSEA
Fuels and chemicals	<input type="checkbox"/>	If applicable, ensure they are stored in a bunded area not near a creek or watercourse. Include in JSEA.
Fire prevention	<input type="checkbox"/>	If applicable, ensure adequate fire fighting equipment is available at the site of the works. Include in JSEA.

Environmental risk assessment completed by

Sign	Name	Position	Date

General

- Undertake an environmental induction to make all personnel aware of the environmental management controls for the works to be undertaken
- Wherever practical, no new access tracks are to be created for the works. If required, the ground surface shall be returned to its pre-existing condition
- Parking of vehicles and storage of plant/equipment is to occur on existing roads and pads only

Erosion & sedimentation

- Erosion and sediment control measures are to be implemented and maintained to:
  - Prevent sediment moving off-site and sediment-laden water entering any water course, drainage lines, or drain inlets
  - Reduce water velocity and capture sediment on site
  - Minimise the amount of material transported from site to surrounding pavement surfaces;
  - Divert clean water around the site

(in accordance with the Landcom/Department of Housing *Managing Urban Stormwater, Soils and Construction Guidelines* -the Blue Book).
- Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request
- Erosion and sediment control measures are not to be removed until the works are complete or areas are stabilised
- Work areas are to be stabilised progressively during the works
- Stockpiles are to be protected with sediment fence on the downslope side

Water quality

- Any clean run-on water will be protected from contamination by works, including stockpiles, by diverting it away from the works/stockpile area until any affected areas of disturbance are stabilised
- Wastewater generated from the works is to be treated to prevent the release of dirty water into drainage lines and/or waterways
- Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills
- Water quality control measures are to be used to prevent any materials (eg. concrete, grout, sediment etc.) entering drain inlets or waterways
- All fuels, chemicals and liquids are to be stored in an impervious bunded area a minimum of 40 metres away from creeks or any areas of concentrated water flow. The bund must be able to contain a bund volume of 110% of the volume of the largest single stored
- Refuelling of plant and equipment is to occur only on roads and pads
- Vehicle wash down and/or cement truck washout is to occur in a designated bunded area or in a suitable area offsite
- An emergency spill kit is to be kept on site at all times. All staff are to be made aware of the location of the spill kit and trained in its use

#### Air Quality

- Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust where required
- Works (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely, and where these would affect adjacent amenity or ecological values
- Vegetation or other materials are not to be burnt on site
- Vehicles transporting waste or other materials that may produce odours or dust, or from which waste could escape, are to be covered during transportation

#### Noise & Vibration

- Works are to be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public holidays is to minimise noise impacts
- All works must be carried out in accordance with the Operational Noise Management Plan

#### Flora & Fauna

- There is to be no disturbance or damage to any native trees without written authority from Project Manager – Owner’s Representative. Works are not to harm any fauna
- Declared noxious weeds are to be managed according to requirements under the *Noxious Weeds Act 1993* (refer to Weed and Pest Management Plan, Appendix I)

#### Traffic

- There is to be no disruption to traffic

#### Non-Aboriginal Heritage

- If archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and Operations Manager contacted immediately.

#### Aboriginal Heritage

- If Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and Operations Manager contacted immediately. Works in the vicinity of the find must not re-commence until clearance has been received from Owner and the OEH

#### Waste Management

- Resource management hierarchy principles are to be followed:
  - Avoid unnecessary resource consumption as a priority
  - Avoidance is followed by resource recovery (i.e. reuse materials if possible, including reprocessing, recycling and energy recovery)
  - Disposal is undertaken as a last resort

(in accordance with the *Waste Avoidance & Resource Recovery Act 2001*)
- Waste is not to be burnt on site
- Waste is to be securely stored, while storage onsite is required, so that pollution of surrounding areas does not occur
- Waste material is not to be left on site once the maintenance works have been completed

- Waste will be securely transported to appropriate waste management facilities or reclaim areas where required (with required licenses where necessary)
- Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day



## **APPENDIX G LANDSCAPE MANAGEMENT PLAN**

Consisting of Appendix G – Landscape Management Plan and Appendix G1 – Substation landscaping documentation.

Gullen Range Wind Farm  
Operation Environmental Management Plan

# Landscape Management Plan

GR-PM-PLN-0018



**FRESH**  
landscape design

October 2013

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# 1 Introduction

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## 1.1 Landscape Management Plan overview

This Landscape Management Plan (LMP) is a sub-plan of the Operational Environmental Management Plan GR-PM-PLN-0017 for the Gullen Range Wind Farm. It has been prepared by Registered Landscape Architect Jennie Curtis on behalf of Gullen Range Wind Farm Pty Ltd, owners of Gullen Range Wind Farm. Jennie Curtis is principal of Fresh Landscape Design and has both design and practical experience in establishing screen planting in rural areas as well as visual assessment, consultation and landscape design.

This LMP consists of three parts:

- Part 1 covers landscape works on the wind farm site
- Part 2 covers landscape works on public land
- Part 3 provides an action plan for developing landscape plans to provide visual screening on private land that is not part of the wind farm site.

## 1.2 Project description

The Gullen Range Wind Farm has 73 turbines and is located along a north-south running ridge NSW. The nearest township is Grabben Gullen, with larger towns including Crookwell, Gunning, Breadalbane and Goulburn in the region (refer to Appendix A Drawing 284-1).

The wind farm has four distinct precincts where wind farm infrastructure will be installed: Kialla, Bannister, Pomeroy and Gurrundah. The precincts are located on private property within and adjacent to agricultural areas used for sheep and cattle grazing. Residential dwellings and two commercial operations (chicken farms) are located nearby. The landscape character of the precincts is cleared grassy ridges and hillsides with woodland patches on slopes and in gullies.

## 1.3 Landscape Management Plan context

Project approval for the Gullen Range Wind Farm was granted by the NSW Land and Environment Court on 4 August 2010 following assessment under Part 3A of the NSW *Environment Planning and Assessment Act 1979* (EP&A Act).

This LMP is based on the following requirements contained in the conditions in Schedule 2 of the approval notice.

On-site landscape works

Condition 7.5 (b) of the project approval conditions of consent requires a Landscape Management Plan to be developed and implemented as part of an Operation Environmental Management Plan (OEMP).

7.5 As part of the Operation Environment Management Plan required under condition 7.4, the Proponent shall prepare and implement, but is not limited to the following Management Plans:

...

- b) a Landscape Management Plan to outline measures to ensure appropriate development and maintenance of landscaping on the site to address the visual impacts arising from the project, including turbines, site access roads, substation and control and facilities building, as far as reasonable and feasible. The Plan must be prepared by a qualified landscape architect and meet the requirements of Council, should there be any. The plan must include, but not necessarily be limited to:

- i) measures associated with the biodiversity offset package required under condition 2.26 and any remnant vegetation onsite;
- ii) details of landscaping to be undertaken at the site including locations for planting;
- iii) maximisation of use of flora species that are native to the locality and with low maintenance requirements;
- iv) a program for the removal of weeds introduced or spread as a result of the development at the site; and
- v) a program for maintenance of all landscaped areas on the site to ensure that these areas are kept in a tidy, healthy state.

This condition refers to a biodiversity offset package required under condition 2.26 but there is no reference to biodiversity offsets or similar in condition 2.26. Condition 2.35 refers to a compensatory habitat package to offset the value of habitat lost as a result of the project. This LMP assumes that this is the condition required to be addressed as part of the LMP.

#### Landscape works on public land

Condition 2.1 of the project approval conditions of consent requires consultation with Council and the RTA about screening measures along public road reserves and reporting of these consultations to the Director-General.

2.1 Prior to the commencement of Operation, the Proponent shall consult with Council and the RTA in relation to the need to provide landscape screening measures along public road reserves such as but not limited to Range Road, Storriers Lane, Bannister Lane and Grabben Gullen Road and shall report to the Director-General on the outcomes of this consultation. The Proponent shall implement landscaping screening measures in accordance with the Director-General's requirements.

#### Off-site landscape works

Conditions 2.2 and 2.3 of the project approval conditions of consent requires consultation with landowners within 3km of the wind farm to discuss the potential for design and arranging for implementation of the agreed landscaping treatments on their properties to minimise visual impacts of the project. Each landowner can decide if they wish to participate.

2.2 Not more than six months prior to the commencement of Operation, the Proponent shall notify in writing:

- (a) all owners of existing or approved residential dwellings that are located within three kilometres of the project;
- (b) all owners of approved subdivision allotments where there is an approved dwelling entitlement, where such subdivision allotments were approved by the date of approval of the project that are located within three kilometres of the project;
- (c) the owners of Lot 55 of DP 754115;
- (d) but excluding the owners of Lot 118 of DP 1116333 and Lot 21 of DP 754115 and the owners of Lots 143 and 303 of DP 754115, Lot 2 of DP 541500 and Lot 2 of DP 541499

that they may be eligible to have landscaping treatment on their property in order to minimise the visual impact of the project on their property.

2.3 Any such owner (or their successors) who may be potentially eligible to have landscaping treatment (as they have views or likely views of a turbine(s) on their property pursuant to clause 2.2 may, no later than six months after the commencement of operation, advise the Proponent whether access to their property for landscaping assessment is granted and request the Proponent to investigate such ways of minimising the visual impact of the project on their property, the Proponent shall:

- (a) within fourteen (14) days of receiving the request, commission a suitably qualified person approved by the Director-General, to:
  - i. inspect the relevant property and determine whether the property is eligible to have landscaping treatment under condition 2.2; and
  - ii. investigate reasonable and feasible measures to minimise the visual impacts of the project on the landowners property using landscape treatments, if that qualified person determines the property is eligible to have landscaping treatment;

- b) ensure that the qualified person provides a landscaping plan detailing the matters investigated and consequential recommendations within twelve (12) weeks of receiving such a request; and
- c) provide the landowner with a copy of the landscaping plan, including suggested landscape treatment measures, within fourteen (14) days of receiving the plan.

Should the parties be unable to reach agreement within one month of receiving the request referred to at a) above whether the property is eligible to have landscaping treatment pursuant to section 2.2, then either party may refer the matter to the Director-General for resolution. The Director-General's decision on such a referral shall be final and binding on the parties.

Landscaping treatments shall be agreed within one month of the landowner receiving a copy of the visual impact mitigation report. The Proponent shall implement the agreed measures with all landscaping being completed within three months (where practical). The Proponent shall maintain these measures, at their cost, for a period of two years. Access and notification arrangements are to be negotiated between the parties.

Landscaping treatments shall include, but not be limited to, site preparation, stock and rabbit-proof fencing, selection and planting of appropriate species decided by both parties, watering, weed control and the replacement of failed plants.

Should the parties be unable to reach agreement, within three months of an eligible landowner receiving a copy of the landscaping plan in accordance with condition 2.3 (c) above, on the scope of and/or timing of implementation of landscaping treatments, then either party may refer the matter to the Director-General for resolution. The Director-General's decision on such a referral shall be final and binding on the parties.

## 1.4 Landscape Management Plan objectives

The objectives of this LMP are:

- identify visual screening requirements for the project based on the outcomes of the environmental impact assessment and approvals processes
- prepare a plan showing the location of landscape works to be undertaken on the project site
- identify plant species suitable for use in landscape works on the project site, taking into account plant provenance, availability, typical performance and local environmental values
- identify locally appropriate landscaping standards for establishing rural shelterbelts to provide visual screening
- document implementation process including details and specification
- document a program and strategy for monitoring and maintaining the landscaped areas
- provide a program for removal of weeds introduced or spread as a result of the development based on the weed management strategy developed for the Flora and Fauna Management Plan (part of the Construction Environmental Management Plan)
- document landscape measures associated with the biodiversity offset package based on the Compensatory Habitat Package GR-PM-PLN-0014 and the Conservation Property Vegetation Plan (CPVP)
- document the results of discussion with Council and Roads and Maritime Services (RMS, formerly RTA) on the need for screen planting along public road reserves
- provide an action plan for consultation with landowners within 3km of the wind farm and the development and implementation of their individual landscape plans for off-site landscape works where requested and agreed.

## 1.5 Roles and responsibilities

The roles and responsibilities for implementing the LMP will follow those detailed in the OEMP (GR-PM-PLN-0017). Details of the specific tasks and responsible parties are detailed in the table below.

Table 1: Roles and responsibilities for LMP

Task	Responsibility
Preparation of LMP	Fresh Landscape Design
Liaison with Council and RMS for landscape screening measures on public land and documentation of results	Gullen Range Wind Farm P/L
Liaison with Director-General, submission of LMP to Director-General	Gullen Range Wind Farm P/L
Make approved LMP publicly available	Gullen Range Wind Farm P/L
Consultation with individual landowners for off-site landscape treatments	Gullen Range Wind Farm P/L and Fresh Landscape Design
Documentation of agreed off-site landscape treatments	Fresh Landscape Design
Construction of landscape works (both on and off-site)	Gullen Range Wind Farm P/L (or representative)
Maintenance of landscape works (both on and off-site)	Gullen Range Wind Farm P/L (or representative)
Removal of weeds onsite (where infrastructure is located)	Gullen Range Wind Farm P/L (or representative)
Landscape measures associated with the Compensatory Habitat Package	Gullen Range Wind Farm P/L (or representative)

## 1.6 Review of Landscape Management Plan

The LMP may be reviewed following feedback from the community, Department of Planning and Infrastructure and as part of the audit process. It will be reviewed in accordance with the process set out in the Operational Environment Management Plan (OEMP). Any changes will be highlighted and updated versions of the plan will be made publicly available and communicated to controlled copy holders as noted in the OEMP.

Where significant changes are required these may require additional approval from the Department of Planning and Infrastructure. Again, these will be made publicly available and will be communicated to controlled copy holders.

# Part 1 – OPERATIONAL PLAN FOR ON-SITE LANDSCAPE WORKS

## 1 Biodiversity offset package

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The biodiversity offset package is described in a document titled *Compensatory Habitat Package GR-PM-PLN-0014*, prepared for Goldwind Australia by nghenvironmental and approved by the NSW Department of Planning and Infrastructure in 2012, and in a *Conservation Property Vegetation Plan* prepared by the Southern Rivers CMA which is currently being finalised.

Refer to these two documents for details of work required to implement and maintain the biodiversity offset package.

## 2 Landscape works

---

### 2.1 Visual screening requirements

The *Landscape and Visual Assessment* prepared by Epuron Pty Ltd for Gullen Range Wind Farm as part of the Development Application did not identify any on-site landscape measures to provide visual screening of the project. Instead the assessment identified a need for off-site screen planting close to residences to be negotiated with individual landowners.

A visit to the site in August 2013 by Fresh Landscape Design identified a need to screen views in Pomeroy of the Gullen Range Wind Farm entry road, switchyard and substation from Storriers Lane and the property to the north of the switchyard. Photo 1 shows the view from the entry road. Requirements by Transgrid prohibit the establishment of trees and shrubs within 25m of the outer switchyard fence and transmission line easement. This is to ensure an adequate separation distance between electrical equipment and trees for reasons of safety.



Photo 1 - Entry road to switchyard and substation

Two areas of on-site screen planting using indigenous trees and shrubs arranged in shelterbelts are proposed. One to the west of the switchyard supplements an existing stand of trees to partially screen the view from the southern end of Storriers Lane. The second area extends an existing tree line to the north of the switchyard to help screen views to the switchyard and substation from both the property to the north and from Storriers Lane.

Drawing 284-2 in Appendix A identifies the location of the on-site screen planting measures.

### 2.2 Plant species

A list of native tree and shrub species has been compiled for use in the on-site screen plantings (table 2). Two vegetation types have been mapped for Pomeroy in the *Biodiversity Assessment* and

the *Flora and Fauna Management Sub-plan GR-PM-PLN-0006* for treed areas near the switching station: Broad-leaf Peppermint – Brittle Gum Dry Forest (BLP-BG) and Apple Box – Yellow Box Grassy Woodland. The Broad-leaf Peppermint – Brittle Gum Dry Forest vegetation type is the most widespread in the area and has been used as the starting point for species selection.

Since the screen planting needs to be fast growing and use plants that are commercially available, the list in Table 2 has been confined to the trees and tall shrubs that are included in local growers' catalogues. Comments are provided outlining additional benefits of particular species.

Table 2: Plant species for on-site screen planting

Scientific name	Mature height (m)	Mature width (m)	Comment	Growing on Pomeroy	BLP-BG
TREES					
<i>Eucalyptus bridgesiana</i>	8-20	25	Local species, fast growing	X	
<i>Eucalyptus dives</i>	8-15	6-10	Local species, dense crown and low branching habit	X	X
<i>Eucalyptus mannifera</i>	10-20	10-20	Local species	X	X
<i>Eucalyptus melliodora</i>	10-20	8-20	Local species, slow growing tree with dense crown	X	
<i>Eucalyptus macrorhyncha</i>	15-30	10-15	Local species, dense rounded crown		X
<i>Eucalyptus pauciflora*</i>	8-15	6-10	Local species often with multi-stemmed trunk	X	
<i>Eucalyptus rossii</i>	15-30	10-20	Local species	X	
<i>Eucalyptus rubida</i>	15-30	10-20	Local species, dense, rounded to spreading canopy, mammal attracting, good habitat tree (hollows)		X
SHRUBS					
<i>Acacia dealbata</i>	5-20	6	Local species, fast growing, nitrogen fixing	X	X
<i>Acacia deanei</i>	3-10	4-6	Fast growing, nitrogen fixing	X	
<i>Acacia melanoxylon</i>	10-30	6-10	Local species, long lived, nitrogen fixing	X	
<i>Acacia rubida</i>	2-10	3-5	Local species, fast growing, nitrogen fixing	X	
<i>Banksia marginata</i>	5	3	Dense shrub, local species, foliage to ground level		

## 2.3 On-site screen planting establishment

The implementation method described below is based on current best practice as documented by Murray CMA (n.d.) and Greening Australia (n.d. and 2003).

All works will be planned and implemented in accordance with the controls set out in the OEMP and Safety Management Plan (SMP).

Works will be undertaken under the control of the Principle Contractor or Owners Representative (depending on implementation timing).

A Job Safety Environmental Analysis (JSEA) will be produced for each activity and will be accompanied by Environmentally Sensitive Area Maps (ESAMs) that will form part of the risk assessment.

Prior to works being undertaken, the JSEAs and ESAMs will be approved by the Operations Manager and where necessary the Environmental Representative.

### 2.3.1 Underground services

Existing services are not shown on the drawings. The contractor shall check on the location of all services before commencing construction and avoid excavation or other disturbance of underground services. Prior to the installation of the landscaping measures, 'as-built' drawings of the cable reticulation will be supplied to the contractor. Works within the wind farm will require perusal of the methodology set out in the OEMP and must adhere to all aspects of the SMP. These requirements will be built into the JSEA and ESAMs of the contractors and approved by the Site Supervisor prior to commencement of works

### 2.3.2 Site setout

The location of the on-site screen planting is shown in Appendix A, Drawing 284-1. Depending on its location, the screen planting is composed of one or more rows of trees and shrubs. The following principles apply to the setout of the rows:

- offset riplines 3 metres minimum from boundary fences (or new stock fence if required)
- locate tree rows 3 metres apart
- plant along centre of double ripline rows using randomly mixed plant species at approximately 3 metre centres, keeping at least 7 metres between trees (shrubs can be closer), position plants in adjacent rows to fill gaps in other rows
- Ensure areas of endangered ecological community are not impacted
- Ensure areas of other environmental/safety constraint are mapped and where necessary delineated to ensure no works within the area occurs

Typical set out drawings are provided in Appendix A, Drawing 284-3.

### 2.3.3 Site preparation

Removal of long grass

Remove long grass in screen planting area immediately before ground preparation works by grazing heavily with livestock or mechanical slashing where feasible/reasonable.

Erosion and Sediment (ERSED) controls will be implemented where required.

## Grass control

Eradicate perennial weeds and unwanted exotic grasses by spraying with a knockdown herbicide such as glyphosate to manufacturer's instructions in an approximately 1.5 metre wide strip along riplines while weeds and grasses are actively growing.

Preferred timing for spraying is:

- After the autumn break (the first time in April to June where the amount of rainfall exceeds the demand of evaporation, creating suitable conditions for germination of seed)
- 1 one month before ripping
- 2 two weeks before planting (if needed)

As an absolute minimum, spraying should be done two days before planting, in which case soil disturbance during planting should be kept to a minimum.

## Ripping

For each row of planting, rip two lines approximately 0.5m apart and 300 to 600mm deep using a winged ripper tyne. Ripping must not occur on a site where the soil is saturated or there is surface runoff. Avoid ripping under the dripline of existing trees or shrubs, across roads and pathways or perpendicular to contours.

Where ripped soil lifts significantly above the ground surface, run a blade over the riplines to smooth the surface without compacting the ripline area.

## Fencing

Livestock shall be excluded from screen planting areas before planting.

Prior to the works commencing, consultation with the landowner will be undertaken to establish the requirements in each area. Where stock can be permanently excluded then fencing may not be required.

Where fencing is required, as a minimum, fence areas to be planted using 1.2m high farm fences with hingejoint netting where feasible or temporary electric fencing. Provide 12' wide farm gates to fenced areas to allow access by slashing equipment.

## 2.3.4 Planting

### Plant selection

Select a mix of 50 per cent trees and 50 per cent shrubs including *Acacia* spp. from the plant species lists provided in Table 2. Plants shall be tubestock grown in conditions that help to prevent root circling, for example air pruning or ribbed pots.

Use plants that are vigorous and hardened off for the cold climate, well established, free from pests and disease and have a balance of roots to shoots.

Proposed plant substitutions are to be hardy, locally occurring species approved by the site superintendent prior to placement of order.

### Planting

Plant in late winter or early spring after site preparation is complete. Plant seedlings in space between two riplines (refer to Appendix A, Drawing 284-3).

Water plants every day if stored on site and before and immediately after planting.

Place tree guards around individual plants immediately after planting. Tree guards shall be flexible green plastic bag type or corflute fixed securely with three hardwood stakes. Finished diameter of tree guard shall be a minimum of 250mm.

## 3 Landscape maintenance program

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### 3.1 Monitoring

Inspections of the screen planting areas will be used to identify any maintenance activities required to keep the plants healthy and actively growing. The inspection schedule has been designed to ensure that problems can be identified before they have a major impact on the plantings. Any maintenance activities identified during the inspections should be done as soon as possible after the inspection.

The inspection schedule is:

- Monthly inspections for first six months by wind farm operators
- Twice-yearly inspections until all plants are large enough to have tree guards removed then annual inspections for three years by wind farm operators
- Frequent checking of fences when stock is in adjacent paddocks. Where electric fences are used to exclude stock, these should be checked daily when stock are present
- Replace dead plants in the following Spring.

## 3.2 Inspection checklist

The following items should be inspected during scheduled inspections:

Fences	Check for any damage to fences. For electric fences, check that voltage is at correct level, no earth leakage is occurring, and that the battery (if used) has sufficient charge to last to the next inspection.
Grass competition	Check for significant growth of grass and herbs within 300mm of seedlings. Check if the grass between seedlings and between rows needs slashing.
Weeds	Check for weeds in screen planting areas.
Pest damage	Check the seedlings for evidence of grazing or damage from wild animals.
Tree guards	Check that tree guards are still in place if they are needed.
Dead plants	Identify any dead plants that need to be replaced.  If significant numbers of plants in one area are dead or performing poorly, identify reasons why to assist in selection of replacement plants.

## 3.3 Maintenance activities

Fences	Repair fences as required
Grass competition	Remove weeds and grass within 300mm of plant by manually removing them or spot spraying.  Slash long grass between rows. After three years, light grazing for short periods may be used to manage grass.
Weeds	Implement weed control activities.
Tree guards	Replace tree guards as required.  Remove tree guards when plants are taller than the tree guards or where tree guards are restricting plant growth habit.
Dead plants	Select appropriate species to replace dead plants. If plant death was caused by specific microclimate factors select appropriate species for the conditions.  Spot spray or lay jute mat over planting area at least two weeks before planting.  Replant between August and September.

## 4 Weed management program

### 4.1 Weeds to be controlled

Each landowner has an individual weed management plan that details the strategies and techniques to manage weeds on their property.

The occurrence of weeds around the wind turbine infrastructure will be monitored by Operational Staff and managed by the Owner's Representative. Where weeds occur within areas of the wind farm's control they will be managed according to the measures in this plan and associated sub-plans.

As noted in the *Flora and Fauna Management Sub-plan (GR-PM-PLN-0006)*, the following Class 4 noxious weeds occur on the project site and need to be controlled according to the measures specified in the management plan published by the Upper Lachlan Shire Council.

Weed	Location
Blackberry ( <i>Rubus fruticosus</i> )	Scattered in pasture on Bannister and common in areas of Pomeroy
Nodding Thistle ( <i>Carduus nutans</i> )	Common in pasture on Bannister and Pomeroy
Scotch Thistle ( <i>Onopordum acanthium</i> )	Locally common in pasture on Bannister
Serrated Tussock ( <i>Nassella trichotoma</i> )	Widespread and abundant on Pomeroy, and a few plants were detected in the southern part of Bannister
Sifton Bush ( <i>Cassinia arcuata</i> )	Locally common in isolated areas of Pomeroy
Sweet Briar ( <i>Rosa rubiginosa</i> )	Scattered sparsely on Pomeroy and Bannister

### 4.2 Weed management information

The Upper Lachlan Shire Council's Noxious Weeds Policy can be found at:

<http://upperlachlan.local-e.nsw.gov.au/images/documents/upperlachlan/Environment/NoxWeeds/12695-NoxiousWeedsPolicyAugust2009.pdf>

Information about management and control measures for each weed species can be found in the following sources:

<http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/blackberry>

<http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/nodding-thistle>

<http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/serrated-tussock>

<http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/thistles>

<http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/sifton-bush>

<http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/sweet-briar>

### 4.3 Weed management program

The following program identifies annual opportunities for inspection and chemical control for the weed species based on information from the Department of Primary Industries.

Weed		Summer			Autumn		Winter			Spring		
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Blackberry	Inspect											
	Control											
Nodding Thistle	Inspect											
	Control											
Scotch Thistle	Inspect											
	Control											
Serrated Tussock	Inspect											
	Control											
Sifton Bush	Inspect											
	Control											
Sweet Briar	Inspect											
	Control											

As a minimum, the program for removal of weeds introduced or spread as a result of development at the site will involve the following.

Action	Timing
Initial weed control in areas identified in the <i>Flora and Fauna Management Sub-plan</i> as hosting noxious weeds	<ul style="list-style-type: none"> <li>during and immediately post-construction</li> </ul>
Inspection and control measures in areas disturbed by construction	<ul style="list-style-type: none"> <li>immediately post construction and rehabilitation</li> <li>then every second month for twelve months</li> </ul>
Ongoing inspection and control measures for whole site	<ul style="list-style-type: none"> <li>as a minimum, twice yearly inspections in September/October and February/March followed up with control measures as required</li> </ul>

## Part 2 – PLAN FOR LANDSCAPE WORKS ON PUBLIC LAND

### 1 Introduction

---

The *Landscape and Visual Assessment* prepared by Epuron Pty Ltd for Gullen Range Wind Farm as part of the Development Application proposed roadside screen planting to screen views to the wind farm infrastructure. As required by the conditions of consent, Ben Bateman, representing Gullen Range Wind Farm Pty Ltd, met with staff from the Upper Lachlan Shire Council on 31 July 2013 to discuss options for providing landscape screening along public road reserves including Range Road, Storriers Lane, Bannister Lane and Grabben Gullen Road. Roads and Maritime Services (RMS) were consulted numerous times via email and telephone to discuss the screening requirements.

### 2 Results of consultations with Council

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Upper Lachlan Shire Council staff indicated that they would prefer not to have landscape screening along public road reserves. Minutes of the meeting have been provided to the Director-General.

No further action to implement landscape screening measures along Council controlled road reserves is proposed.

### 3 Results of consultations with RMS

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Roads and Maritime Services consultation concluded that they would prefer not to have landscape screening along the reserves of RMS controlled roads. They expressed a preference instead for the development of a public viewing area. This is outside the scope of the LMP. Records of correspondence will be provided to the Director-General. Due to the nature of the emails they are not included in this plan.

Gullen Range Wind Farm Pty Ltd will continue consultation with RMS about the potential for implementing a viewing area in an appropriate location to give the public the opportunity to view the wind farm.

# Part 3 – ACTION PLAN FOR INDIVIDUAL OFF-SITE LANDSCAPE TREATMENTS

## 1 Introduction

---

The purpose of this Action Plan is to provide off-site visual screening to minimise the visual impact of Gullen Range Wind Farm turbines and associated infrastructure that can be seen from properties within three kilometres of a turbine. The Action Plan sets out the methodology used to consult with individual landowners, design landscape screening treatments, document the agreements (Individual Landscape Plans) and undertake construction and maintenance.

The location of the three kilometre zone is shown in Appendix A, Drawing 284-1.

## 2 Landscape screening options

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### 2.1 Overview

Screen planting can provide a visual barrier to hide or disguise views to the turbines in the long term. Appropriate choice of location, plant species and installation size is dependent on the individual site and screening requirements as well as landowner preferences, shared knowledge of species that have been grown successfully in the past and the economic viability of choosing certain species and locations. As a general principle, trees and shrubs planted closer to the primary viewing locations will provide more effective visual screening than if planted further away.

Screen planting does not necessarily need to deliver an opaque barrier in order to be an effective visual screen. Often a filtered view through branches will soften the view to turbines effectively. This approach also has the advantages of providing better performing wind breaks, allowing for solar access in winter where needed and retaining the long views that are often highly regarded by rural landowners.

In limited circumstances, vertical structures such as fences and trellises close to the house may be an effective screening strategy for sensitive vantage points. Screening methods at each property need to be feasible and reasonable and will be subject to the acceptance of all parties.

As well as appropriate species, size and location selection, the following strategies can be employed to achieve the best possible project outcomes:

- best practise site preparation including deep ripping and grass control for shelterbelt plantings and large holes, soil improvement and mulching for advanced tree planting
- tree protection as appropriate for the location including staking and wire tree guards for advanced trees, plastic tree guards for shelterbelt plantings, and stock and rabbit-proof fencing
- watering on planting day
- ongoing maintenance during the establishment period.

## 2.2 Targeted planting of advanced trees

Screen planting close to the house will typically use a small number of more advanced trees to provide a more immediate effect. The plant species will be selected to blend with the existing garden as well as delivering summer shade and winter sun to the house as appropriate. These trees could be exotic or indigenous and deciduous or evergreen. It is desirable, in order to minimise future maintenance and fire hazard, that the trees be placed so that they do not overhang the house when they reach their expected mature size.

## 2.3 Shelterbelt planting

Shelterbelt planting along fence lines in carefully selected locations further out from the house is likely to cover a larger area and use smaller plants installed using techniques established by Greening Australia and Landcare. The screening effects using this approach are likely to take five to ten years to be realised although the trees may start to distract from longer views to turbines within a couple of years with good rainfall. Landowners may prefer this approach where planting close to the house is not a viable option. Species used for this option are typically native trees and shrubs that have been proven locally to establish well in rural shelterbelt plantings. Sometimes evergreen exotic species are preferred by the landowner.

In native shelterbelt planting, inclusion of Acacias and other shrubs is thought to improve the long term health of the larger trees. Interplanting shrubs between trees can also provide an inbuilt thinning process as many shrubs are shorter lived and tend to die out as the trees become larger and require more space.

The offer of shelterbelt screening will be subject to an assessment of practicality and costs as well as the other options available to feasibly and reasonably screen the views.

# 3 Project methodology

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## 3.1 Key dates

Notification letters delivered	November 2013
Commissioning of turbines commences	15 November 2013
Operational status expected	1 June 2014
Expected latest date that landowners can request a landscape treatment	1 December 2014
Expected completion of plan implementation	July 2015

## 3.2 Off-site landscape planning process

The process for assessing eligibility for landscape treatments and reaching agreements with landowners about the landscape plans is specified in conditions 2.2 and 2.3 of the Land and Environment Court determination. This process is summarised in the following flowchart.

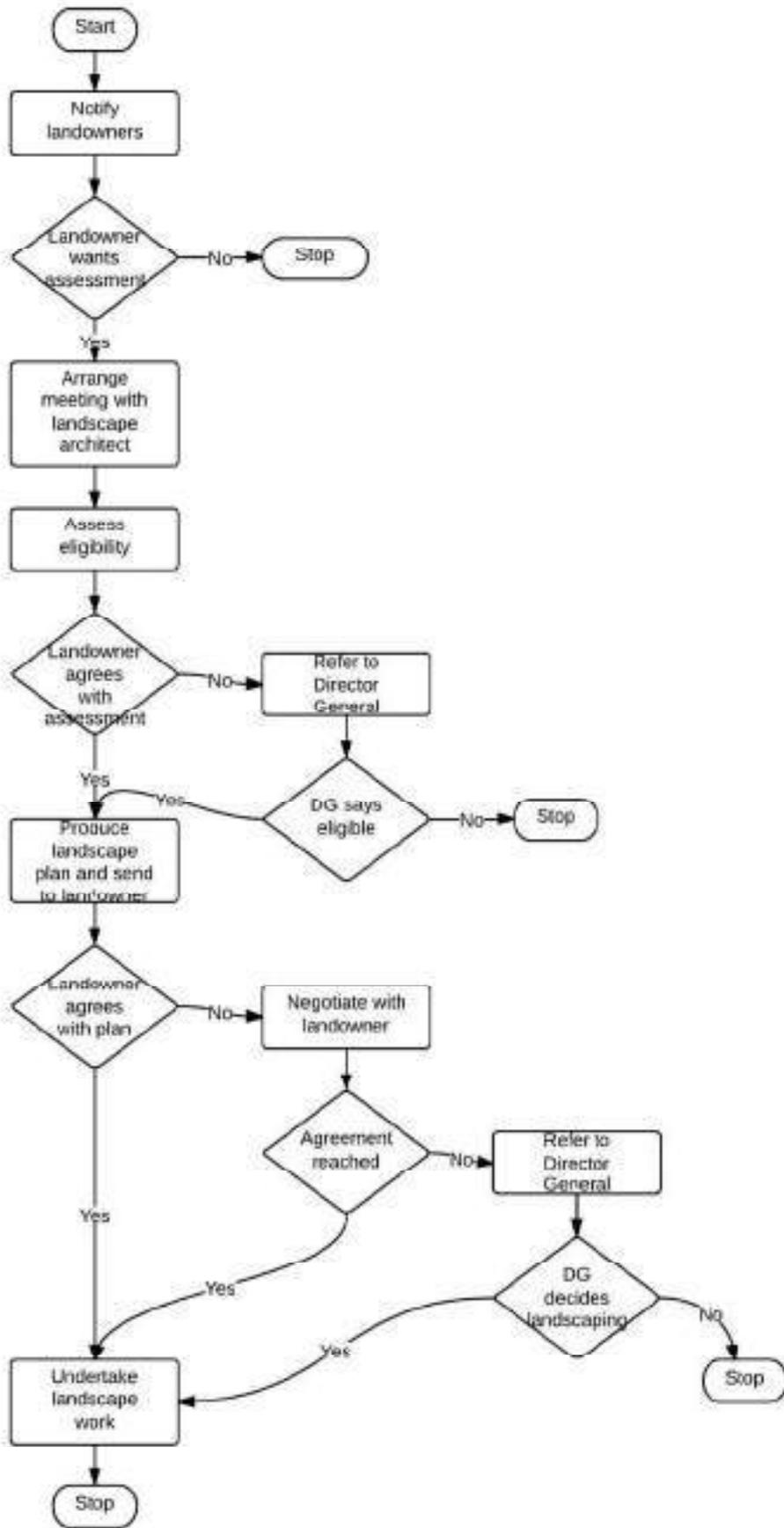


Figure 1 - Off-site landscape plan development process

Figure 2 – Offsite Landscape Plan development timing

Activity	Timing as Per CoA 2.3
Notify Landowners within 3km of wind farm	Not more than 2 months prior to commissioning
Landowner to respond to notification (and reminder)	Within 6 months
GRWF to respond for landscaping request from eligible landowners	within 14 days of receiving a request
GRWF and Landscape architect to attend meeting at premises to create landscape plan	Within 12 weeks
Landowner to receive completed plan	Within 14 days
GRWF and the landowner to agree whether or not the site is eligible, (after which the landowner may go to the DoPI for resolution)	1 Month
If after 3 months of the landowner receiving a copy of the Plan a resolution is not reached, DoPI can be asked to resolve	3 months

### 3.3 Identification and notification of eligible properties

The location of existing and approved residential dwellings and other subdivision allotments with building entitlements within three kilometres of any Gullen Range Wind Farm turbine will be established by the Upper Lachlan Shire Council. Council will send a notification letter to the owners of these properties notifying them that they may be eligible to have landscaping treatment on their property in order to minimise the visual impact of the Gullen Range Wind Farm. The letter will request property owners who are interested in having their eligibility assessed to contact a representative of Gullen Range Wind Farm Pty Ltd. A copy of this letter is in Appendix B.

### 3.4 Landowner responses

Landowners will be able to indicate, using mail, email or phone call to the nominated representative of Gullen Range Wind Farm Pty Ltd, their interest in having their eligibility to have landscaping treatment on their property assessed. Gullen Range Wind Farm Pty Ltd will collect contact details for property owners who contact them in response to this letter in order to organise a site visit to assess eligibility and discuss landscape treatment options. It is entirely optional for the landowners to take part in this process.

Where a response is not received, landowners will be reminded after three months that the option for screening is available to them.

Should the landowners fail to respond by December 2014 no further offer of screening is available under this plan.

### 3.5 Initial discussion with landowners

A Landscape Architect from Fresh Landscape Design and a representative from Gullen Range Wind Farm Pty Ltd will attend the initial meeting on site with the property owners. The site meeting will be used to identify views from the property in which Gullen Range Wind Farm structures are visible to establish eligibility for having landscaping treatment on the property. Options for screening these views will be discussed. Minutes from these meetings will be taken and recorded to ensure effective communication of requirements and decisions is made.

A record will be made of the views affected, landscape treatment options discussed and the preferred option of all parties. This record will be reviewed with the property owners at the conclusion of the meeting.

The preferred treatment option agreed by the property owners and Gullen Range Wind Farm Pty Ltd will form the basis of the Individual Landscape Plan.

If no agreement about the preferred landscape treatment can be reached at the time of the meeting, a number of options will be left for consideration, with follow up at a later time. If an impasse is reached the matter will be referred to the Director-General for resolution.

### 3.6 Preparation of Individual Landscape Plans

The preferred landscape treatment for a property will be documented using sketches, diagrams and specifications to create an Individual Landscape Plan for that property. The draft Individual Landscape Plan, documenting the landscape treatment design, construction process and maintenance arrangements, will be sent to the property owner for review.

Gullen Range Wind Farm Pty Ltd will also review the plan and comment where necessary. Should the plan not be reasonable or feasible then this will be raised with the landowner and a different plan may be negotiated

The landowners will be offered a period of 8 weeks to consider the options available. Should the landowners disagree with the options considered then there is an opportunity to ask for a different option of their choice that is of equal or less financial or operational cost to the wind farm. Gullen Range Wind Farm Pty Ltd will consider these on a case-by-case basis and agreement will be subject to meeting the goals of this plan. A sample Individual Landscape Plan is provided in Appendix C.

If agreement is not reached at this point the matter will be referred to the Director-General for resolution. The decision of the Director-General will be final and binding.

### 3.7 Implementation of Individual Landscape Plans

After sign off of the Individual Landscape Plan by the property owner, where possible the construction works will be organised by Gullen Range Wind Farm Pty Ltd to:

- take advantage of seasonal factors when scheduling ground preparation and planting activities to optimise the chances of successful plant establishment
- minimise interruption to farming activities normally carried out by the property owner
- group together similar construction activities for a number of properties to facilitate efficient delivery of services
- deliver the works in a timely manner as outlined in the project approval conditions.

Completed landscape works will be inspected by a landscape architect for compliance with the Individual Landscape Plan documentation.

### 3.8 Maintenance of landscape works

Where agreed by the property owner, Gullen Range Wind Farm Pty Ltd will undertake maintenance of the completed landscape works for two years. Optimum timing of inspection and maintenance activities will depend on rainfall and seasonal variability during the two years. Inspection and maintenance of each site to be maintained may be undertaken at the end of winter, the end of spring and mid autumn in the two years following completion of the works. Arrangements for access and notification will be documented in the Individual Landscape Plan.

The following items should be inspected during scheduled inspections:

Fences	Check for damage to fences.
Grass competition	Check for significant growth of weeds and grass within 300mm of seedlings. Check if the grass between tree rows needs slashing.
Pest damage	Check the seedlings for evidence of grazing or damage from wild animals.
Tree guards	Check that tree guards are still in place if they are needed.
Dead plants	Identify any dead plants that need to be replaced. If significant numbers of plants in one area are dead or performing poorly, identify reasons why to assist in selection of replacement plants.

The following maintenance activities should be undertaken as required:

Fences	Repair fences as required
Grass competition	Remove weeds and grass within 300mm of plant by manually removing them or spot spraying. Slash long grass between rows.
Weeds	Implement weed control activities.
Tree guards	Replace tree guards as required. Remove tree guards when plants are taller than the tree guards or where tree guards are restricting plant growth habit.
Dead plants	Select appropriate species to replace dead plants. If plant death was caused by specific microclimate factors select appropriate species for the conditions. Spot spray or lay jute mat over planting area at least two weeks before planting. Replant between August and September.

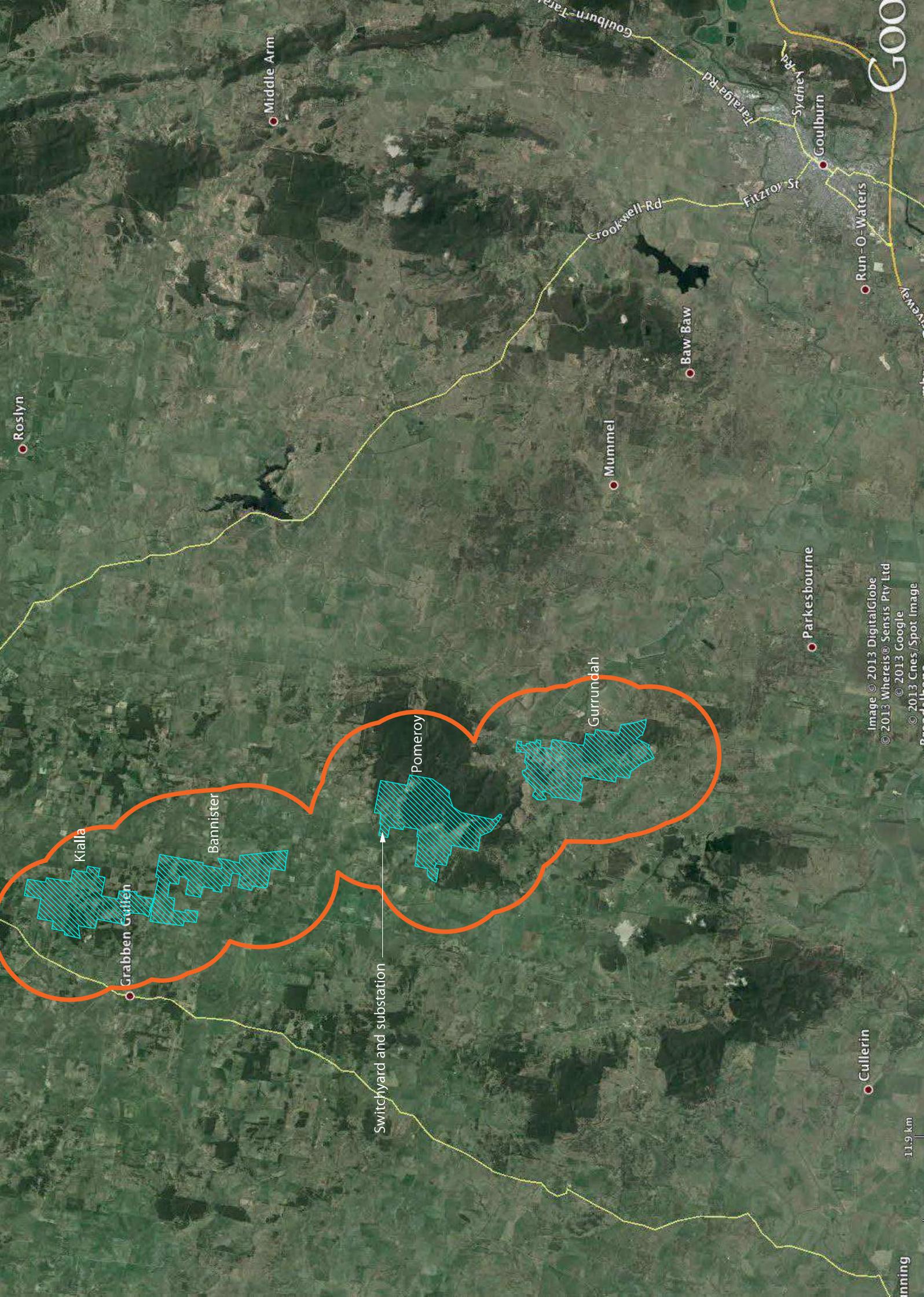
## 4 References

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- Greening Australia (n.d.) *A Revegetation Guide for Eucalypt Woodlands*. [Available online [http://www.greeningaustralia.org.au/uploads/Our%20Resources%20-%20pdfs/Reveg\\_Guide\\_Eucalypt\\_Woodlands\\_Case\\_Study\\_FINAL.pdf](http://www.greeningaustralia.org.au/uploads/Our%20Resources%20-%20pdfs/Reveg_Guide_Eucalypt_Woodlands_Case_Study_FINAL.pdf)]
- Greening Australia Victoria (2003) *Revegetation Techniques: A guide for Establishing Native Vegetation in Victoria*. [Available online [http://live.greeningaustralia.org.au/nativevegetation/pages/pdf/Authors%20C/13\\_Corr.pdf](http://live.greeningaustralia.org.au/nativevegetation/pages/pdf/Authors%20C/13_Corr.pdf)]
- Murray CMA (n.d.) *South West Slopes Revegetation Guide*. [Available online <http://murray.cma.nsw.gov.au/swsrguide/home.html>]
- NSW Department of Primary Industries (2011) *Noxious and Environmental Weed Control Handbook*. [Available online <http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/publications/noxious-enviro-weed-control>]
- NSW Department of Primary Industries (n.d.) *Calendar of Growth Cycle and Control for Weeds of the Southern Tablelands*. [Available online [http://www.dpi.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0019/154504/calendar-weed-south-tablelands.pdf](http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0019/154504/calendar-weed-south-tablelands.pdf)]

# Appendix A: Maps and construction details

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Cullerin

Parkesbourne

Fitzroy St

Goulburn

Sydney Rd

Taralga Rd

Baw Baw

Crookwell Rd

Mummel

Gurrundah

Pomeroy

Switchyard and substation

Middle Arm

Bannister

Kialla

Grabben Gulfen

Roslyn

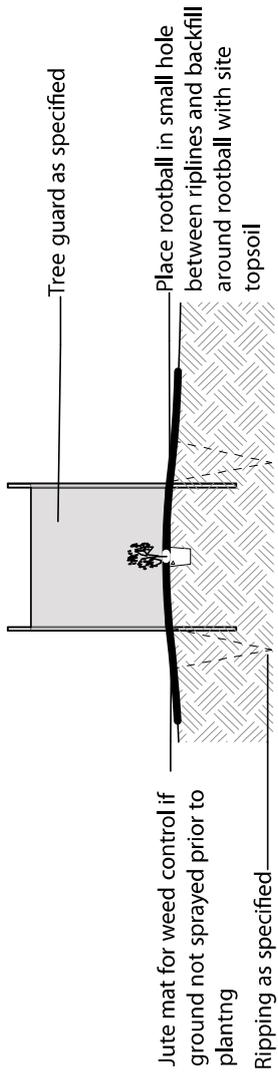


SUBSTATION

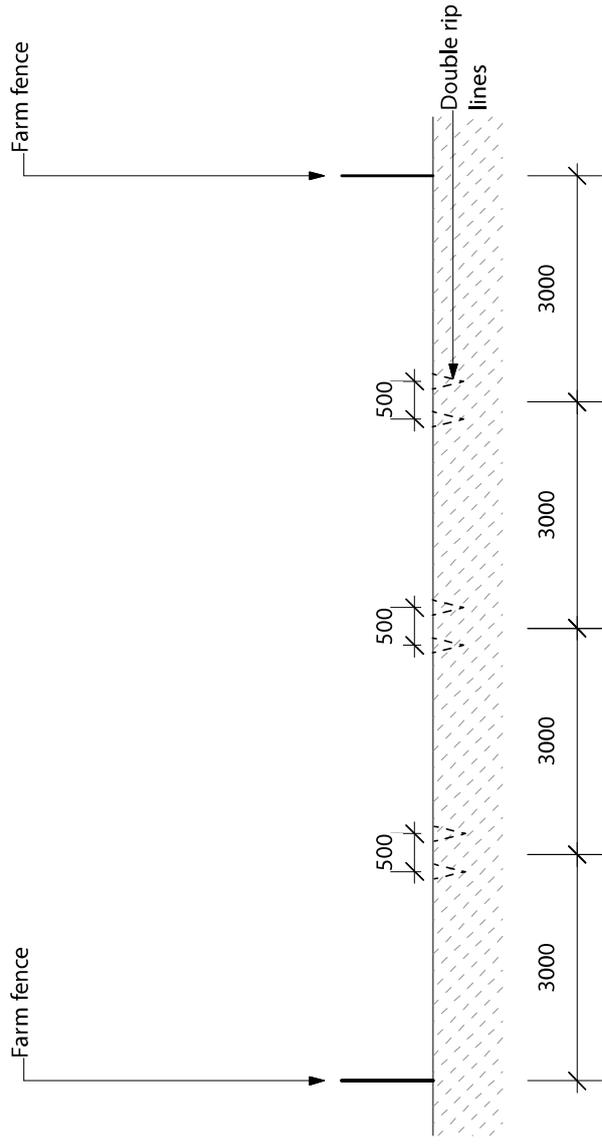
TRANSGRID  
SWITCHYARD

25m

30m



**DETAIL: TYPICAL RIP LINE TUBE PLANTING SECTION SCALE 1:20**



**DETAIL: TYPICAL RIP LINE SETOUT FOR THREE ROW PLANTING SCALE 1:100**

## Appendix B: Draft Notification letter

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DATE

To the land owner

### **Offer for off-site landscape plan – Gullen Range Wind Farm**

Gullen Range Wind Farm Pty Ltd is the owner of the Gullen Range Wind Farm, located between Gunning, Crookwell and Goulburn. Construction of the 73 wind turbines is continuing with the commissioning period due to commence in November 2013. Operation of the wind farm will not commence until mid-2014.

As part of the approval conditions for the wind farm, the NSW Department of Planning and Infrastructure requires that owners of residences within three kilometres of the new turbines be given the option to have appropriate landscape screening offered and implemented to assist with hiding views of the new wind turbines. This offer applies until December 2014. Individual landowners can choose whether to participate.

Gullen Range Wind Farm Pty Ltd has engaged local landscape architects, Fresh Landscape Design to consult landowners within three kilometres of any Gullen Range Wind Farm turbine about whether they wish to investigate screening and to discuss their preferred options for landscape screening measures. Landscape screening measures will likely consist of tree planting in strategic locations to screen views of the turbines from the house. Usually this consists of either:

- a small number of advanced trees planted close to the house (in the house garden)
- shelterbelt planting further from the house using a mix of native tree and shrub tubestock with fencing as appropriate to exclude livestock.

The location, plant species and timing will be discussed with each interested landowner and the preferred option recorded in a landscape plan. After approval, the work will be done by landscape contractors organised by Gullen Range Wind Farm Pty Ltd. The plantings will be maintained for up to two years by Gullen Range Wind Farm Pty Ltd before being handed over to the landowner to maintain.

If you are interested in discussing this offer further, please contact

#### **Gullen Range Wind Farm - Landscaping**

**Toll Free:** 1800 509711

**Web:** [www.gullenrangewindfarm.com](http://www.gullenrangewindfarm.com)

**Email:** [info@gullenrangewindfarm.com](mailto:info@gullenrangewindfarm.com)

**Write:** GRWF, Level 23, 201 Elizabeth Street, Sydney, NSW 2000

by 15 **January 2014** to register your interest. We will then organise a meeting with you to discuss options for landscape screening works on your property.

Yours sincerely

Ben Bateman

GRWF Project Manager

# Appendix C: Sample Individual Landscape Plan

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# Individual Landscape Plan

## Property details

Property name and address	
Owners/residents	
Distance to nearest turbine (approx):	
GPS location of house:	

## Screening requirements and preferred options

Identification of location and nature of views to be screened including photographs

Brief description of character of existing vegetation and land uses including type of stock

Description of the preferred landscape treatment option and what it will achieve. The following is an example.

The landowner prefers to have three advanced trees such as Desert ash or Claret ash planted in front of the dam to screen the main cluster of visible turbines (centre of photo) and a mass planting of native tubestock shrubs (no eucalypts) along the northern section of the front boundary to screen the remainder of the turbines (left side of photo). Trees planted in front of the dam will need to be at least 15m high to provide effective screening of the turbines which can only be achieved with time.

## Construction works

List requirements for construction. The following is an example.

### Location of works



### Plant schedule

Quantity	Species	Container size	Common name
2	Fraxinus oxycarpa	75L	Desert Ash
1	Fraxinus raywood	75L	Claret Ash
40	Mixed native shrubs*	tube	

\* Mixed selection from: Acacia rubida, A. dealbata, A. pravissima, Grevillea victoriae

## **Underground services**

No guarantee is given that all existing services are shown on the landscape plan. The contractor shall check on the location of all services before commencing construction. The exact location of underground services should be verified on site.

## **ADVANCED TREES**

### **Plant setout**

Setout of plants is to be approved by property owner before planting.

### **Ground preparation**

Eradicate perennial weeds and unwanted grass when actively growing by spraying with glyphosate according to manufacturer's instructions at least one week before cultivation or scalping surface.

Excavate planting hole for each tree to a minimum 1m width and 400mm depth. Note: excavation must not be done with a post hole digger. Spread Gypsum (0.5kg/square metre) and a 100mm deep layer of compost and incorporate into existing site soil.

### **Planting**

Use plants that are vigorous and hardened off for the cold climate, well established, free from pests and disease and have good form consistent with the species.

Water plants every day if stored on site and before and immediately after planting.

Remove all labels, wire ties and unnecessary stakes. Give plant labels to client.

### **Mulching**

Form a watering basin around the base of the tree at least 800mm in diameter and mulch with a 70mm deep layer of shredded woody tree surgeon's prunings or equivalent.

Keep the mulch clear of plant stems.

### **Staking**

Stakes shall be 50mm x 50mm x 1.8m hardwood driven 600mm into the ground in a manner that avoids damage to the root system of the tree. Trees shall be tied to two stakes using flat hessian ties fixed securely to the stakes and positioned to support the tree between  $\frac{1}{4}$  and  $\frac{1}{2}$  of its height from the ground.

### **Protective fencing**

Each tree shall be fenced individually with a tree guard.

Tree guards are to be constructed from four 50mm x 50mm x 1.8m hardwood driven 600mm into the ground to form a one metre square around the outside of the root system of the tree. 1.2m high heavy duty chicken wire is to be securely attached to the stakes.

## **Site clean up**

Remove all rubbish generated by the construction activity.

Rake any soil to disturbed by the works to an even graded surface and sow with a dryland grass mix.

## **MASS PLANTING IN RIP LINES**

### **Ground preparation**

Eradicate perennial weeds and unwanted grass in an approximately 1.5m wide strip along riplines by scalping surface or spraying with glyphosate and an appropriate pre-emergent herbicide according to manufacturer's instructions at least one month before ripping.

Riplines are to be located as described in the location plan with a minimum depth of 450mm (where possible).

Set out of riplines is to be approved by the landowner or resident after the contractor has verified the location of underground services. For each tree line, rip two lines 0.5m apart.

Avoid ripping within the drip lines of existing trees or within 5 metres of the edge of defined drainage lines. Ripping must not occur on a site where the soil is saturated or there is surface runoff.

### **Planting**

Use plants that are vigorous and hardened off for the cold climate, well established, free from pests and disease and have good form consistent with the species.

Plant between double riplines with trees positioned to be offset from adjacent rows (that is, the trees align with the spaces in the previous row). Mix plant species evenly throughout mass planting area. Mix plant species evenly throughout the rip lines and plant at approximately 3 metre centres with 7 metre minimum space between trees.

Water plants every day if stored on site and before and immediately after planting.

### **Tree guards**

Provide and install 450 x 400mm, 100um thick LDPE tree guards with 4% UV and light green tint or similar securely fixed to three 25mm thick hardwood stakes to each plant.

### **Protective fencing**

Not included.

## **Site clean up**

Remove all rubbish generated by the construction activity.

## Establishment and maintenance

Details to be negotiated with the landowner. The following is the starting offer.

Goldwind Australia will be responsible for maintenance of the landscape works for two years after the landscape works are completed. Maintenance activities include grass/weed control, pest control, replacement of plants that die, repair of damaged tree guards and repair of fencing.

Timing of maintenance activities will depend on rainfall and seasonal variation but as a minimum inspection and necessary maintenance will be undertaken at the end of winter, the end of spring and mid autumn.

Goldwind Australia will notify the landowner in writing at least two weeks before inspection and maintenance activities are planned to take place.

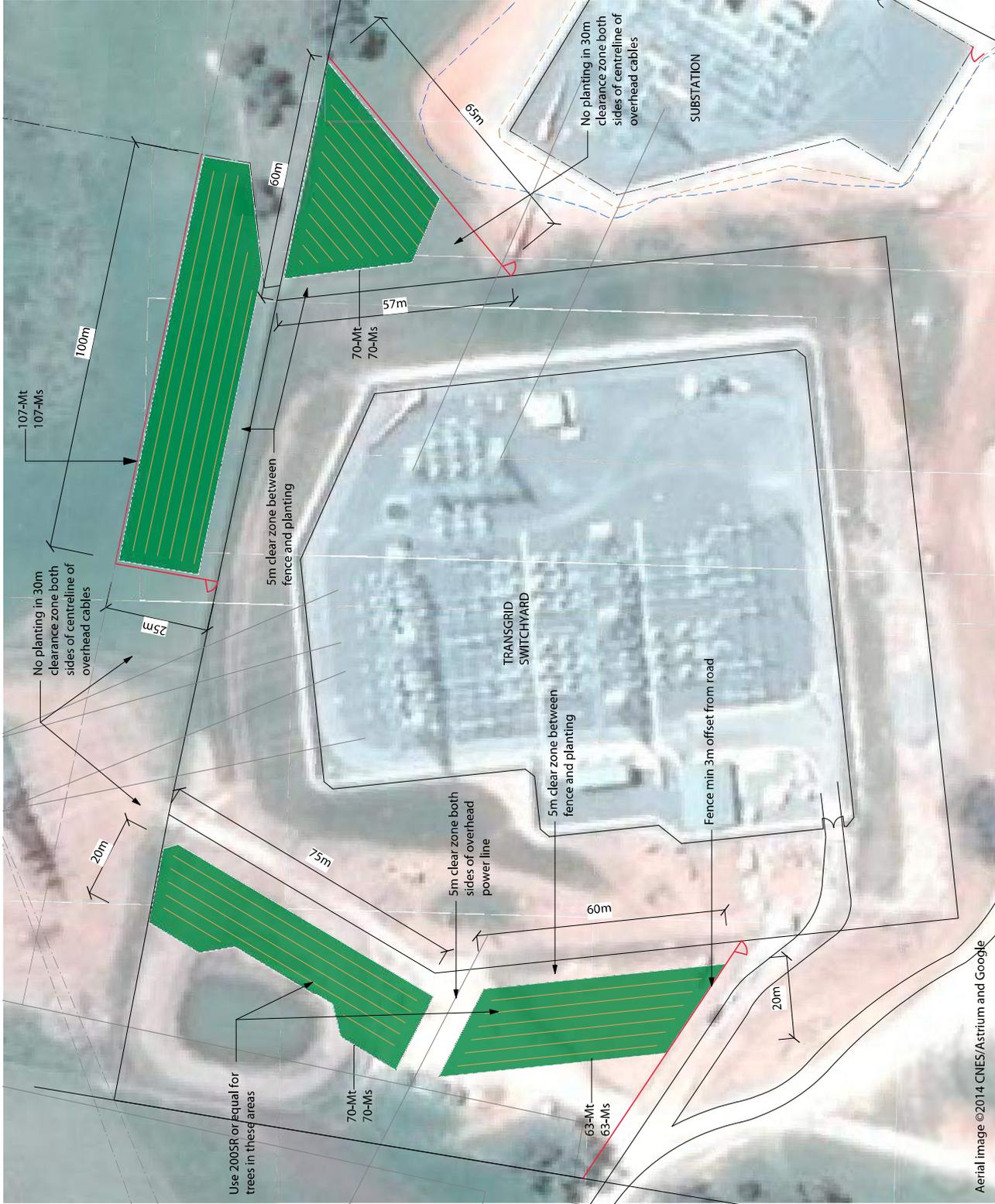
If the landowner does not want the inspection and maintenance activities to take place on a particular occasion they will notify Goldwind Australia in writing before the inspection and maintenance activities are scheduled to take place.

## Agreement to individual landscape plan

As the owner of this property I confirm that the works described above comprise the agreed plan to address the visual impact of Gullen Range Wind Farm at my property and give permission for the contractor, subcontractors and their equipment to access my property for the purposes of carrying out the above works.

Plan prepared by	
Version	
Date	
Agreed by Landowner(s)	Name Signature Name Signature Date
Agreed by Goldwind Australia	Name Signature Date

# APPENDIX G1 – SUBSTATION LANDSCAPING



Aerial image ©2014 CNES/Astrium and Google

**LEGEND**

-  Shelter belt planting in rip lines 50% mixed trees, 50% mixed shrubs @ 3m centres
-  Property boundary
-  Existing fence
-  Transmission line
-  Top of bank
-  Bottom of bank
-  New fence (refer specifications)
-  New 14' farm gate

**PLANT SCHEDULE**

Code	Quantity	Species	Container size
Mt	310	mixed shrubs	forestry tube or hiko
Mt	133	mixed trees	200AS
Mt	177	mixed trees	forestry tube or hiko

**Mixed trees**

at least 3 species selected from:  
*Eucalyptus bridgesiana*  
*Eucalyptus mannifera*  
*Eucalyptus melliodora*  
*Eucalyptus pauciflora*  
*Eucalyptus rossii*

**Mixed shrubs**

at least 3 species selected from:  
*Acacia dealbata*  
*Acacia deanei*  
*Acacia melanoxylon*  
*Acacia rubida*  
*Banksia marginata*

**GENERAL NOTES**

**Details and specifications**

This drawing is to be read in conjunction with the other project drawings, specification and details on drawing 284-6

**Safety**

Refer to GRWF superintendent for information on safe work methods near fences, underground cables, overhead services and other infrastructure.  
 Refer to GRWF superintendent for safety information about attaching gate chains to existing substation and switchyard fences.

**Survey and services**

This drawing contains survey information collated from a variety of sources and may not be complete or accurate. Measurements, dimensions and levels should be confirmed on site before commencing construction.

The contractor is responsible for locating all services on site before commencing construction.

**PRELIMINARY**

Drawing  
 Onsite Landscape Works  
 Transgrid Switchyard  
 Project  
 Gullen Range Wind Farm  
 Dwg no. Design Date Version  
 284-4C JC 2/6/15 B

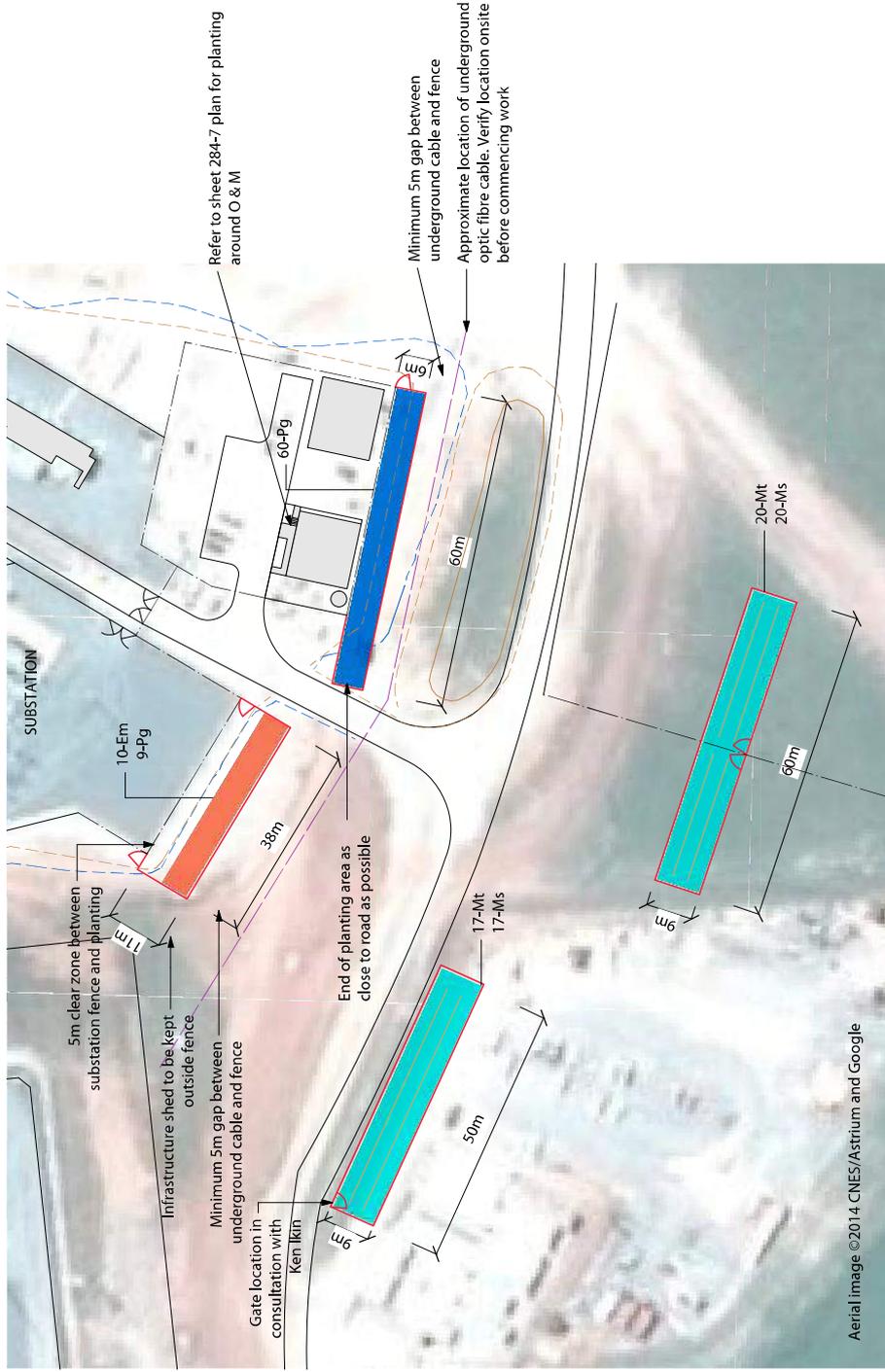


Scale  
 1:1000 at A3



**LEGEND**

- Shelter belt planting - two rows in rip lines 50% mixed trees, 50% mixed shrubs @ 3m centres
- One row alternating *Eucalyptus mannifera* 'Little Spotty' and *Photinia glabra* 'Rubens' @ 3m centres
- Two rows *Photinia glabra* 'Rubens' @ 2m centres
- Property boundary
- Existing fence
- Transmission line
- Underground fibre optic cable (approximate location)
- Top of bank
- Bottom of bank
- New fence (refer specifications)
- New 14' farm gate



Aerial image ©2014 CNES/Astrium and Google

**PLANT SCHEDULE**

Code	Quantity	Species	Container size
Em	10	<i>Eucalyptus mannifera</i> 'Little Spotty'	200AS
Pg	69	<i>Photinia glabra</i> 'Rubens'	200mm forestry tube
Ms	37	mixed shrubs	forestry tube
Mt	37	mixed trees	

**Mixed trees**

at least 3 species selected from:  
*Eucalyptus bridgesiana*  
*Eucalyptus mannifera*  
*Eucalyptus melliodora*  
*Eucalyptus pauciflora*  
*Eucalyptus rossii*

**Mixed shrubs**

at least 3 species selected from:  
*Acacia dealbata*  
*Acacia deanei*  
*Acacia melanoxylon*  
*Acacia rubida*  
*Banksia marginata*

**GENERAL NOTES**

**Details and specifications**

This drawing is to be read in conjunction with the other project drawings, specification and details on drawing 284-6

**Safety**

Refer to GRWF superintendent for information on safe work methods near fences, underground cables, overhead services and other infrastructure. Refer to GRWF superintendent for safety information about attaching gate chains to existing substation and switchyard fences.

**Survey and services**

This drawing contains survey information collated from a variety of sources and may not be complete or accurate. Measurements, dimensions and levels should be confirmed on site before commencing construction.

The contractor is responsible for locating all services on site before commencing construction.

**PRELIMINARY**

Drawing  
 Onsite Landscape Works  
 GRWF substation + O&M  
 Project  
 Gullen Range Wind Farm  
 Dwg no.  
 284-5  
 Design  
 JC  
 Date  
 7/5/15  
 Version  
 A



Scale  
 1:1000 at A3



## SPECIFICATIONS

### Services

No guarantee is given that all existing services are shown on the landscape plan. The contractor shall check on the location of and clearances for all services before commencing construction. The exact location of underground services shall be verified on site.

### Ground preparation

Rip lines are to be located as described in the location plan with a depth of 400mm (where possible) with minimum 3m offset from fences. Set out of rip lines is to be approved by the GRWF superintendent after the contractor has verified the location of underground services.

Avoid ripping within the drip lines of existing trees, within 5 metres of the edge of defined drainage lines or within clearance zones for underground services. Ripping must not occur on a site where the soil is saturated or there is surface runoff.

Eradicate perennial weeds and unwanted grass along rip lines by spot spraying 1m wide patches in locations to be planted with glyphosate according to manufacturer's instructions at least two weeks before planting.

### Planting

Use plants that are vigorous and hardened off for the cold climate, well established, free from pests and disease and have good form consistent with the species. Tubestock plants shall not be more than double the height of the container.

**Shelter belts:** Plant along rip lines with plants positioned to be offset from adjacent rows (that is, the plants align with the spaces in the previous row). Mix plant species evenly throughout mass planting area. Where both trees and shrubs are to be planted, mix trees and shrub species evenly throughout.

Water plants every day if stored on site and before and immediately after planting.

### Tree guards

Provide and install a Greenway Enterprises Greenway Corflute Treeguard (450mm high, 200mm width sides) with two hardwood stakes to each tubestock plant.

### Protective fencing

Install stock fence around new planting with two rows of barb wire, 8/80/15 hinged joint with plain wire top and bottom, steel posts, strainers and stays. Install eight 14' farm gates.

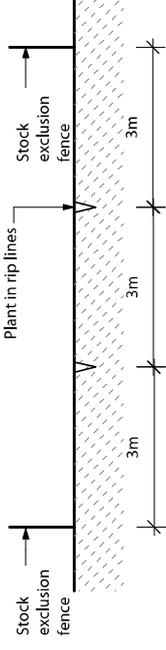
### Site clean up

Remove all rubbish generated by the construction activity.

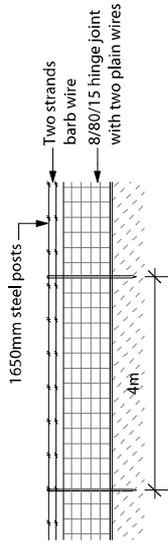
### Plant establishment

A plant establishment period of 13 weeks shall apply after practical completion. During the establishment period the contractor will visit the site at least monthly and undertake the following tasks:

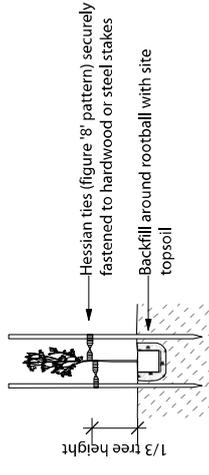
- water plants if required
- fertilise plants as needed
- keep 1m dia. area around each plant free of weeds
- replace dead plants
- maintain staking and tree guards



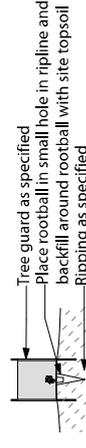
DETAIL: TYPICAL RIP LINE SET OUT FOR TWO ROW SHELTER BELT PLANTING  
SCALE 1:100



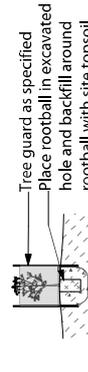
DETAIL: TYPICAL STOCK EXCLUSION FENCE  
SCALE 1:100



DETAIL: TYPICAL 200AS TREE PLANTING SECTION



DETAIL: TYPICAL RIP LINE TUBE PLANTING SECTION

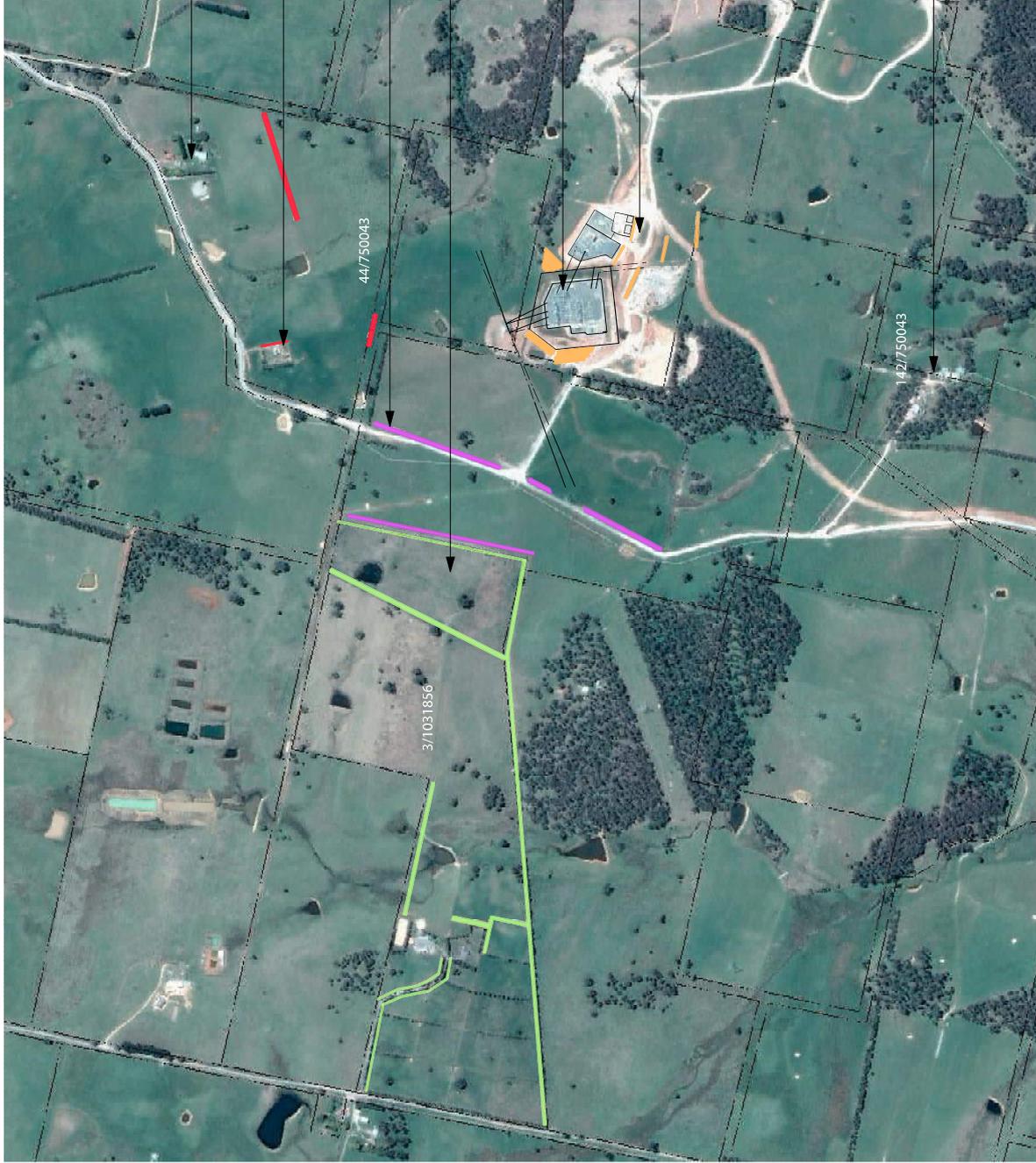


DETAIL: TYPICAL POT PLANTING SECTION



LEGEND

- Screen planting as part of on-site landscape works
- Screen planting proposed for individual landscape plan for 44/750043
- Screen planting proposed for individual landscape plan for 142/750043
- Screen planting already completed for 3/1031856
- - - Easement
- Property boundary
- Transmission line



Views from residence to TransGrid switchyard screened by existing planting and planting in proposed individual landscape plan for 44/750043

Views from cottage to TransGrid switchyard to be screened by planting in proposed individual landscape plan for 44/750043

Views from road to TransGrid switch yard to be screened by planting in individual landscape plan for 142/750043

Views from 3/1031856 including residence to TransGrid switch yard to be screened by planting already done and to be reimbursed for individual landscape plan for 3/1031856 and additional planting proposed in individual landscape plan for 142/750043

TransGrid switchyard (no planting permitted inside easement or near overhead transmission lines, two options to be discussed with B. Johnson)  
GRWF substation and O&M (no planting permitted near fences and underground cables)

Views from residence to GRWF and office building screened by on-site screen planting

Aerial image ©2014 CNES/Astrium and Google

SUMMARY OF LANDSCAPE SCREENING MEASURES FOR SWITCHYARD, SUBSTATION AND O&M FROM ON-SITE LANDSCAPE PLAN AND INDIVIDUAL LANDSCAPE PLANS

PRELIMINARY

Drawing Switchyard/substation screening  
 Project Gullen Range Wind Farm  
 Dwg no. 284-8 Design JC Date 7/5/15 Version E



Fresh Landscape Design  
 Landscape Architects  
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Scale 1:10,000 at A3

# APPENDIX H COMPENSATORY HABITAT PACKAGE



# Compensatory Habitat Package

## GR-PM-PLN-0014

GULLEN RANGE WIND FARM



JULY 2016



## Document Verification



Project Title: Compensatory Habitat Package (GR-PM-PLN-0014)  
Gullen Range Wind Farm

Project Number: 6078

Project File Name: Gullen CHP Revised (GR-PM-PLN-0014)\_v7.0\_tracked

Revision	Date	Prepared by (name)	Reviewed by (name)	Approved by (name)
Final V0	25/08/11	Dave Maynard Bianca Heinze	Brooke Marshall	Brooke Marshall
Final v1	25/10/10	Dave Maynard	Brooke Marshall	Brooke Marshall
Final V2 minor change	3/11/11	Brooke Marshall		Brooke Marshall
Final V2.1 minor change	14/11/11	Brooke Marshall		Brooke Marshall
Final V2.2 minor change	21/03/12	Brooke Marshall	Erwin Budde	Erwin Budde
Final V3	29/06/12	Brooke Marshall Dave Maynard	Erwin Budde	Erwin Budde
Final V3.1	20/09/12	Brooke Marshall minor changes		Brooke Marshall
Final V4 (validation section based on 2011 data)	24/07/14	Dave Maynard	Brooke Marshall	Brooke Marshall
Final v5	13/08/14	Dave Maynard	Brooke Marshall	Brooke Marshall
Final v5.1	22/08/14	Dave Maynard	Brooke Marshall	Brooke Marshall
Final v5.2	25/08/14	Dave Maynard	Brooke Marshall	Brooke Marshall
Final v6.0	26/02/15	Dave Maynard	Brooke Marshall	Brooke Marshall
Final v6.1 minor changes	16/03/15	Dave Maynard		Brooke Marshall
Final v7.0	28/07/16	Dave Maynard	Nick Graham-Hggs	Nick Graham-Higgs

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# 1 INTRODUCTION

## 1.1 PURPOSE OF THIS DOCUMENT

This document provides a revised version of the Gullen Range Wind Farm (GRWF) Compensatory Habitat Package (CHP) that was approved by Department of Planning and Environment (DPE) in September 2012. The CHP is required by Approval Condition 2.35 of the Project Approval. The implementation of the offset described in the CHP is proposed to be via a Conservation Property Vegetation Plan (CPVP) to be formalized in consultation with Office of Environment and Heritage (OEH) and with the involvement of Local Land Services (LLS) as the agency that registers CPVP's under the provisions of the Native Vegetation Act, 2003.

Consultation has been undertaken with OEH to prepare the approved CHP and for subsequent revision to prepare this revised CHP. On the basis of the consultation, the proponent, New Gullen Range Wind Farm Pty Ltd (NGRWF) has offered to expand the offset area defined in the CHP that was approved in 2012. A revised CHP was provided to OEH in September 2014 and an updated version in March 2015 reflecting additional mapping results. This CHP has been further revised based on the need for minor boundary adjustments to align the boundaries of the offset site with surveyed property boundaries and reflect on ground fencing practicalities.

Draft documentation for a proposed CPVP will be submitted to OEH and LLS with a copy to Department of Planning and Environment (DPE). It was also considered appropriate to provide this updated CHP despite a CHP having already been approved. The revised document utilizes additional assessment information, addresses outcomes of OEH consultation and describes the offset that is currently proposed to be implemented via a CPVP. As the offset in this revised CHP is greater than that for the approved CHP (2012) it is not considered that it conflicts with the approved CHP and, beneficially provides a much improved conservation outcome.

This CHP describes the process for development of the revised offset area, its characteristics and proposed management zones and actions that are to be included in the CPVP.

## 1.2 BACKGROUND

The Gullen Range Wind Farm (GRWF) project involves the construction and operation of 73 wind turbines at Gullen Range in the Southern Tablelands region of NSW. Construction commenced in September 2012 and full operation commenced in December 2014.

The GRWF project was assessed under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and was approved by the NSW Land and Environment Court on the 4<sup>th</sup> of August 2010 subject to Project Approval conditions.

Project Approval Condition 2.35 required that the proponent prepare “a compensatory habitat package to offset in perpetuity the value of habitat lost as a result of the project”. A CHP was prepared by NGH Environmental Pty Ltd on behalf of the proponent and in consultation with OEH. The CHP was subsequently approved by DPE on 10 September 2012 subject to four conditions set out in DPE's letter.

This version of the CHP has been updated following validation of impact areas for native vegetation (conducted July 2014) and to address outcomes of consultation with OEH during 2014.

The GRWF Bird and Bat Adaptive Management Plan (BBAMP) addresses the ongoing monitoring and adaptive management for avifauna in the vicinity of the project. This CHP provides for conservation of known habitat for species such as Powerful Owl, Wedge-tailed Eagle and potentially Little Eagle, if present.

It is noted that a Modification Application was lodged for the project, in March 2014, under Section 75W of the EP&A Act. The modification related to changes to specific turbine locations. This involved adjustments from the approved indicative locations to as-built locations based on detailed design and further consideration of site specific construction, engineering and environmental constraints. In July 2014, the DPE recommended approval of the modification subject to recommended conditions. The determination of the modification application was referred to the Planning Assessment Commission (PAC) and on 2 October 2014, PAC refused the application. On 6 March 2015, the Land and Environment Court, by Consent, set aside the decision of the PAC leaving the modification undetermined. The modification was referred back to the DPE.

The DPE provided a revised assessment of the modification in May 2015 recommending that the application be approved. The modification was approved on the 7 September 2015 subject to some amendments to the conditions. Condition 2.3.5 was amended to include, in general, revision of the CHP in consultation with OEH by 31 December 2015. The March 2015 version of the revised CHP was endorsed by OEH meeting this condition of consent.

This revised CHP provides an opportunity for further consultation with OEH to agree management measures that can be integrated in the final CPVP and provide a basis for implementation of the offset.

### **1.3 LOCATION**

The Gullen Range Wind Farm is located along a north-south running ridge system of the Great Dividing Range between Gunning, Crookwell and Goulburn in NSW's southern tablelands. The wind farm occurs across four different precincts. All four precincts where infrastructure would be installed, Kialla, Bannister, Pomeroy and Gurrundah, are located on private property within and adjacent to mainly agricultural areas used for sheep and cattle grazing. As well, residential dwellings and two commercial operations (chicken farms) are located nearby. In general, the locations can be characterised as grassland ridges and flats with woodland and forest patches on slopes and in gullies. The nearest township is that of Grabben Gullen, with larger towns including Crookwell, Gunning, Breadalbane and Goulburn in the region.

A significant area of woodland is located to the east of the Pomeroy Group of turbines and part of this woodland has been included within the proposed offset area. The area selected for the proposed offset has significant conservation value.

### **1.4 LEGISLATIVE CONTEXT**

An Environmental Assessment to assess the potential environmental impacts of the wind farm was undertaken by NGH Environmental in 2008 (EA; NGH Environmental 2008a). A Biodiversity Assessment (BA; NGH Environmental 2008b) was prepared as part of the assessment. The BA forms a key source document for this plan.

The Gullen Range Wind Farm is subject to the conditions specified in Annexure A of the Land and Environment Court Order (L&ECO), 4 August 2010. Conditions relevant to this package included:

#### **L&ECO Condition 2.35:**

*"Prior to the commencement of construction of the project, the Proponent shall in conjunction with the DECC, finalise (and following approval) implement a compensatory habitat package to offset in perpetuity the value of habitat lost as a result of the project, to the satisfaction of the Director General. Unless otherwise agreed to by the Director General, the package shall comprise:*

- a) *A minimum of 2:1 'like for like' offset of the vegetation communities to be removed or otherwise disturbed on site utilising a "Worst Case Scenario" impact assessment; or*
- b) *The implementation of in kind management measures or funding for such measures as agreed to by DECC; or a combination of the measures specified in a) and b)."*

As part of the Modification Application process, DPE recommended approval of the modification in July 2014, subject to draft conditions which included the replacement of the L&ECO Condition 2.35 above. The DPE recommended draft condition addressed areas of concern that were identified by OEH. NGRWF accepted the intent and objectives of the recommended conditions and addressed them as part of the March 2015 CHP revision. As this recommended condition provided the basis for the current CHP, details of how this CHP addressed the specific requirements of the recommended condition are provided in Table 1-1 together with explanations of proposed variations to provide practical and effective means of achieving the objectives of the proposed condition.

Following final approval of the modification in September 2015, Consent Condition 2.35 was amended to:

*"By the 31 December 2015, unless otherwise agreed with the Secretary, the Proponent shall revise the proposed compensatory habitat package to offset in perpetuity the value of habitat lost as a result of the project, in consultation with OEH, and to the satisfaction of the Secretary. Unless otherwise agreed to by the Secretary, the package shall comprise:*

- a) *A minimum of 2:1 'like for like' offset of the vegetation communities to be removed or otherwise disturbed on site utilising a "Worst Case Scenario" impact assessment; or*
- b) *The implementation of in kind management measures or funding for such measures as agreed to by OEH; or a combination of the measures specified in a) and b)."*

The March 2015 version of the revised CHP was endorsed by OEH meeting this condition of consent.

Table 1-1 Recommended draft condition 2.35 and status for the revised CHP.

Aspect of DPE Recommended draft condition 2.35	Description of proponent's response in this CHP to the specific DPE aspect in the recommended Condition 2.35 and reason for any changes from the draft condition.
<p>a. <i>Within 6 months of the date of determination of modification 1, the Proponent shall in consultation with the Office of Environment and Heritage (OEH), finalise (and following approval implement all the actions of the package within 3 months or as otherwise agreed to by OEH) a revised compensatory habitat package (CHP) to offset in perpetuity the value of habitat lost as a result of the project, to the satisfaction of the Secretary. Unless otherwise agreed to by the Secretary, the package shall comprise, but not necessarily be limited to:</i></p>	<p>This CHP satisfies this requirement.</p>
<p>i. <i>a minimum of 2:1 'like for like' offset of the vegetation communities to be removed or otherwise disturbed on site utilising a "Worst Case Scenario" impact assessment.</i></p>	<p>The proposed offset area does not contain all vegetation types impacted. It is considered to provide a '<b>like for better</b>' outcome with regard to the protection of vegetation of conservation value as discussed in Section 3.3.</p>
<p>ii. <i>an extended area of box gum woodland, determined in consultation with OEH.</i></p>	<p>This revised CHP includes extended areas of Box-Gum Woodland determined in consultation with OEH</p>
<p>iii. <i>measures to prohibit rabbit baiting within the foraging areas of the Little Eagle that is within the vicinity of any turbines (to be determined in consultation with OEH).</i></p>	<p><b>No rabbit baiting will be allowed within the offset area or within land owned by the operator at Pomeroy precinct.</b> This requirement is included in the suggested management measures in Section 3.5.</p>
<p>iv. <i>measures to actively rehabilitate any Box Gum Woodland within the offset area to within the NSW Vegetation Biometric benchmark level for Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands in the Hawkesbury Nepean CMA. This rehabilitation must be within benchmark by June 2019.</i></p>	<p>The date at which the offset area is established and active management begins is not fixed. Also the success of rehabilitation depends on climatic conditions beyond the control of the proponent. It is considered reasonable that demonstrating a substantial improvement over a five year time frame whilst considering the climatic conditions, meets the objective of the condition.</p> <p>Suitable measures are included in Section 3.5.</p> <p>These measures would aim to have the Box Gum Woodland within or approaching Biometric benchmark level for <i>Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands in the Hawkesbury Nepean CMA</i> within five years of establishment of the offset site, subject to seasonal conditions.</p>

Aspect of DPE Recommended draft condition 2.35	Description of proponent's response in this CHP to the specific DPE aspect in the recommended Condition 2.35 and reason for any changes from the draft condition.
<p>v. <i>no spraying using a boom spray or aerial spraying within the areas of box gum woodland, or within the other areas of the compensatory habitat areas. Spraying for noxious weeds is to be undertaken using a hand held spray device on target species only. Other woody weeds should be removed by hand.</i></p>	<p>There are a number of methods that may be employed that have minimal impact on surrounding environments and removing all woody weeds by hand may not be the most efficient, cost effective or less intrusive approach.</p> <p>Weed control measures are included in Section 3.5. These include:</p> <ul style="list-style-type: none"> <li>• No spraying using a boom spray or aerial spraying within the areas of box gum woodland, or within the other areas of the compensatory habitat areas.</li> <li>• <i>Spraying for noxious weeds is to be undertaken using a hand held spray device on target species only. Other woody weeds should be removed by hand (or suitable alternatives as determined by an expert, in consultation with OEH).</i></li> </ul>
<p>vi. <i>no grazing within the CHP area without consultation with OEH and approval of the Secretary.</i></p>	<p>The exclusion of grazing (unless approved by the Secretary) is included in the suggested management measures in Section 3.5.</p>
<p>vii. <i>a program of feral animal control, including control and removal of feral goats, pigs and foxes. A feral animal control plan is to be developed which clearly outlines the types of control and when the feral animal control will occur.</i></p>	<p>The preparation of a pest control strategy is included in the suggested management measures in Section 3.5.</p>
<p>viii. <i>Protection of the known nesting and roosting area of the Powerful Owl. As such the CHP area is to include all known roosting or nest trees of the Powerful Owl within the project boundary. The boundary of the CHP area must be finalised in consultation with OEH. The nest trees and surrounding habitat should be protected in perpetuity, using either a conservation PVP or biobanking agreement.</i></p>	<p>It is not feasible for the proponent to include the known nesting and roosting area in the CHP area as it is on a neighbouring property. However, this CHP provides a significant protection buffer including key foraging habitat that is located between developed areas and the known nesting and roosting habitat. This buffer will be secured in perpetuity under a conservation PVP and actively managed and restored to support protection of native vegetation communities and maintain its habitat potential for species such as the Powerful Owl. The current CHP boundary has been developed in consultation with OEH and significantly increases the area and conservation values to be protected under the proposed Conservation PVP.</p>

Aspect of DPE Recommended draft condition 2.35	Description of proponent's response in this CHP to the specific DPE aspect in the recommended Condition 2.35 and reason for any changes from the draft condition.
<p>ix. <i>Measures for minimising the impact of the windfarm on the Powerful Owl inclusive of the monitoring requirements as stipulated within condition 2.35A.</i></p>	<p>The existing condition 2.33 contains provision for restriction of operation for turbines POM 03, 04, 06 and 07 to avoid risk to Powerful Owl juvenile dispersion. Additionally the Bird and Bat Adaptive Management Program (BBAMP) (required by Condition 3.1) contains provisions for monitoring impacts and for adaptive management.</p> <p>A Powerful Owl Management Strategy (POMS) has also been prepared for the project and will be updated in consultation with DPE/OEH. The POMS will address monitoring requirements.</p>
<p>x. <i>a monitoring and reporting program for the CHP area, to be determined in consultation with OEH.</i></p>	<p>A monitoring and reporting program is included in the suggested management measures in Section 3.5 and is expected to be incorporated in the conservation PVP.</p>
<p>b. <i>Within 3 months of the date of determination of modification 1, the Proponent shall provide an accurate assessment of the amount and type of vegetation that is impacted by the project, to the OEH and the Secretary.</i></p>	<p>Section 3.1 of this CHP includes the results of a ground validated impact assessment (undertaken in July 2014) and describes the assessment of the suitability of the proposed offset against these verified areas.</p>

Additionally, Statements of Commitment (SoCs) were made within the documents referred to Project Approval Condition 1.1 to address potential environmental impacts associated with the project. SoC 16 and 16a are relevant to this CHP as outlined below.

**Statement of Commitment 16:**

*The Proponent would commit to offsets determined by suitably qualified experts on the basis of the quantum of vegetation to be removed, pending development of the final infrastructure layout. The offset plan would be established in perpetuity.*

*A Conservation Property Vegetation Plan (CPVP) area has been defined and actions for this area will be finalised in consultation with OEH and CMA.*

**Statement of Commitment 16a:**

*A review of impacts during construction will be undertaken and assessed against the offset to ensure that the offset is adequate*

This CHP provides the results of the validation of the project's impacts on native vegetation and the strategy for calculating, securing and managing the offset site. The overall objective is to 'maintain or improve' its condition – no loss of value and ideally enhancement of the values. The actions to implement this CHP include:

- securing the land under a CPVP consistent with this CHP,
- finalising a management plan in consultation with the OEH and Local Land Services (LLS) (previously Catchment Management Authority - CMA) to set out the type and timing of management actions, and
- carrying out those actions, in accordance with the registered CPVP.

## 1.5 CONSULTATION

Consultation in respect of Condition 2.35 has occurred, with NSW Office of Environment and Heritage (OEH), at several stages described below:

Input was sought from OEH at an early stage in the development of the plan. A draft was reviewed by OEH and a formal response was provided on 7<sup>th</sup> October 2011 (a number of issues were further clarified on the basis of this). OEH advised that overall, they were in support of the package (OEH reference DOC11/44912/12069).

Additionally, the Southern Rivers CMA officer (now LLS) provided information relating to Conservation Property Vegetation Plans (CPVPs) generally, sufficient to inform the development of the strategy provided in Section 4.4 of this document.

Additional consultation was undertaken with the OEH between April and July 2014 and addressed OEH concerns regarding the current condition of the offset area. The concerns included; condition of areas infested with the noxious weed Serrated Tussock (*Nassella trichotoma*) and the management actions to be applied for the offset area. As a result of the consultation, NGRWF revised the boundary of the proposed offset area and updated the management measures. The revised CHP (August 2014) included a validation of the project's impact on native vegetation, a revised description of the offset area, inclusion of an additional management zone and, additional management measures. It was submitted to DPE and OEH in latter half of 2014 with the expectation of further consultation but that did not occur due to the legal

proceedings associated with PAC refusal of the modification application. The PAC decision has since been set aside by the Land and Environment Court.

The March 2015 CHP was revised to address results of the impact validation and matters raised in the draft conditions recommended by the DPE in July 2014 including specific management measures. Primarily, the offset area was significantly increased and additional management requirements added. These revisions were deemed to be appropriate by the OEH and LLS.

Further consultation with the OEH and LLS has been undertaken to confirm the suitability of the current revisions to the CHP for implementation via a CPVP.

## **1.6 SCOPE OF THIS CHP**

The scope of this CHP is to describe the project's impact on native vegetation, the proposed offset and the management measures which are proposed to be integrated in the CPVP. It is intended to fulfil the requirements under the Project Approval Condition 2.35 and to provide guidance on how the offset site should be managed to maintain or improve biodiversity values.

This CHP provides the following:

1. Quantifies the value of habitat removed by the project.
2. Determines if the minimum of 2:1 'like for like' offset of the vegetation communities that have been removed or otherwise disturbed is met, based on the validated final construction footprint.
3. Includes an extended area of Box-Gum Woodland partly determined in consultation with OEH (June 2014) but further extended following the impact validation.
4. Guidance on how the offset site should be managed to maintain or improve biodiversity values including:
  - a. Committing to alternate methods for rabbit control other than baiting.
  - b. Applying measures to actively rehabilitate any Box Gum Woodland within the offset area.
  - c. Committing to the preparation of a weed management plan incorporating measures for weed control other than spraying using a boom spray or aerial spraying.
  - d. The exclusion of grazing in consultation with OEH and the landowners.
  - e. Committing to the preparation of a feral animal control plan, including the control and removal of feral goats, pigs and foxes
  - f. Measures appropriate to protecting any previously identified Powerful Owl or Little Eagle nesting and roosting areas within the offset site.
5. Proposes a monitoring and reporting program for the CHP area, to be determined in consultation with OEH.
6. Reflects OEH review and input and recognizes the ongoing role by OEH.
7. Has been prepared by suitably qualified experts.
8. Sets out a method to achieve in perpetuity, management of the offset site for improved biodiversity outcomes.

Preparation of this CHP has been guided by the OEH document, *Draft Principles for the use of Biodiversity Offsets in NSW*.

The implementation of the Compensatory Habitat Package (CHP) will involve the establishment of a CPVP in consultation with OEH and LLS and an ongoing management program.

## 2 METHODOLOGY

### 2.1 GENERAL APPROACH

The following approach was undertaken to ensure that the offset area is appropriate relative to the areas of native vegetation that will be permanently removed by the project.

1. Validate the areas permanently impacted by infrastructure components based on the actual disturbance footprint (July 2014).
2. Calculate the specific areas of vegetation to be permanently removed in terms of:
  - a. Vegetation type.
  - b. Vegetation condition.
  - c. Habitat values (flora and fauna, including estimates of hollow-bearing trees).

Appropriate offsets were investigated by:

1. Validating existing vegetation mapping within the 'proposed offset areas' (confined to the Pomeroy site and defined in Section 3.2). Existing vegetation mapping (Biodiversity Assessment, NGH Environmental 2008) was updated to reflect current condition of vegetation and habitat and any vegetation type changes<sup>1</sup>.
2. Calculate the specific area of vegetation proposed to be offset in terms of:
  - a. Vegetation type.
  - b. Vegetation condition.
  - c. Habitat values (flora and fauna, including estimates of hollow-bearing trees).

In defining the extent of the final 'offset site', additional consideration was given to:

- Ensuring that the offset site adequately represents a 2:1 ratio in terms of *actual* permanent impacts from the development.
- Ensuring a 'like for like' or 'like for better' offset (in terms of the conservation significance of habitat to be removed).
- Ensuring appropriate management of the offset site (aiming to 'maintain or improve' its condition – no loss of value).
- Ensuring appropriate security of the offset site (to ensure in-perpetuity retention).

This approach is further detailed below.

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<sup>1</sup> Mapping for the offset site has been updated in June 2014 and in January 2015. The June 2014 mapping assessed the approved offset area. The January 2015 survey reviewed the area of Mountain Gum – Broad-leaf peppermint forest and surrounding vegetation to the south-west of the approved offset site that was added to the approved offset area. The mapping in this CHP has been updated to reflect the new information along with the minor boundary adjustments.

## 2.2 VALIDATION OF VEGETATION TO BE IMPACTED

### 2.2.1 Assessment tools

The most up to date vegetation mapping was used for the site. This included:

- updates to the original biodiversity assessment (BA; 2008) mapping, updated as part of the preparation of the Flora and Fauna Management Plan (2011)
- mapping of project impact areas in July 2014 (project field validation)

At the time of the field validation, a final infrastructure ('as built') layout was available and was used to assist with validation of permanent impacts. The extent of earthworks was well defined and at various stages of rehabilitation.

### 2.2.2 Field Assessment

#### Inspection points

Field work was undertaken from the 28 – 30 July 2014 by two field ecologists (a senior botanist and an ecologist). This timing was considered suitable for determining vegetation types and condition as defined by the Biometric methodology.

Not all areas of impact were inspected. The survey targeted infrastructure sites which:

- involved the clearing of woody vegetation
- contained vegetation known or likely to be derived from EECs
- had changed location since earlier surveys
- were not surveyed in detail during previous fieldwork.

Generally, areas mapped as non-native vegetation (exotic pasture) were not inspected in the field, although some areas were validated to ensure they were still exotic.

Thirty-six sites were inspected on the ground. Approximately 30 – 45 minutes was spent at each infrastructure site verifying and updating existing vegetation mapping and habitat types and condition within the development envelope.

#### Flora assessment

At each survey site, vegetation was characterised according to community (as defined in the original Biodiversity Assessment for the project), EEC status and condition. In view of the size of the study area and the confirmatory nature of the survey, a qualitative rapid assessment approach was adopted focusing on 3 key indicators of condition; structure, dominance of native species in the groundlayer and non-grass understorey species richness.

Structural formation was assessed at the hectare scale and the floristic survey used standardised 10 minute random meanders in undisturbed vegetation within 30 metres of the edge of the clearing. In most cases, the assignment of vegetation types follows the mapping provided in earlier assessments. Most sites found to be dominated by exotic pasture during previous fieldwork were not surveyed. Where two structural formations were present at the development site (e.g. grassland and woodland), the site has been allocated to the formation which is likely to have made up the majority of the area of the site.

### 2.2.3 Mapping and calculation of areas

At each survey site visited, the extent of clearing was mapped using a GPS and later uploaded onto an ArcPad tablet. Each turbine and hardstand was mapped as well as areas of disturbance around the hardstands, including cable trenches, cuttings and batters. Temporary impact areas including construction compounds and laydown areas were also mapped.

At representative sites, road and cable trench impact areas were measured using a tape measure and mapped using a GPS.

These areas were then extrapolated for use in any sites which were not inspected on the ground.

A spreadsheet was used to itemize and calculate the infrastructure footprint areas according to the vegetation types in which they occurred. This allowed a precise impact area to be calculated for the project according to vegetation type and condition. In determining the residual impacts of the project that are required to be offset, only permanent vegetation removal was considered including:

- Turbine footings
- Tracks (new and upgrades of existing)
- Substation and control buildings

In addition, where cable trenches, hardstands and construction compounds impact on woodland or forest (i.e. with an existing overstorey) or EEC derived grasslands this is also considered permanent habitat removal. Rehabilitation of these areas is not considered likely to be able to fully replace the biodiversity values lost by the removal of mature trees and native grassland, even where these impacts will be rehabilitated as part of the construction process.

Validated vegetation communities and their condition were mapped and the infrastructure layout overlaid utilising ArcGIS 10.0 to determine precise impact area within each vegetation type and condition category. Up to date Google imagery (which was captured post wind farm construction) was also used to cross-check impact areas.

## 2.3 DETERMINING THE OFFSET AREA

Guiding principles that were employed to define the offset included:

- A 'like for like' or 'like for better' offset. Areas were selected that provide like or better conservation values, in comparison to the areas being impacted. That is, vegetation of the same conservation status or greater conservation status (clearing of common vegetation type in a modified landscape offset with Endangered Ecological Communities or vegetation within more intact areas).
- Areas will be connected or, enhance landscape connectivity, as much as possible. This will reduce the degradation of edge effects as well as improve usage of the areas as corridors.

A broad envelope for selection of a potential offset site was identified early in the planning process at the Pomeroy site (refer to Figure 4.1), where extensive forest abuts the eastern edge of the project. Based on the results of field surveys undertaken as part of the Biodiversity Assessment for the project, the broader area was known to have generally high biodiversity values. It contains:

- Areas of EEC.
- A small community of a regionally uncommon plant, Argyle Apple (*Eucalyptus cinerea*).

- Diverse flora and fauna habitat (forested slopes and gullies, forest / pasture ecotone).
- Threatened fauna records and confirmed nesting sites (woodland birds, several microbats, Powerful Owl).
- A potential nesting site of the threatened Little Eagle.
- Habitat features of importance to threatened species (gullies, hollow-bearing trees).
- Moderately low level of human disturbance (interior area more intact than peripheral areas).
- An opportunity to enhance connectivity by protecting a habitat link.

Vegetation and habitat values were validated for the majority of this area, using the same methodology as for the impact areas in 2011. Additional validation was conducted in association with an OEH site visit in June 2014 specific to the northern areas of EEC. The currently proposed boundary of the offset site has been extended to the south and overall defined to achieve a:

- Minimum 2:1 offset ratio.
- 'Like for like' or 'like for better' offset, considering both vegetation type and fauna habitat values.

Further validation was conducted in February 2015 in the additional areas now included in the south-west of the offset site.

The eastern boundaries of the offset site are defined by the current project boundary and mark the limit of lands which are owned by the proponent. The previously identified Powerful Owl nest and roosting habitat is located about 400 metres south of the project boundary and beyond the offset area within a neighbouring property. However, the offset area does protect a significant area of foraging habitat for this species.

## 3 RESULTS

### 3.1 AREAS TO BE IMPACTED BY THE DEVELOPMENT

#### 3.1.1 *Vegetation communities to be impacted*

Five vegetation communities have been impacted by the development as well as areas of native and exotic dominated pasture. These communities are:

- Apple Box – Yellow Box Woodland
- Broad-leaf Peppermint – Brittle Gum Forest
- Mountain Gum – Broad-leaf Peppermint Forest
- Narrow leaf Peppermint Forest
- Scribbly Gum – Brittle Gum – Broad-leaf Peppermint Forest

These communities are described within the original Biodiversity Assessment, 2008. Within the site boundary, Apple Box – Yellow Box Woodland, Narrow-leaf Peppermint Forest and some occurrences of Mountain Gum – Broad-leaf Peppermint Forest are included within definitions of Endangered Ecological Communities (EEC's) however, the areas of Mountain Gum – Broad-leaf Peppermint Forest that were impacted by the proposal are not considered to comprise an EEC.

Most vegetation types, excluding exotic pasture, were considered to be in moderate to good condition according to the Biometric guidelines. One turbine site (POM 11) was determined to be Apple Box – Yellow Box Grassy Woodland, in Low condition.

### 3.1.2 Validated impact area

A total of 34.21 hectares of vegetation has been permanently impacted by the development. 68% of the vegetation impacted was either exotic pasture (11.33 ha) or native pasture (11.79 ha). however, approximately 11.09 hectares of woodland/forest and derived grassland has been impacted including 3.36 hectares of Apple Box – Yellow Box Grassy Woodland and 4.27 hectares of Narrow-leaf Peppermint Moist Forest (both EECs) (Table 3-1).

The impacted vegetation is summarized in Table 3-1 below and is quantified in respect of the components of the project in Table 3-1.

Table 3-1 Summary of areas of vegetation impacted by the by the development

Vegetation type	Area removed	Percentage of total vegetation impacted
Exotic pasture	11.33	33
Native Pasture	11.79	34.5
Apple Box Yellow Box Woodland and derived grassland	3.36	10
Broad-leaf Peppermint- Brittle Gum Forest	1.49	4
Mountain Gum-Broad-leaf Peppermint Forest	1.02	3
Narrow-leaf Peppermint Forest and derived grassland	4.27	12.5
Scribbly Gum-Brittle Gum-Broad-leaf Peppermint Forest	0.95	3
<b>Total</b>	<b>34.21</b>	<b>100</b>

In comparison to earlier estimates, the clearing impact has increased by 13.75 hectares. The increase is due to two main factors:

- In the original Biodiversity Assessment (2008) for the project, native pasture was not included as a vegetation type requiring offsets. As a precautionary approach and to ensure that impacts to vegetation of conservation significance (as defined by the current NSW Scientific Committee determinations) are adequately compensated for this validation has included those pastures that now qualify as grasslands derived from EEC vegetation.
- Temporary impacts, where they occur in EEC, woodland or forest areas have been included in the permanent impact calculations.

These changes to the way the clearing is calculated demonstrate a commitment to ensuring that the actual impacts of the project are compensated for and are considered justified in the context of current EEC definitions and the ability to restore temporary impacts to their pre-development state. While it increases the offset requirement, they are considered in keeping with current expectations for the project.



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### 3.1.3 Fauna habitat values

#### Moist forest

Snow Gum or Ribbon Gum Forest, Narrow-leaf Peppermint Forest and Mountain Gum – Broad-leaf Peppermint Forest are moist forest types and are dominant at Kialla and Bannister sites, where they occur as fragments with moderate habitat connectivity. Across the landscape, this habitat type occurs as isolated clusters of stepping stones (patches of vegetation) mostly associated with drainage lines. Patch size is up to several hectares. The forest is mostly regrowth with scattered mature trees and a low abundance of hollows. The moist forest has a diverse habitat structure and microhabitat types include dense shrubbery, mistletoe and patches of bracken. Native fauna associated with this area include macropods, Common Wombat (*Vombatus ursinus*), and birds such as Buff-rumped Thornbills (*Acanthiza reguloides*), Superb Fairy-wren (*Malurus cyaneus*) and Grey Fantail (*Rhipidura fuliginosa*). Most fauna that use the moist forest would also utilise the surrounding dry forest and woodland matrix.

#### Dry forest

Pomeroy and Gurrundah are dominated by dry forest types, with moist forest in deep gullies. These are the Broad-leaf Peppermint – Brittle Gum Dry Forest and Scribbly Gum – Brittle Gum – Broad-leaf Peppermint Dry forest communities. The dry forest across the sites is fairly homogenous in canopy structure but mid and understorey stratum varies considerably. Most dry forest is regrowth with clusters of mature and hollow-bearing trees in the gullies and lower parts of steep slopes. The understorey varies from grassy and open on ridgelines and exposed slopes though to dense with shrubs such as Dogwood on sheltered slopes. The ground is mostly rocky with thin soils. Some patches are devoid of fallen timber while other areas have a high abundance of small and large logs, twigs and litter. The dry forest at Pomeroy is well connected, with a very large extent of vegetation to the west and habitat connectivity afforded via stepping stones, woodland and paddock tree matrix and linear corridors. There is a low level of disturbance in the core of the forest, with disturbance levels including grazing pressure and past clearing increasing toward the periphery of the forest. Fauna species observed include Wallaroo (*Macropus robustus*), White-eared Honeyeater (*Lichenostomus leucotis*), Mistletoebird (*Dicaeum hirundinaceum*), Powerful Owl (*Ninox strenua*) and nesting Wedge-tailed Eagles (*Aquila audax*).

#### Open woodland

Apple Box – Yellow Box Grassy Woodland occurs as fragments along the edges of forest at the southern sites, between forest and cleared land or native pasture. Here the woodland serves an important habitat corridor function, providing a level of connectivity between forest fragments. The woodland areas have a history of disturbance including current and past grazing and clearing. These areas generally have an open understorey, grassy ground cover and low abundance of fallen timber. The overstorey consists mostly of remnant trees although few bear hollows. Microhabitat includes grassy tussocks (including Serrated Tussock *Nassella trichotoma*), open perching areas, scattered hollow-bearing trees and dead wood and dams. Native fauna observed include Brown Quail (*Coturnix australis*), Eastern Grey Kangaroo (*Macropus giganteus*) and Eastern Rosella (*Platycercus eximius*).

#### Native pasture

Areas of native pasture with scattered mature and regrowth trees occur in the northern part of the site such as Bannister. Native pasture with scattered trees provides a linking habitat matrix between areas of forest. Microhabitats include grassy tussocks (including *Poa* spp.), open perching and foraging areas and

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dams. Native pasture provides habitat for a range of species including foraging Wedge-tailed Eagles, Australian Magpie (*Gymnorhina tibicen*), Welcome Swallow (*Hirundo neoxena*), robins (*Petroica* spp.) and finches. Native pasture may also provide habitat for reptiles.

### 3.2 AREAS TO BE PROTECTED AT THE OFFSET SITE

An initial broad area was nominated from which a suitable offset site could be selected. The broad area extended to lands beyond the project area and consists of a large area of continuous treed vegetation (approximately 314ha, Figure 4.1) and six vegetation communities that include:

- Apple Box – Yellow Box Woodland
- Broad-leaf Peppermint – Brittle Gum Forest
- Mountain Gum – Broad-leaf Peppermint Moist Forest
- Snow Gum or Ribbon Gum Moist Forest
- Scribbly Gum-Brittle Gum-Broadleaf Peppermint Forest
- An area dominated by Argyle Apple

The majority of the vegetation is in moderate to good condition according to the biometric guidelines and the area is known to provide habitat for threatened fauna species. To achieve the required 2:1 ratio required at the offset site only a small proportion of this area (approximately 68.42 hectares) is required.

The proposed offset site (see Figure 4.1) has been selected based on its ability to provide biodiversity outcomes that meet the requirements of the approval conditions for the project. This was able to be accommodated within the project boundary. In total, the proposed offset site comprises approximately 125 hectares of mostly forest or woodland vegetation including:

- Approximately 28.13 hectares of Apple Box – Yellow Box Woodland (EEC)
- Approximately 4.48 hectares of Apple Box – Yellow Box Woodland Derived Grassland (EEC)
- Approximately 83.59 hectares of Broad-leaf Peppermint – Brittle Gum Forest
- Approximately 5.51 hectares of Mountain Gum – Broad-leaf peppermint Forest (EEC)
- Approximately 1.22 hectares of Ribbon Gum Forest
- Approximately 2.09 hectares of exotic dominated derived grassland

The current condition of these vegetation types within the offset site is discussed in the sections below and mapped on Figure 3-2. The condition of each area will be further verified during the collection of baseline data to be used for monitoring status of the PVP over time. The proposed offset site also contains the heads of several gullies from which unnamed creeks traverse the site, generally from north to south (refer Figure 3-2) and are part of the Wollondilly River Catchment.

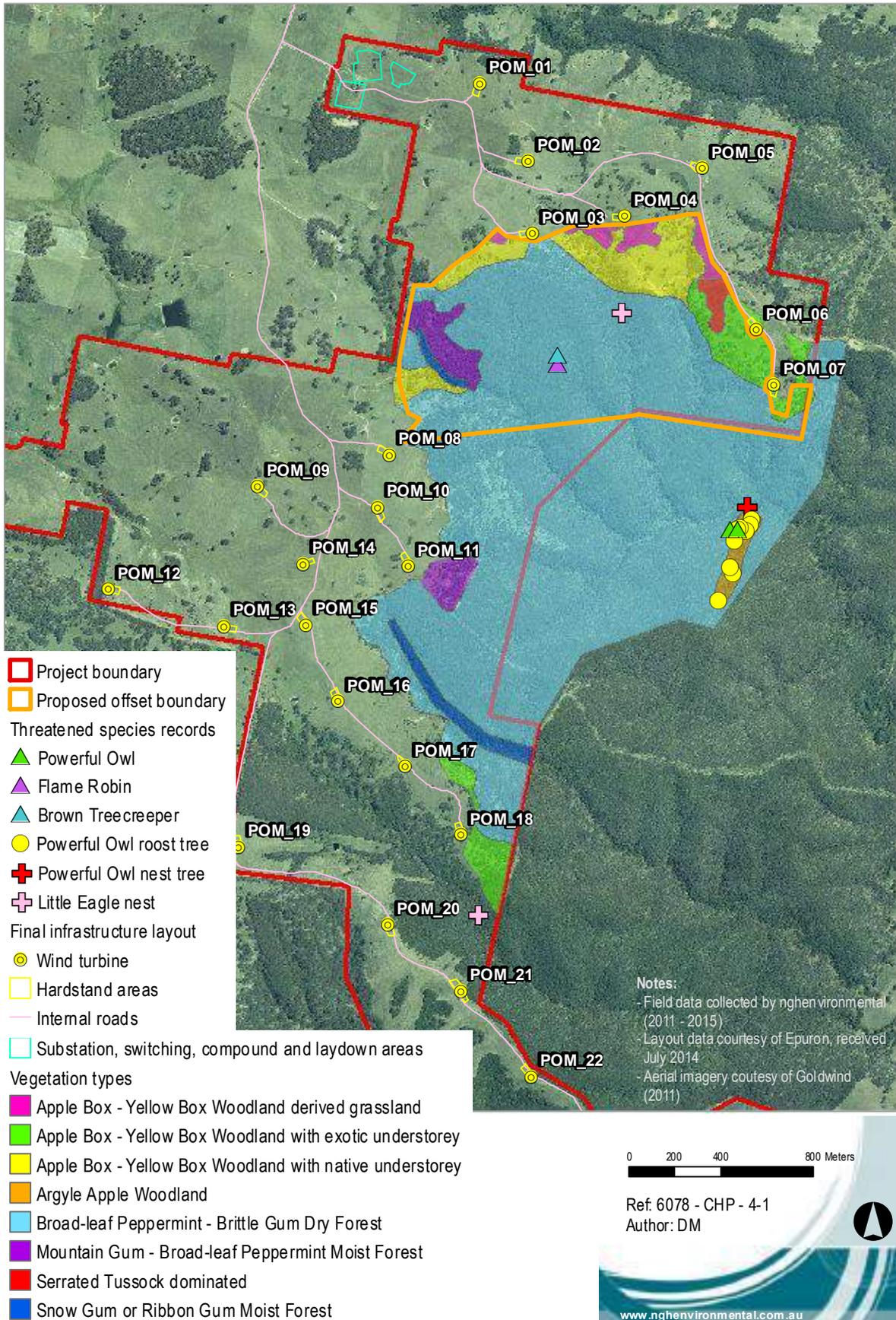


Figure 3-1 Vegetation types within the designated offset area and proposed offset site

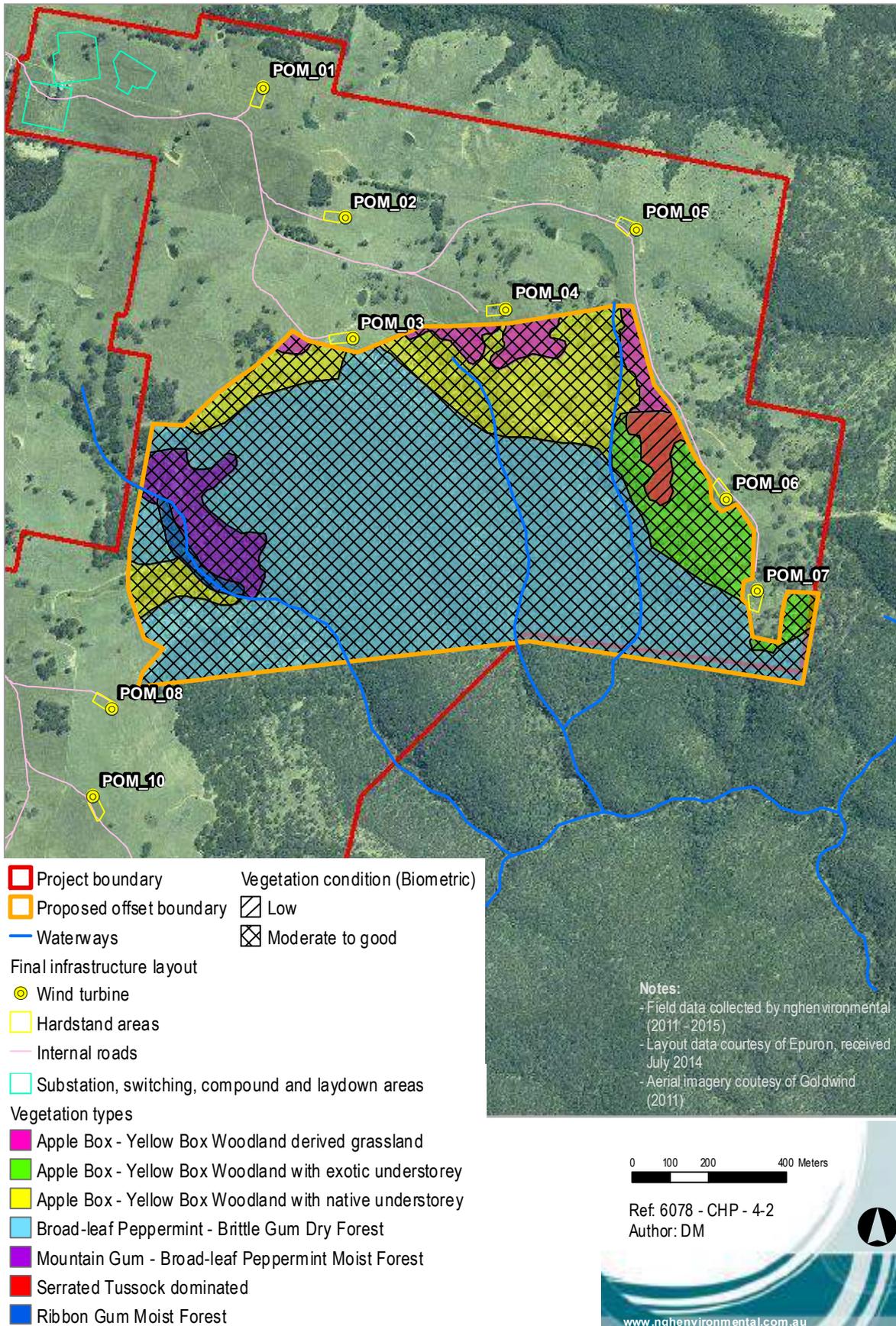


Figure 3-2 Vegetation types and condition within the proposed offset site

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### 3.2.1 Vegetation communities to be offset

#### Apple Box – Yellow Box Woodland EEC and Derived Grassland

The Apple Box – Yellow Box Woodland within the offset site has been subject to varying levels of disturbance mostly due to past clearing and ongoing grazing. An overstorey comprised of Apple Box (*Eucalyptus bridgesiana*) and Yellow Box (*E. melliodora*) is present across the mapped area. In the section of the site west of the unnamed creek, active regeneration of the overstorey is occurring (Figure 3-3). The understorey is predominately comprised of native grasses such as *Poa* spp., Weeping Grass (*Microlaena stipoides*), Red-leg Grass (*Bothriochloa macra*) and Corkscrew Grass (*Austrostipa scabra* subsp. *falcata*) although native forb diversity is very low. The noxious weed, Serrated Tussock (*Nassella trichotoma*) is widespread in adjacent pastures and is present as scattered plants and localized denser patches throughout the western section. The vegetation in this area would be considered to be in moderate to good condition according to the Biometric condition classes both due to percent overstorey cover and the presence of a predominately native understorey.



Figure 3-3 Apple Box – Yellow Box Woodland and derived grassland in the west of the offset site with evidence of overstorey regeneration (right)

To the east of the unnamed creek, serrated tussock becomes more prevalent in the understorey and is dominant south of the existing track to the west of turbines POM\_06 and POM\_07 (refer to map in Figure 3-2 and Figure 3-4). There is no evidence of overstorey regeneration in this area and native grasses and forbs are largely absent. Approximately 9 hectares of the Apple Box – Yellow Box Woodland within the offset area has an understorey dominated by Serrated Tussock, however, given the amount of overstorey cover in the treed areas, it would still be considered to be in moderate to good condition according to the Biometric condition classes.



Figure 3-4 Serrated Tussock to the south of the existing track (left) and dominating the understorey west of POM\_06 (right).

Some degree of forb diversity was evident in the area south of turbine POM\_07 (Figure 3-5). Common species such as *Geranium solanderi*, *Acaena ovina* and *Viola betonicifolia* were present. Serrated Tussock was also prevalent in this area and native grasses largely absent during the 2014 survey however, this is considered likely to be a result of recent attempts to control the Serrated Tussock in the area in which it appeared that a broad application of a grass specific herbicide had been used.



Figure 3-5 Apple Box – Yellow Box Woodland south of POM\_07.

An area of approximately 2.23 hectares of Apple Box – Yellow Box Woodland occurs in the south-west of the proposed offset site (Figure 3-6). Grazing pressure appears to be lower in this area and scattered regeneration of Yellow Box was observed. The understorey is variable dominated by Kangaroo Grass (*Themeda australis*) and Snow Grass (*Poa sieberiana* var. *sieberiana*) with a moderate diversity of native forbs including Native Dock (*Rumex brownii*), Kidney Weed (*Dichondra repens*), Sheeps Burr (*Acaena echinata*), Common Woodruff (*Asperula conferta*) and Raspwort (*Gonocarpus tetragynus*). Serrated tussock occurs in low densities within this area but its distribution is patchy and confined to areas where the overstorey is more open.



Figure 3-6 Apple Box – Yellow Box Woodland in the south-west of the proposed offset site.

The Apple Box – Yellow Box vegetation at the offset site meets the definition of the White Box - Yellow Box - Blakely’s Red Gum Woodland Endangered Ecological Community (EEC) listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act).

#### Broad-leaf Peppermint – Brittle Gum Forest

The majority of the Broad-leaf Peppermint – Brittle Gum Forest within the offset site is relatively undisturbed. A continuous canopy of Broad-leaf Peppermint (*Eucalyptus dives*) and Brittle Gum (*E. mannifera*) typical of this community is present over a predominately native midstorey and understorey. Serrated Tussock is present along the margins of the community where it borders the Apple Box – Yellow Box Woodland particularly in the eastern section of the offset site however, it did not appear to penetrate into areas where the canopy was continuous (Figure 3-7).

A mixed age class of trees is present however, mostly trees are younger regrowth. The Broad-leaf Peppermint – Brittle Gum Forest within the offset site would be considered to be in moderate to good condition according to the Biometric condition classes both due to percent overstorey cover and the presence of a predominately native understorey.

This community is not considered to comprise an EEC.



Figure 3-7 The Broad-leaf Peppermint – Brittle Gum Forest boundary within the offset site

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## Mountain Gum – Broad-leaf Peppermint Forest

This community occurs in the west of the proposed offset site (Figure 3-8). The overstorey is dominated by Mountain Gum (*Eucalyptus dalrympleana*) and Broad-leaf Peppermint with a variable component of Apple Box. Hickory Wattle (*Acacia falcata*) is a common small tree in the east of the community. Common shrubs include Sifton Bush (*Cassinia arcuata*), Urn Heath (*Melichrus urceolatus*) and Grey Guinea Flower (*Hibbertia obtusifolia*). A generally grassy groundcover is present dominated by species including Kangaroo Grass, Wallaby Grasses and Snow Grasses. A high diversity of native forbs is present.

Exotic species are generally sparse with occasional Cat's Ear (*\*Hypochaeris radicata*) and Common Centaury (*\*Centaureum erythraea*) most abundant. Sweet Vernal Grass (*\*Anthoxanthum odoratum*) is present in patches.



Figure 3-8 Mountain Gum – Broad-leaf Peppermint in the west of the proposed offset site

Serrated Tussock is generally absent from the area occupied by this community with the exception of a more open patch on an upper flat where Apple Box is the sole dominant species. Here, likely due to the more open canopy, Serrated Tussock dominates the groundcover (Figure 3-9) however, a good diversity of native forbs and shrubs still persists in the inter-tussock spaces.



Figure 3-9 Area within the Mountain Gum – Broad-leaf Peppermint community with a Serrated Tussock dominated understory.

The Mountain Gum – Broad-leaf Peppermint Forest within the offset site was largely comprised of younger regrowth with occasional more mature trees. It would be considered to be in moderate to good condition

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according to the Biometric condition classes, due to the presence of a predominately native understorey and/or percent overstorey cover. The community appeared to be confined to areas containing underlying Basalt.

This community is considered to comprise the Tablelands Basalt Forest EEC listed under the TSC Act.

### Ribbon Gum Forest

This community occurs along the unnamed drainage line in the south-west of the proposed offset site and occupies a stretch of approximately 350 metres where the adjacent slopes are relatively steep (Figure 3-10). The overstorey is dominated by Ribbon Gum (*Eucalyptus viminalis*) with *Acacia* spp. common as small trees. The shrub layer is largely comprised of *Cassinia* spp. with large patches of the noxious weed Blackberry (*\*Rubus fruticosus* sp. agg.) also present. The groundcover is largely dominated by Bracken Fern (*Pteridium esculentum*) with other common native species including Snow Grass, *Geranium solanderi*, Bidgee Widgee (*Acaena novae-zelandiae*), Prickly Starwort (*Stellaria pungens*), Maidenhair Fern (*Adiantum aethiopicum*) and Forest Hedgehog Grass (*Echinopogon ovatus*). Exotic groundcover species are also widespread and include common weed species such as Cocksfoot (*\*Dactylis glomerata*), Sheeps Burnett (*Sanguisorba minor*) and Cat' Ear.



Figure 3-10 Ribbon Gum Forest and dense areas of Blackberry within the proposed offset site

Large mature Ribbon Gum trees are common within the Ribbon Gum Forest. The vegetation would be considered to be in moderate to good condition according to the Biometric condition classes, due to percent overstorey cover. Percent native cover in the understorey is variable depending on the degree of invasion by exotic species.

This community could be considered to form part of the Tablelands Basalt Forest EEC listed under the TSC Act at the site.

## 3.3 SUITABILITY OF THE PROPOSED OFFSET SITE TO MEET THE OBJECTIVES

### 3.3.1 Offset ratios

A total of approximately 22.88 hectares of native vegetation has been permanently removed by the development of the wind farm. Approximately 122.93 hectares of native vegetation will be protected at the offset site resulting in a ratio of 5.4:1. This exceeds the 2:1 ratio required however, it does not completely satisfy the requirements of a “like for like” offset. Only three vegetation communities that will

be impacted occur within the offset site whereas five vegetation communities plus areas of native pasture will be permanently impacted by the development (refer Table 3-3 below).

Table 3-3 Areas by vegetation type impacted by the development and offset at the offset site

Vegetation type	Area impacted	Area offset	Ratio
Apple Box - Yellow Box Woodland (and derived grassland)	3.36	32.61	9.7
Broad-leaf Peppermint- Brittle Gum Forest	1.49	83.59	56.1
Mountain Gum-Broad-leaf Peppermint Forest	1.02	5.51	5.4
Narrow-leaf Peppermint Forest (and derived grassland)	4.27	0	0
Scribbly Gum-Brittle Gum-Broad-leaf Peppermint Forest	0.95	0	0
Ribbon Gum	0	1.22	NA
Native Pasture (not Apple Box – Yellow Box Woodland derived)	11.79	0	0
<b>Total</b>	<b>22.88</b>	<b>122.93</b>	<b>5.4</b>

The three native vegetation communities that are impacted by the development and represented within offset site have high offset ratios, 9.7 : 1 for Apple Box – Yellow Box Woodland, 5.4 : 1 for Mountain Gum – Broad-leaf Peppermint Forest and 56.1 : 1 for Broad-leaf Peppermint – Brittle Gum Forest, well exceeding the general 2:1 offset requirement. The vast majority of permanent impact to native vegetation occurred within native dominated (non-EEC derived) pasture which has little conservation value and does not occur within the offset site. Areas of forested vegetation (not including derived grassland) that were permanently removed only total 3.1 hectares. It is considered that the generous ratios of the communities within the offset site compensate for the small areas to be impacted in those communities that aren't contained within the offset site. Also, given the total area to be offset exceeds the 2:1 requirement of the total area to be impacted and that the majority of vegetation that has been impacted is of low conservation value (native pasture) the offset site is considered to satisfy the 2:1 offset ratio requirement.

### 3.3.2 Conservation values

#### Flora

The offset site contains approximately 28.13 hectares of Apple Box – Yellow Box Woodland and (4.48ha) derived grassland an EEC listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act). Compared to the relatively small amount (3.36 ha) of this community that has been permanently impacted by the proposal this represents a positive conservation outcome for this community. The area to be protected represents the largest occurrence of this community within the site boundary. The majority (19.21 ha) is in reasonable condition with an intact overstorey and mostly native understorey (although with a low forb diversity and scattered patches of exotics). By protecting this area and employing the management measures recommended in Section 4.5, the biodiversity values of this area will be enhanced.

It is acknowledged that approximately 11 hectares of the offset site is currently heavily infested with Serrated Tussock. Of this 11 hectares approximately 9 hectares has an Apple Box – Yellow Box overstorey of sufficient density to be considered the Box-Gum Woodland EEC in moderate to good condition according to the Biometric definitions. With intense management including ongoing weed control and re-vegetation

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works, it is considered likely that over time this area can be rehabilitated resulting in the removal of a declared noxious weed and restoration of a mostly native understorey. Mature trees are present in this area and with appropriate management including the exclusion of grazing, it is likely that natural regeneration of the overstorey will occur. This could be assisted with plantings. Appropriate management measures specific to this area have been recommended in Section 4.5.

With the implementation of these measures over the long-term it is considered that a “maintain or improve” outcome for the Apple Box – Yellow Box Woodland EEC can be achieved.

Approximately 4.27 hectares of Narrow-leaf Peppermint Forest and derived grassland which is listed as Tablelands Basalt Forest under the TSC Act have been permanently removed by the development. The Narrow-leaf Peppermint vegetation type is not present within the offset site. The offset therefore fails to provide a “like for like” offset with regard to this vegetation type however, the Mountain Gum – Broad-leaf Peppermint Forest within the proposed offset site is considered to meet the definition of the Tablelands Basalt EEC as it occurs on Basalt, is of suitable structure, and contains species that are diagnostic of the EEC. The Ribbon Gum Forest within the offset site could also be considered to fall within the definition of the EEC. As such the offset is considered to provide a ‘like for like’ offset with regards to the Tablelands Basalt Forest EEC offsetting the impacts of the proposal at a ratio of 1.6 : 1.

It is acknowledged that a ratio of 2 : 1 is not met for Tablelands Basalt Forest EEC. However, a relatively large area of Apple Box – Yellow Box Woodland and derived grassland is to be conserved (32.61 hectares) in the offset site, compared to the total area (7.63 ha) of mostly degraded EEC (Box Gum Woodland and Tablelands Basalt Forest) to be permanently removed by the development (a 4.2 : 1 ratio). The Tablelands Basalt Forest EEC to be impacted is predominately comprised of actively grazed low diversity derived grasslands (4.27 ha) whereas a mature overstorey is present over the majority of the Box Gum Woodland and Tablelands Basalt Forest EEC within the offset site. With active management over time, the offset is considered likely to provide a ‘like for better’ conservation outcome. Further, the proposed offset site provides one consolidated area of vegetation which will minimise edge effects and maximise management outcomes. This also provides a ‘like for better’ outcome as areas to be impacted by the development are fragmented and vulnerable to further degradation.

## Fauna

The habitat to be cleared represents small portions over a large area. Therefore it is difficult to compare directly the value of what would be lost to the value of what would be offset. The primary concern with clearing for the proposal is not the quantity of direct loss of habitat *per se*, but the impact such loss may have on landscape and habitat connectivity. Habitat connectivity affects the ability for fauna to utilise available habitat to the fullest extent and maintain viable populations. Therefore in considering the suitability of the proposed offset site, its’ role in connectivity and the strategic benefit of its conservation must be considered.

Within the context of surrounding forest, the proposed offset site would protect the extant connectivity between forest areas to the north, south and west. That is, it would maintain the existing biodiversity values. This linking habitat provides valuable stepping stones and a paddock tree matrix which allows fauna to move between forest areas. Long-term protection will aid foraging of sedentary species such as Powerful Owls and migration of nomadic and migratory species such as Scarlet Robins (*Petroica multicolor*).

With regard to the habitat value of the proposed offset site, the site does capture relatively diverse and good quality habitat for species such as robins and (potentially) threatened reptiles. Flame Robins (*Petroica phoenicea*) are known to utilise the open woodland, forest and grassland matrix and it is likely that Scarlet Robins would also utilise these habitats. Both are listed as vulnerable under the TSC Act. The Brown

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Treecreeper (*Climacteris picumnus victoriae*) is also listed as Vulnerable under the TSC Act and is known to occur within the offset site. Conservation of this habitat in perpetuity would assist these and other potentially occurring threatened species with small home ranges, such as Varied Sittella (*Daphoenositta chrysoptera*).

For wide-ranging fauna species such as Powerful Owl and Little Eagle (both listed as Vulnerable under the TSC Act), Wedge-tailed Eagle, Wallaroo and others, the conservation of around 120 hectares of woodland will make little difference to long-term population viability. The proposed offset site does not capture the most diverse fauna habitat with the highest ecological integrity but fortunately, no such patch would be affected by the proposal. The offset site does however, protect a known nesting site attributed to the Little Eagle<sup>2</sup> and provides a managed buffer between the development and agricultural lands and known nesting and roosting habitat for the Powerful Owl. Long-term management of the offset site will provide flow on benefits for the Powerful Owl by limiting potential encroachment on important habitat (from either direct or indirect impacts) and reducing impacts from feral species which in turn may promote healthier populations of prey species.

Overall, conservation of any continuous area of forest or woodland in an agricultural setting is an improved outcome for biodiversity values. In many threatened species recovery plans, threat abatement strategies and priority actions identified by OEH, off-reserve conservation is a key tool for long-term biodiversity conservation.

### 3.3.3 Suitability of the offset site: summary

The proposed offset site has been selected based on its ability to provide biodiversity outcomes that meet the requirements of the approval conditions for the project. Its suitability is demonstrated above.

The proposed offset site provides good conservation outcomes in terms of providing and protecting habitat for species and communities of conservation significance and protecting a valuable habitat link in a highly fragmented landscape. The overall offset ratio of 5.4 : 1 exceeds the required 2:1 ratio and although a 'like for like' offset is not fully achieved for some vegetation types, the site is considered to provide a 'like for better' offset for communities and species of conservation significance. This is due to the large areas of EEC and continuous forest/woodland habitat (providing known threatened species habitat) to be protected, in comparison to the values of the areas being impacted which are primarily pasture (native and exotic) with low conservation significance.

There are areas of the proposed offset site that would benefit from long-term management and it is considered likely that the condition of these disturbed and degraded areas can be improved over time increasing the biodiversity value of the site in the long-term. Along with these areas, the areas that already contain high biodiversity values will be protected in perpetuity.

## 3.4 SECURING THE SITE IN PERPETUITY

A formal vehicle is required to secure the offset site in perpetuity and allow for the ongoing management of the offset site (including how the designated management actions will be funded). Four options were considered for securing a long-term management arrangement at the offset site:

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<sup>2</sup> The nest was identified as that of Little Eagle by John Young in 2011. The species has not been sighted utilising the nest.

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1. Biobanking agreement
  2. Conservation Property Vegetation Plan (CPVP)
  3. Local Environmental Plan: Environmental Zone
  4. Plan of management with S.88b covenant

The benefits of each of these options were assessed. Based on the duration and security of the agreement (in perpetuity and attached to title) and the relative simplicity of establishment, a CPVP was decided upon as the vehicle to secure the offset site.

The local Catchment Management Authority has been previously contacted to set up a Conservation Property Vegetation Plan (CPVP) for the site. The CPVP would:

- Stipulate land title details and management zones (see section 3.5)
- Stipulate the management actions, for each zone, that must be carried out to improve the site.
- Disallow any activities that adversely impact on the objective of the site which is to improve biodiversity values.

The CPVP will be a legally binding agreement under both the Native Vegetation Act 2003 and the Threatened Species Conservation Act 1995. To ensure that the CPVP is binding on successors in title, an abstract of the CPVP will be registered with the NSW Office of Land and Property Information under the *Real Property Act 1900*. The terms of the CPVP will not be affected by any changes to local or state planning rules or new listings of threatened species. A CPVP can be varied at the landholder's request, provided the variation will still improve or maintain environmental outcomes.

The offset site and the property on which it is located are both owned by New Gullen Range Wind Farm Pty Ltd. The CPVP's management prescriptions will affect only the offset site (delineated in orange on Figure 4-1).

As the CPVP is attached to the land title, the land owners are ultimately responsible for funding the management actions required at the offset site and monitoring the effectiveness of their implementation. The CPVP will include management actions associated with the offset site that will apply in perpetuity. These management actions will be applied in consultation with the Office of Environment and Heritage and be consistent with recommendations as detailed in Section 3.5. Funds would be made available by New Gullen Range Wind Farm Pty Ltd to implement management measures as the owners of the land.

### 3.5 SUGGESTED MANAGEMENT MEASURES

The offset site contains different vegetation types and areas that has been subject to varying levels of disturbance. As such it is recommended that the site be divided into five separate management zones which will allow management measures to be targeted to the characteristics of each zone. These zones are described in Table 3-4 and shown on Figure 3-11.

Table 3-4 Proposed management zones within the offset site

Management Zone	Description
<b>Zone 1</b>	Apple Box – Yellow Box Woodland with a predominately low diversity native understorey and evidence of overstorey regeneration. The area has been previously thinned for grazing. Serrated Tussock occurs in patches and as scattered individuals throughout the zone.
<b>Zone 2</b>	Apple Box – Yellow Box Woodland with a predominately exotic understorey dominated by Serrated Tussock. There is no evidence of overstorey regeneration. The area has been previously thinned for grazing.
<b>Zone 3</b>	Predominately regrowth Broad-leaved Peppermint – Brittle Gum Dry Forest and Mountain Gum – broad-leaf Peppermint Forest with a relatively intact diverse native understorey. Serrated Tussock occurs at the boundary of the Broad-leaved Peppermint – Brittle Gum Dry Forest and the Apple Box – Yellow Box Woodland but does not penetrate into areas with a dense overstorey.
<b>Zone 4</b>	Ribbon Gum Forest with a mixed native and exotic understorey. Blackberry is extensive in this area.
<b>Zone 5</b>	Localised Apple Box dominated area where an more open canopy has facilitated the invasion of Serrated Tussock

The overall objective in managing the offset site is to ‘maintain or improve’ its condition – no loss of value. It is recommended that a detailed CPVP be prepared in consultation with OEH to identify appropriate measures, which will enable the objective of ‘maintain or improve’ to be measured, quantified and verified.

The plan should outline:

- a. The objectives of the offset land, in particular the objectives of the management regime to be implemented on the land
- b. Management response actions associated with particular scenarios, such as fire damage, pest control, unexpected weed invasion, vandalism etc.
- c. Details of how the management measures address the objectives, and details of any monitoring that is required to measure the success or otherwise of the management plan. A key measure would be to undertake a detailed survey of the proposed conservation area, following endorsement of the CPVP and prior to the implementation of the management plan, to provide a benchmark for determining whether the objective of ‘maintain or improve’ is being achieved, relative to the those management measures/actions identified in the plan.

A range of management strategies could be taken to managing the offset site. A set of management actions appropriate to the proposed offset site have been formulated below considering:

- The conditions of approval for the project.
- Existing biodiversity threats identified onsite.
- Specific threats identified in recovery plans for relevant threatened entity listings.
- The OEH *Principles for the use of biodiversity offsets in NSW*.
- Indicated concerns of OEH as set out in the recommended conditions of approval.

The following table sets out the aim of each measure, the management zones in which it applies, the rationale for undertaking it at the site and an auditable measure of its implementation. Recommended methods for monitoring the success of management measures with respect to achieving a ‘maintain or improve’ objective are also included.

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Appendix B takes the recommended management actions for the offset site and provides them as a series of practical actions, able to be audited and adapted in response to what is observed at the offset site. The plan is formatted as a **quarterly checklist** and **annual review** so that a record of actions and useful notes on their effectiveness can be retained.

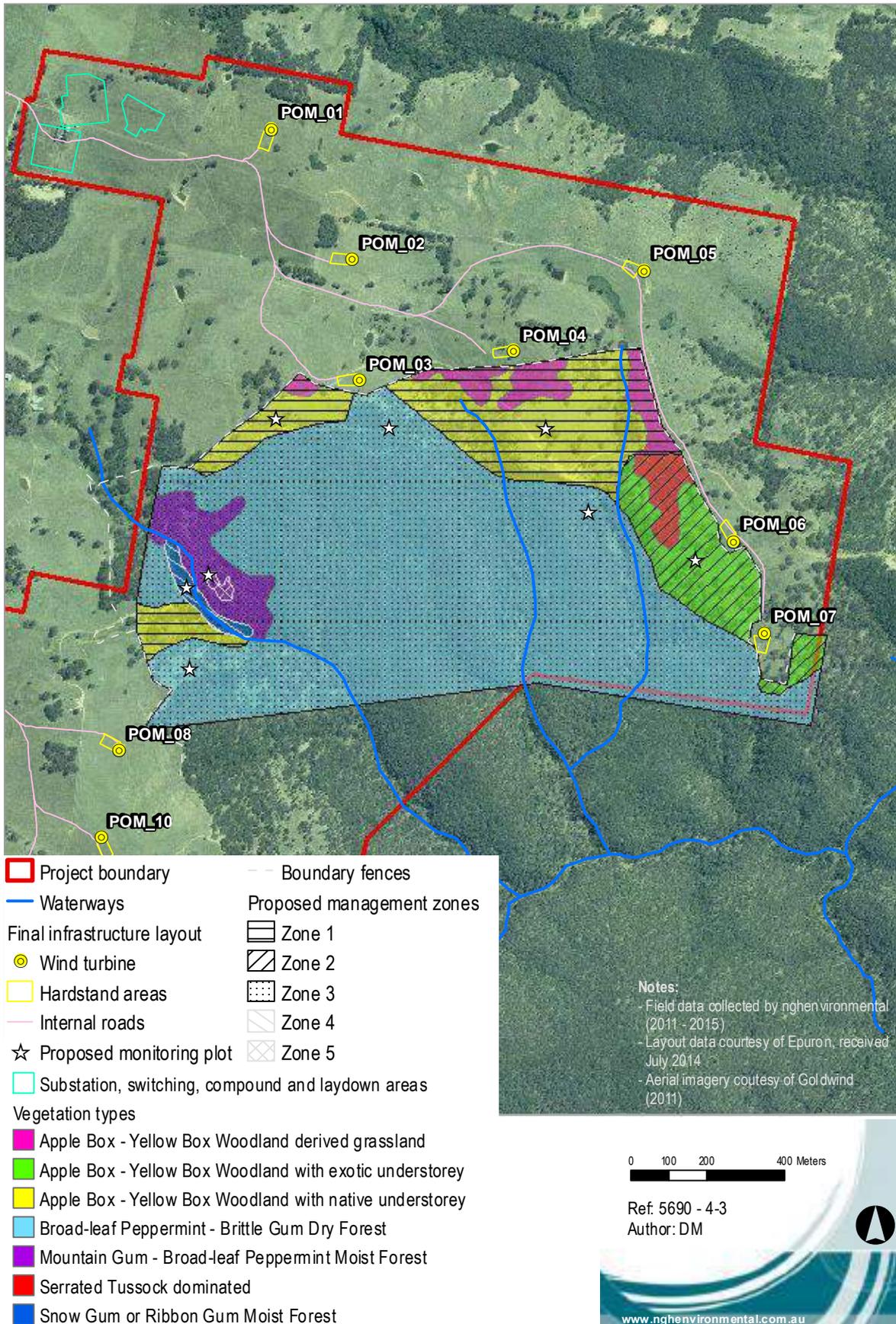


Figure 3-11 Proposed management zones and monitoring plot locations within the offset site

Table 3-5 Management measures required for the offset site

Aim	Rationale	Applicable management zones	Auditable measure
<b>AT ESTABLISHMENT OF OFFSET SITE</b>			
Develop a detailed management plan to guide and record management actions.	This will be required to clearly set out actions, guide their implementation (including co-coordinating with land holders where required) and should be used as working document to record actions undertaken and any issues that could be modified. This will be in the form of a CPVP.	Zone 1, 2, 3, 4 and 5	Completed and registered CPVP (the measures below can be documented within this plan).
Encourage existing actions that are leading to improvement of the areas.	The majority of the proposed offset site consists of intact woody vegetation. Although there are breaches in fencing, it is likely this area has not been subject to high grazing pressure. The ongoing prevention of grazing in this area is recommended. Fencing of the entire offset area is not recommended due to the potential to fragment an existing intact forest remnant. To achieve the aim of stock exclusion, fencing is only considered to be necessary where the offset site adjoins cleared pastures. Within the forest vegetation, survey pegs would be located sufficient to visually identify the boundary.	Zone 1, 2, 3, 4 and 5	Stock-proof fencing of the offset site installed and maintained for the areas as shown in Figure 3-11.
Establish baseline vegetation and habitat condition data	To demonstrate that a “maintain or improve” objective is being achieved at the offset site, it is necessary to collect data which categorises the condition of the offset prior to establishment. It is recommended that a repeatable method of data collection that provides quantifiable data be used such as Biometric plots. This would involve the establishment of permanently marked transects and quadrats within each management zone. The data collected would enable the calculation of a site value score which, along with the data collected for each individual variable, can be compared to benchmark data held by the OEH for the relevant vegetation type and could easily be compared across years. It is suggested that at least two plots be established in Zone 1, three plots in Zone 3 and one plot each in Zone 3, 4 and 5 as indicated on Figure 3-11.	Zone 1, 2, 3, 4 and 5	Permanently marked Biometric plots established.  Baseline data collected prior to the implementation of management actions.

Aim	Rationale	Applicable management zones	Auditable measure
<b>ONGOING GENERAL MANAGEMENT MEASURES</b>			
<b>Target identified threats to biodiversity:</b>			
<ul style="list-style-type: none"> <li><b>Invasion by exotic perennial grass</b></li> </ul>	<p>The majority of the areas targeted for offset have not been ‘improved’ or intensely managed. Other potential areas have been subject to high levels of disturbance. Weed monitoring and eradication (particularly targeting exotic perennial grasses and noxious weeds) would be undertaken within and on the periphery of the site with the aim of reducing weed abundance on the offset site and protecting it from invasion from adjacent sites.</p> <p>A Weed Management Plan would be prepared for the offset site in consultation with the land owner and qualified weed control personnel (e.g. Local council or NSW Local Land Services) Control measures implemented would be targeted and would not include broad acre applications of herbicide such as boom or aerial spraying. Suitable measures would include:</p> <ul style="list-style-type: none"> <li>Spot spraying target species using a hand held device</li> <li>Physical removal by hand</li> <li>Any other methods recommended by a weed control expert and agreed in consultation with OEH</li> </ul>	Zone 1, 2, 3, 4 and 5	<p>Weed Management Plan incorporating suitable measures prepared and implemented.</p> <p>Weed monitoring completed seasonally.</p> <p>Weed treatments consistent with Weed Control Plan. Quantity of chemical and location of action to be recorded.</p> <p>Annual report to provide map of extent of current and past weed infestation, details of control undertaken and an assessment of the success of current management.</p>
<ul style="list-style-type: none"> <li><b>Pest animal control</b></li> </ul>	<p>Foxes, rabbits, hares, goats and deer are likely to be established within or near the offset site (NGH Environmental 2008). A Feral Animal Control plan would be prepared in consultation with the landowner and landowners of adjacent properties and qualified feral animal control personnel (e.g. Local council or NSW Local Land Services). The plan would clearly outline the types of control and when the feral animal control will occur. Baiting for rabbits and hares would not be allowed as a control measure as this has the potential to negatively impact on foraging Little Eagles.</p>	Zone 1, 2, 3, 4 and 5	<p>Feral Animal Control Plan prepared and implemented.</p> <p>Correspondence with adjacent landowners documented.</p> <p>Control measures and their location recorded.</p>
<ul style="list-style-type: none"> <li><b>Removal of fallen timber</b></li> </ul>	<p>Fallen timber would be left in place within the offset site.</p>	Zone 1, 2, 3, 4 and 5	<p>Annual audit of performance.</p>

Aim	Rationale	Applicable management zones	Auditable measure
<ul style="list-style-type: none"> <li><b>Installations to offset removed hollow-bearing trees</b></li> </ul>	<p>Sections of felled trees containing hollows or nest boxes to emulate hollow-bearing trees would be mounted within the offset site to preserve the overall abundance of hollows across the project boundaries. That is, for each hollow removed by the proposal, one hollow would be mounted or nest box constructed in the offset area. Mounted hollows or nest boxes would not be placed within 200m of turbines.</p>	<p>Zone 1, 2, 3, 4 and 5</p>	<p>Documentation of the number of nest boxes installed compared to number of hollows removed.</p> <p>One-off audit, once installed. Annual audit to confirm still in place.</p>
<p><b>SPECIFIC MANAGEMENT MEASURES</b></p>			
<p><b>Rapid control of Serrated Tussock</b></p>	<p>Serrated Tussock is widespread within more open areas of the offsite site and within the adjacent development site. This noxious weed species threatens the integrity of the native dominated groundcover in Zone 1 and has already come to dominate the groundcover in Zone 2. The weed management plan would include specific actions focusing on the rapid control of Serrated tussock and other noxious weeds in Zones 1 and 2. The plan would include follow up works to establish native grass species in areas where Serrated Tussock is dominant.</p>	<p>Zone 1, 2 and 5. Follow up works in Zone 2 and 5.</p>	<p>Weed management plan prepared and implemented.</p> <p>Reduced extent of Serrated Tussock.</p>
<p><b>Rapid control of Blackberry</b></p>	<p>Blackberry is extensive within the Ribbon Gum Forest which occupies the unnamed drainage line in the west of the offset site. The weed management plan would include specific actions focusing on the rapid control of Blackberry and other noxious weeds in Zone 4. The plan would include follow up works to prevent the re-establishment of Blackberry in this area.</p>	<p>Zone 4</p>	<p>Weed management plan prepared and implemented.</p> <p>Reduced extent of Blackberry</p>

Aim	Rationale	Applicable management zones	Auditable measure
<p><b>Assisted regeneration of overstorey and midstorey vegetation</b></p>	<p>Overstorey regeneration is occurring in Zone 1 but not in Zone 2 where Serrated Tussock is prevalent. The establishment of overstorey and midstorey vegetation would not only assist in the recovery of the community in this area but would also help to control the re-establishment of Serrated Tussock following control works. Plantings would aim to increase the tree density to at least 25 (or an on-site determined benchmark tree/shrub density) trees and shrubs per hectare and consist of the species present within the surrounding Apple Box – Yellow Box Woodland. Plants used for planting must be obtained from locally collected provenances.</p> <p>Plantings would be monitored, maintained and replaced if necessary for the first 3 years after planting or until plants are at least 2 metres in height.</p> <p>The planting program would aim to have the overstorey and midstorey vegetation cover within benchmark for Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands in the Hawkesbury Nepean CMA within 5 years after CPVP is registered and active management has commenced.</p> <p>Planting of overstorey trees would not be undertaken within 100m of turbines so as not to further encourage roosting/nesting of bird and bat species in close proximity to turbines.</p>	<p>Zone 2</p>	<p>Plantings established and maintained.</p> <p>Planting density at least 25 plants per hectare (or at other predetermined benchmark).</p> <p>Proportion of planted vegetation &gt;2m high.</p> <p>Overstorey and midstorey vegetation cover within or approaching benchmark within 5 years after CPVP is registered and active management has commenced.</p>
<p><b>Enrichment of native ground cover and species diversity</b></p>	<p>Native groundcover diversity is generally low across Zones 1 and 2. Where weed species such as serrated tussock have become prevalent, the percent cover of native species is also low. Increasing the percent cover and diversity of native groundcovers would assist in restoring ecosystem function within these zones.</p> <p>Native seed containing local province grass, forb and shrub species would be broadcast in late winter/early spring for the first three years or until monitoring indicates that native groundcover and diversity has sufficiently increased. Seed would be broadcast at a rate of between 2 - 6kg/ha depending on the weed load (higher in weedier areas) or as determined in consultation with an expert in revegetation.</p> <p>The seeding program would aim to have the native ground cover vegetation cover within benchmark for Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands in the Hawkesbury Nepean CMA within 5 years after the CPVP is registered and active management has commenced.</p>	<p>Zone 1, 2 and 5</p>	<p>Seeding conducted late winter/early spring.</p> <p>Groundcover vegetation within or approaching benchmark within 5 years after the CPVP is registered and active management has commenced.</p>

Aim	Rationale	Applicable management zones	Auditable measure
Exclusion of grazing	<p>Given that overstorey regeneration is occurring in Zone 1, plantings will be established in Zone 2 and that stock provide a vector for the spread of weeds such as Serrated Tussock, it is recommended that grazing be excluded from all areas within the offset site unless agreed upon in consultation with OEH and with the approval of the Secretary.</p> <p>It is acknowledged that there are farm dams within the offset area that currently provide water for stock. A simple solar pump and overland poly pipe system is recommended to allow for the transportation of this water out of the offset area to other appropriate stock watering points in existing pasture areas. This would remove the need for stock to enter the offset site for access to water.</p>	Zone 1, 2, 3, 4 and 5	<p>No evidence of grazing within the offset area.</p> <p>Solar pump system for any water transportation installed, if required.</p>
<b>MONITORING AND REPORTING</b>			
To undertake surveys to assess performance against baseline data and management objectives.	<p>Following the collection of baseline data, monitoring plot data would be then collected annually (up to a maximum of 20 years) as management actions are implemented. Comparing the data to the baseline (and to previous years when applicable) and the bench mark data held by OEH would allow improvements in condition to be demonstrated with the goal of reaching bench mark condition within 5 years after CPVP is registered and active management has commenced) . The data would also be utilised to inform the adaptive management of the site.</p> <p>In addition to the monitoring plot data, quarterly site inspections and an annual review of management performance would be undertaken as outlined in Appendix B.</p>	Zone 1, 2, 3, 4 and 5	<p>Ongoing monitoring completed annually (up to a maximum of 20 years).</p> <p>Quarterly site inspections and annual management performance review completed.</p>

Aim	Rationale	Applicable management zones	Auditable measure
<b>REVIEW AND ADAPTIVE MANAGEMENT</b>			
<p>Be adaptive to the results obtained during monitoring.</p>	<p>All actions above would be assessed in an annual report aiming to document:</p> <ul style="list-style-type: none"> <li>• Details of all actions undertaken throughout the year.</li> <li>• Any change in condition, observed through monitoring.</li> <li>• Recommendations for alterations to management.</li> </ul> <p>The information could be collected by the land manager and reviewed by the Goldwind Australia Representative as part of the OEMP, who in consultation with relevant specialists would assess the yearly report and revise management prescriptions as required to achieve improvement at the site.</p> <p>This report can be used to review the effectiveness of actions in consultation with the land manager.</p>	<p>Zone 1, 2, 3, 4 and 5</p>	<p>Annual report, provided to Dept. Planning and Wind Farm Developer.</p> <p>Management adapted as recommended in the annual report.</p>

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## 4 CONCLUSION

This revised CHP has been prepared to satisfy the proponent's obligations under Approval Condition 2.35 and their commitment to offset vegetation removed according to SoC 16 & 16a of the Environmental Assessment for the project. The OEH document *Principles for the use of Biodiversity Offsets in NSW* (see Appendix A) has been used to guide the preparation of this package.

The proposed offset site is considered suitable to offset the validated permanent biodiversity impacts from the Gullen Range Wind Farm. The overall offset ratio of 5.4:1 exceeds the required 2:1 ratio. It is considered that a 'like for better' offset is provided given the large areas of EEC and threatened species habitat to be protected and the provision of landscape connectivity that the proposed offset site provides. Management strategies have been provided within this package that will 'maintain or improve' the biodiversity values of the proposed offset site for the long-term.

A CPVP will be established in perpetuity to ensure the long-term management of the site. The implementation of a monitoring program to inform adaptive management will ensure that a 'maintain or improve' outcome for the project is achieved.

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## 5 REFERENCES

Department of Environment and Climate Change (DECC) (2008) BioMetric 2.0 A Terrestrial Biodiversity Assessment Tool for the NSW Native Vegetation Assessment Tool Operational Manual, July 2008.

NGH Environmental (2008a) Environmental Assessment: Proposed Wind Farm, Gullen Range NSW.

NGH Environmental (2008b) Proposed development the Gullen Range wind farm, southern tablelands of New South Wales: Biodiversity Assessment.

Office of Environment and Heritage, Principles for the use of biodiversity offsets in NSW, (<http://www.environment.nsw.gov.au/biocertification/offsets.htm> accessed 2.9.11)

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## Appendix A Principles for the use of biodiversity offsets in NSW

This offset strategy has been guided by the OEH Principles for the Use of Biodiversity Offsets in NSW, as detailed below.

### **1 Impacts must be avoided first by using prevention and mitigation measures.**

*Offsets are then used to address remaining impacts. This may include modifying the proposal to avoid an area of biodiversity value or putting in place measures to prevent offsite impacts.*

By way of iterative infrastructure planning, considering refined constraints mapping, the proposal has avoided and mitigated, proposing to offset only residual impacts. This is documented within the BA (NGH Environmental 2008).

### **2 All regulatory requirements must be met.**

*Offsets cannot be used to satisfy approvals or assessments under other legislation, e.g. assessment requirements for Aboriginal heritage sites, pollution or other environmental impacts (unless specifically provided for by legislation or additional approvals).*

Not relevant to this proposal.

### **3 Offsets must never reward ongoing poor performance.**

*Offset schemes should not encourage landholders to deliberately degrade or mismanage offset areas in order to increase the value from the offset.*

The offset site will be set up in perpetuity – this removes the incentive to degrade the offset site to facilitate development at a later date

### **4 Offsets will complement other government programs.**

*A range of tools is required to achieve the NSW Government's conservation objectives, including the establishment and management of new national parks, nature reserves, state conservation areas and regional parks and incentives for private landholders.*

As a private conservation area, this offset site would complement existing reserves.

### **5 Offsets must be underpinned by sound ecological principles.**

*They must:*

- *include the consideration of structure, function and compositional elements of biodiversity, including threatened species*
- *enhance biodiversity at a range of scales*
- *consider the conservation status of ecological communities*
- *ensure the long-term viability and functionality of biodiversity.*

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*Biodiversity management actions, such as enhancement of existing habitat and securing and managing land of conservation value for biodiversity, can be suitable offsets. Reconstruction of ecological communities involves high risks and uncertainties for biodiversity outcomes and is generally less preferable than other management strategies, such as enhancing existing habitat.*

This plan provides a comprehensive evaluation of the value of the areas to be impacted and an assessment of suitable offset areas at the site (refer to Section 3) and demonstrates the ability to achieve a like for better outcome. The offset site includes large areas with intact ecosystem functionality and relatively low disturbance. Management measures are recommended in this plan to actively improve areas that are more highly disturbed. Established, mature overstorey vegetation is present in the disturbed areas (that are invaded by Serrated Tussock) which provides a basis for rehabilitation. It includes vegetation of conservation significance and provides connectivity benefits at the landscape scale. The offset site establishes an area that will help to ensure the long-term viability and functionality of biodiversity at the site by ensuring its management and protection in perpetuity.

#### **6 Offsets should aim to result in a net improvement in biodiversity over time.**

*Enhancement of biodiversity in offset areas should be equal to or greater than the loss in biodiversity from the impact site.*

*Setting aside areas for biodiversity conservation without additional management or increased security is generally not sufficient to offset against the loss of biodiversity. Factors to consider include protection of existing biodiversity (removal of threats), time-lag effects, and the uncertainties and risks associated with actions such as revegetation.*

*Offsets may include enhancing habitat, reconstructing habitat in strategic areas to link areas of conservation value, or increasing buffer zones around areas of conservation value and removal of threats by conservation agreements or reservation.*

This plan:

- Identifies threats to the proposed offset site
- Sets out suitable management measures that can be undertaken for the long-term
- Includes enhancement options, where required

#### **7 Offsets must be enduring - they must offset the impact of the development for the period that the impact occurs.**

*As impacts on biodiversity are likely to be permanent, the offset should also be permanent and secured by a conservation agreement or reservation and management for biodiversity. Where land is donated to a public authority or a private conservation organisation and managed as a biodiversity offset, it should be accompanied by resources for its management. Offsetting should only proceed if an appropriate legal mechanism or instrument is used to secure the required actions.*

Consent Condition 2.35 and Statement of Commitment 16 state that offsets will be in perpetuity. As discussed in Section 3.4 of this document, a CPVP would be established on the title of the land and is therefore in perpetuity. The CPVP will be a legally binding agreement under both the Native Vegetation Act 2003 and the Threatened Species Conservation Act 1995. To ensure that the CPVP is binding on successors in title, an abstract of the CPVP will be registered with the Land and Property Management

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Authority under the *Real Property Act 1900*. The terms of the CPVP will not be affected by any changes to local or state planning rules or new listings of threatened species.

### **8 Offsets should be agreed prior to the impact occurring.**

*Offsets should minimise ecological risks from time-lags. The feasibility and in-principle agreements to the necessary offset actions should be demonstrated prior to the approval of the impact. Legal commitments to the offset actions should be entered into prior to the commencement of works under approval.*

Previous iterations of this plan were endorsed by the OEH prior to the commencement of works. Subsequent modifications have resulted in an increase in the size of the offset area and the inclusion of more intense management which will further contribute to the long-term protection of biodiversity values at the site.

### **9 Offsets must be quantifiable - the impacts and benefits must be reliably estimated.**

*Offsets should be based on quantitative assessment of the loss in biodiversity from the clearing or other development and the gain in biodiversity from the offset. The methodology must be based on the best available science, be reliable and used for calculating both the loss from the development and the gain from the offset. The methodology should include:*

- *the area of impact*
- *the types of ecological communities and habitat/species affected*
- *connectivity with other areas of habitat/corridors*
- *the condition of habitat*
- *the conservation status and/or scarcity/rarity of ecological communities*
- *management actions*
- *level of security afforded to the offset site.*

These points have been addressed in the calculation of impact areas and the management measures and security vehicles discussed in this document.

*The best available information/data should be used when assessing impacts of biodiversity loss and gains from offsets. Offsets will be of greater value where:*

- *they protect land with high conservation significance*
- *management actions have greater benefits for biodiversity*
- *the offset areas are not isolated or fragmented*
- *the management for biodiversity is in perpetuity (e.g. secured through a conservation agreement).*

In defining suitable offset areas, all points have been considered.

*Management actions must be deliverable and enforceable.*

This Compensatory Habitat Package provides the strategy for calculating, securing and managing the offset site. The overall objective is to 'maintain or improve' its condition – no loss of value. The actions to follow this strategy include securing the land under a CPVP, finalising a management plan to set out the timing of management actions and carrying out those actions, in accordance with this strategy.

### **10 Offsets must be targeted.**

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*They must offset impacts on the basis of like-for-like or better conservation outcome. Offsets should be targeted according to biodiversity priorities in the area, based on the conservation status of the ecological community, the presence of threatened species or their habitat, connectivity and the potential to enhance condition by management actions and the removal of threats. Only ecological communities that are equal or greater in conservation status to the type of ecological community lost can be used for offsets. One type of environmental benefit cannot be traded for another: for example, biodiversity offsets may also result in improvements in water quality or salinity but these benefits do not reduce the biodiversity offset requirements.*

Offsets are proposed based on biodiversity values present in the context of the surrounding area and are considered likely to achieve a like for like or like for better outcome in the long-term.

**11 Offsets must be located appropriately.**

*Wherever possible, offsets should be located in areas that have the same or similar ecological characteristics as the area affected by the development.*

The offset site is located immediately adjacent to the areas that are to be impacted. Section 3 of this report demonstrates the similarity of the values between these areas.

**12 Offsets must be supplementary.**

*They must be beyond existing requirements and not already funded under another scheme. Areas that have received incentive funds cannot be used for offsets. Existing protected areas on private land cannot be used for offsets unless additional security or management actions are implemented. Areas already managed by the government, such as national parks, flora reserves and public open space cannot be used as offsets.*

The potential offset areas are currently privately owned and used for agricultural grazing activities. They are not funded under another scheme, protected or managed by the government. Management actions would retain private ownership.

**13 Offsets and their actions must be enforceable through development consent conditions, license conditions, conservation agreements or a contract.**

*Offsets must be audited to ensure that the actions have been carried out, and monitored to determine that the actions are leading to positive biodiversity outcomes.*

A covenant is proposed to be attached to the title of the offset site, to ensure no adverse activities are undertaken.

Management measures within this plan recommend yearly monitoring and reporting as part of the OEMP. Auditable measures have been provided.

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## Appendix B Adaptive management plan

The following plan has taken the recommended management actions for the offset site and turned them into a series of practical actions, able to be audited and adapted in response to what is observed at the offset site. The plan is formatted as a **quarterly checklist** and **annual review** so that a record of actions and useful notes on their effectiveness can be retained. **A separate quarterly checklist and annual review should be completed for each management zone.**

### Offset site management protocols:

Once off:

1. Quantify the number and size of hollows removed during the wind farm construction phase.
2. Install an equivalent number and size of hollows within the offset site at least 200m from turbines.
3. Conduct intense control of Serrated Tussock using suitable methods that do not inhibit the reestablishment of native vegetation.
4. Conduct plantings to initiate regeneration (no planting of overstorey vegetation within 100m of turbines).

Ongoing:

5. Undertake quarterly site inspection.
6. Undertake management actions where required including:
  - a. Ongoing weed and pest control
  - b. Maintenance of fences
  - c. Maintenance of plantings
7. Record observations, management actions and their effectiveness on quarterly checklist form below.
8. Provide an annual review of management performance including:
  - a. Effectiveness of weed control
  - b. Effectiveness of feral animal control
  - c. Establishment of native vegetation
  - d. Maintenance of native vegetation
  - e. Incidences of erosion and sedimentation and effectiveness of any remedial action
  - f. Incidences of bushfire

The annual review would be included with the annual offset site management report which would include the results of monitoring and identify any need to modify the management action program.

9. Provide annual offset site management report to the Department of Planning and Environment, with the wind farms Annual Environmental Management Report.

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### Quarterly management checklist

Zone: \_\_\_\_\_ Date of site inspection: \_\_\_\_\_ Person undertaking inspection: \_\_\_\_\_

Issue	Action	Comments
<b>Habitat values</b>	Is timber being left where it falls?	
	Has timber collection been restricted?	
	Have the required number of nest boxes been installed?	
<b>Grazing management</b>	Are stock being excluded from the offset site?	
	Has fencing been installed as detailed on Figure 4-7 of the CHP?	
	Do fences need repair?	



Issue	Action		Comments	
<b>Pest animal control</b>	Is there evidence of foxes, rabbits, hares, goats, deer or pigs within the zone?			
	Has consultation been undertaken with adjacent landholders?			
	List the pest animals present in the offset site, below			
<i>Name of pest (abundance score<sup>4</sup>)</i>	<i>Location (include a map and append to checklist)</i>	<i>Evidence of activity</i>	<i>Proposed action (including date)</i>	<i>Provide date when action was undertaken</i>
<i>Example: Foxes</i>		<i>Seen taking refuge in dense regrowth</i>	<i>Talk to landholders and bait with 1080 (November)</i>	<i>Carried out November 12 and 13, 2011</i>

<sup>4</sup> 1 = little evidence of activity, 2 = some evidence of activity, 3 = damage to vegetation or soil evident, 4 = extensive damage evident



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Issue	Action	Comments
<b>Summary</b>	What seasonal changes are evident?	
	Do any actions need to be undertaken in the next month?	
	Do any changes need to be made to this checklist or to management actions?	

---

**Annual review**

Zone: \_\_\_\_\_ Date of site inspection: \_\_\_\_\_ Person undertaking inspection: \_\_\_\_\_

Review question	Comment
Were all quarterly inspections undertaken?	
Should the frequency be altered?	
Has annual monitoring at established BioMetric plots been completed?	
Have all nest boxes been installed. Are they in need of repair?	
Is there any evidence of bushfire?	

Review question	Comment
<p>What positive trends are evident?</p> <p><i>For example, is habitat complexity increasing (timber on ground, good understorey cover, good regeneration, hollows and canopy vegetation retained)</i></p>	
<p>What negative trends are evident?</p> <p><i>For example, are weeds and pest animal activity increasing? Is there any evidence of erosion or sedimentation requiring action?</i></p>	

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Review question	Comment
What changes will be made to the management actions to improve biodiversity outcomes?	

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## Appendix C Author qualifications and experience

Brooke Marshall

*Qualifications*

*B. Natural Resources (Hons1)*

Brooke provided technical input and senior review for this project. Brooke is Certified Environmental Practitioner (CEnvP) and manages the project work undertaken by the Bega office of NGH Environmental. Brooke also undertakes project work and has increasingly focused on large-scale infrastructure environmental assessment and management and strategic biodiversity assessment. She has prepared several wind farm environmental assessments, co-coordinating the preparation and incorporation of specialist reports to the Department of Planning. She has prepared referrals under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999*. Brooke is also an accredited Biobanking assessor and has undertaken Biobanking assessments and prepared offset plans, under this scheme in NSW.

Dave Maynard

*Qualifications*

*B. Science (Ecology; Hons1)*

Dave was the lead botanist, lead author and the GIS Officer for this project. Dave is part of NGH Environmental's biodiversity team and specialises in flora assessment. Dave has been involved in a range of projects including constraint and biodiversity impact assessment for major solar and wind farm projects. Dave has conducted botanical surveys within several biogeographic areas of NSW including the south-east coast, tablelands, alpine areas and north-western plains. He has experience in floristic survey planning and design and he has conducted numerous targeted surveys for threatened flora species listed under state and federal legislation in a wide range of habitats.

Jackie Miles

*Qualifications*

*B. Science (Hons)*

Jackie was the senior botanist in the field for this project. Jackie is a senior botanist and has worked on a number of large assignments including botanical surveys for the Comprehensive Regional Assessment which included full CRA floristic field validation for the Department of Environment and Climate Change (formerly NPWS). She also assisted in the preparation of the Vegetation Map for South East Forests National Park, botanical surveys for mapping of all NSW ski resort areas (for Planning NSW), surveys of significant remnant grassy vegetation for Bega Valley Shire Council, and a large number of botanical and fauna assessments for minor and major development proposals. This includes vegetation mapping and condition assessment for a number of wind farm projects.

Bianca Heinze

*Qualifications*

*B. Applied Science (ERM/Coastal Mgt)*

Bianca was the lead fauna ecologist for this project and assisted in mapping and review of the report. Bianca is part of NGH Environmental's biodiversity team, specialising in fauna assessment. Bianca has been involved in complex infrastructure projects in a range of biogeographic areas, including wind farms, highway realignments and power transmission alignments in New South Wales, South Australia and Western Australia. Bianca has been involved with surveys for marine and terrestrial mammals, birds, reptiles and microbats, including fauna survey and operational bird and bat monitoring for numerous wind farms.

# APPENDIX I BIRD & BAT MANAGEMENT PLAN

**GULLEN RANGE WIND FARM**

**BIRD AND BAT**  
**ADAPTIVE MANAGEMENT PROGRAM**

**New Gullen Range Wind Farm Pty Ltd**



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**May 2016**

**Report No. 14182 (4.7)**

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## 1. INTRODUCTION

The Gullen Range Wind Farm (GRWF) received Project Approval from the NSW Land and Environment Court (L&EC) on the 4<sup>th</sup> of August 2010 following assessment under Part 3A of the NSW *Environment Planning and Assessment Act 1979* (EP&A Act). The GRWF comprises 73 wind turbines, one substation, associated access roads and 33kV electrical collection infrastructure. Construction occurred September 2012 to December 2014. The GRWF has been fully operational since 23<sup>rd</sup> December 2014. The GRWF owner and operator is New Gullen Range Wind Farm Pty Ltd (NGRWF).

Gullen Range Wind Farm is located in the Southern Tablelands region of NSW (Figure 1). Four groups of turbines are located within approximately 2,800 hectares of agricultural and wooded land associated with the project: Kialla, Bannister, Pomeroy and Gurrundah.

The Minister for Planning approved the project application for up to 84 turbines (File No: S07/00846) subject to conditions given by the Land & Environment Court (L&EC) that included deletion of 11 turbines (allowing up to 73 turbines to be installed).

Condition of Approval 3.1 requires the proponent to prepare a 'Bird and Bat Adaptive Management Program' (BBAMP) for the wind farm, consistent with the requirement of the condition as set out below.

3.1 *The Proponent must prepare and submit for the approval of the Director-General a Bird and Bat Adaptive Management Program, which takes account of bird/ bat monitoring methods identified in the current editions of AusWEA Best Practice Guidelines for the Implementation of Wind Energy Projects in Australia and Wind Farms and Birds: Interim Standards for Risk Assessment. The program shall be implemented by a suitably qualified expert, approved by the Director General. The Program shall incorporate Monitoring, and a Decision Matrix that clearly sets out how the Proponent will respond to the outcomes of monitoring.*

- a) *The program must incorporate an ongoing role for the suitably qualified expert.*
- b) *Set out monitoring requirements in order to assess the impact of the project on bird and bat populations, including details on survey locations, parameters to be measured, frequency of surveys and analyses and reporting. The monitoring program must be capable of detecting any changes to the population of birds and/or bats that can reasonably be attributed to the operation of the project, that is, data may be required to be collected prior to the commencement of construction. The requirements must also account for natural and human changes to the surrounding environment that might influence bird and/or bat behaviour such as changes in land use practices, and significant changes in water levels in nearby water bodies.*
- c) *Incorporate a decision making framework that sets out specific actions and when they may be required to be implemented to reduce any impacts on bird and bat populations that have been identified as a result of the monitoring.*
- d) *Identify 'at risk' bird and bat groups such as the Powerful Owl, the Common Bent-wing Bat, the Large-footed Myotis and the Eastern False Pipistrelle and include monthly mortality assessments and periodic local population censuses and bird utilisation surveys.*

- e) *Identify potential mitigation measures and implementation strategies in order to reduce impacts on birds and bats ... that are predicted to or have had an unacceptable impact on bird/bat mortality at certain times.*
- f) *Identify matters to be addressed in periodic reports in relation to outcomes of monitoring, the application of the decision making framework, the need for mitigation measures, progress with implementation of such measures and their success.*

*The Reports referred to under part f) shall be submitted to the Director-General on an annual basis.*

*The Proponent is required to implement reasonable and feasible mitigation measures as identified under part e) where the need for further action is identified through the Bird and Bat Adaptive Management Program, or as otherwise agreed with the Director-General.*

Related conditions in respect of avifauna include 2.33, 2.36 and 2.37, presented below.

#### Condition 2.33

Condition 2.33 requires the shutdown of Turbines POM\_03, POM\_04, POM\_06 and POM\_07 overnight during 4 months from December to March inclusive to avoid any risk to juvenile Powerful Owl dispersal. This aspect is the subject of a separate document the Powerful Owl Management Strategy (POMS) that specifically addresses the management of risks for dispersal of juvenile Powerful Owls. It is intended that management of that issue be integrated with BBAMP management.

#### Conditions 2.36 and 2.37

The Proponent shall make a financial contribution of \$1,500.00 (CPI adjusted) to the NSW Wildlife Information and Rescue Service for each death of the Powerful Owl or Wedge-tailed Eagle that has been reasonably attributed to the carrying out of the project.

An initial BBAMP (nghenvironmental 2012b) was approved by the Department of Planning and Environment (DPE) and has been adopted for the initial period of operation of the wind farm. In view of the development of improved BBAMP approaches based on application of the programs across an increasing number of sites this BBAMP provides an updated document to guide collection of more meaningful data that will enable effective management. This revised BBAMP fulfils the requirements of Condition of Approval 3.1 and subject to approval by DPE will be implemented for GRWF.

### **1.1. BBAMP Objectives**

The overall aim of this BBAMP is to provide a program for monitoring the impacts on avifauna from GRWF operation and an overall strategy for managing and mitigating any significant bird and bat impacts arising from the operation of GRWF.

This is achieved by establishing monitoring and management procedures consistent with the methods outlined by the Australian Wind Energy Association (AusWEA 2005) and endorsed in the Clean Energy Council's Best Practice Guidelines (CEC 2013).

The specific objectives of this plan, derived from the conditions of approval, are detailed as follows:

- To implement a monitoring program capable of detecting any changes to the population of birds and/ or bats that can reasonably be attributed to the operation of the project including pre- and post-construction presence;
- To directly record impacts on birds and bats through carcass surveys;
- To detail a decision-making framework that outlines the specific actions to be taken and possible mitigation measures implemented to reduce any impacts on bird and bat populations that have been identified as a result of the monitoring, or in the event that an impact trigger<sup>1</sup> is detected;
- To detail specific monitoring for 'at risk' bird and bat groups, such as the Powerful Owl, the Little Eagle, the Wedge-tailed Eagle and the Eastern Bent-wing Bat and include monthly mortality assessments, periodic local population censuses and bird utilisation surveys;
- To detail specific and potential mitigation measures and related implementation strategies to reduce impacts on birds and bats; and
- To identify matters to be addressed in periodic reports in relation to the outcomes of monitoring, the application of the decision making framework, the need for mitigation measures, progress with implementation of such measures, and their success.

The strategy employed to ensure that any impact triggers and/or unacceptable impacts are detected includes:

- Post-construction monitoring surveys, including carcass searches under operating turbines
- Statistical analysis of the results from monitoring
- Reporting

This management program is designed to utilise an adaptive management approach. Therefore, management measures can be amended based on monitoring results to ensure more effective management and mitigation are implemented in response to the findings of monitoring. In order to ensure the efficacy of this adaptive management program, all activities will be undertaken subject to regular review and reporting by the suitably qualified expert with relevant experience who is approved by the Secretary of the Department of Planning and Environment (DPE). Personnel undertaking the carcass searches will be adequately trained to undertake the assessments. The expert will also be in charge of data analysis, interpretation and reporting.

Note that the technical advice in this plan and the decision making framework is based on the preparation and implementation of approved management plans to monitor and mitigate the impacts of wind farm operation on birds and bats at numerous wind farms in New South Wales and Victoria. At the time of writing, BL&A have prepared and/or implemented approved management plans for Cullerin Range, Taralga, Capital I and Woodlawn wind farms in NSW (BL&A 2011b &c, 2014), and Bald Hills, Macarthur, Berrybank, Crowlands, Hawkesdale, Lal Lal, Mt Gellibrand, Mt Mercer, Mortlake South and Ryan's Corner wind farms in Victoria (BL&A 2009, 2011a, 2012a-d, 2013a-c).

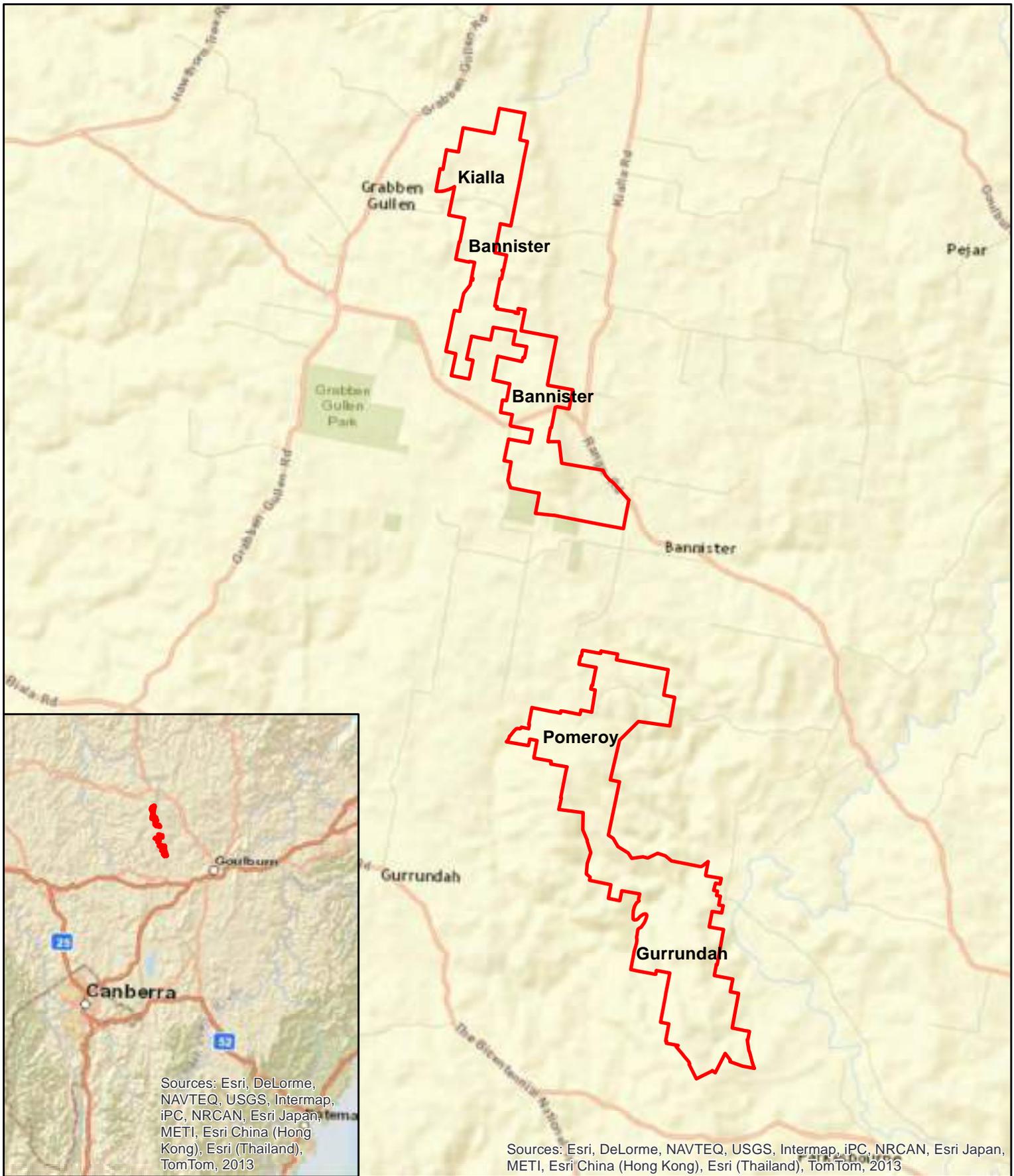
The approach developed for monitoring impacts on birds and bats has been refined as these plans have been prepared and feedback received from regulators and approval

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<sup>1</sup> Definition of 'impact trigger' and 'unacceptable impact' is detailed in section 7.1

authorities. This BBAMP has incorporated learning and experience from these plans, and as a result incorporates the latest approaches to monitoring wind farm impacts on birds and bats.

This plan will be implemented by a suitably qualified expert approved by the Secretary of Planning.



## Legend

 Wind farm boundary

 Kilometers

**Figure 1: Location of wind farm**

**Project: Gullan Range Wind Farm**

**Client: Goldwind Australia**

Project No.: 14182

Date: 30/10/2014

Created By: M. Ghasemi / A. Stewart

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	30 Buxton Rd, Canberra ACT 2601, Australia		

## 1.2. Compliance Summary

The following table details which sections of the BBAMP comply with each of the specific requirements outlined in the relevant Condition of Approval 3.1 for the project. The conditions of approval have been abbreviated but their full and correct wording can be found in the introduction.

Condition 3.1 for the GRWF requires that this program be informed by AusWEA (2005), the Australian interim bird risk assessment standards for wind farms. The methods and reporting standards in this document have been adopted, with adaptation to reflect more recent technical development and regulatory input as well as the content of these standards.

**Table 1: Sections within the BBAMP that respond to Condition of Approval 3.1 for Gullen Range Wind Farm.**

Condition number	Abbreviated condition details	BBAMP Section/s
3.1 (a)	<i>Incorporate an ongoing role for the suitably qualified expert</i>	1.1
3.1 (b)	<i>Set out monitoring requirements in order to assess the impact of the project on bird and bat populations including details on survey locations, parameters to be measured, frequency of surveys and analyses and reporting.</i>	0, 5.3
3.1 (c)	<i>Incorporate a decision making framework that sets out specific actions and when they may be required to be implemented to reduce any impacts on bird and bat populations that have been identified as a result of the monitoring</i>	7.1, 7.2
3.1 (d)	<i>identify 'at risk' bird and bat groups....and include monthly mortality assessments and periodic local population censuses and bird utilisation surveys;</i>	4.3
3.1 (e)	<i>Identify potential mitigation measures and implementation strategies in order to reduce impacts on birds and bats....</i>	6
3.1 (f)	<i>Identify matters to be addressed in periodic reports...</i>	5.7, 7.4
3.1	<i>Submit reports to the Director-General on an annual basis ...</i>	7.4

### 1.3. Site Description

Gullen Range Wind Farm is located in the Southern Tablelands region of NSW (Figure 1). The Project site extends along about 25 kilometres (km) of the Great Dividing Range from about 6km south of Crookwell to the Gurrundah locality in the south. It is near the village of Grabben Gullen, New South Wales in the Local Government Area of the Upper Lachlan Shire Council. The site is located about 27 km northwest of Goulburn and 80 km northeast of Canberra. Four groups of turbines are distinguished (Kialla, Bannister, Pomeroy and Gurrundah). The project covers approximately 2,800 hectares of mainly agricultural and wooded land. The site varies from elevations of about 1,000 metres in the north to less than 800m in the south.

In August 2010, the Land and Environment Court of NSW granted project approval for the Gullen Range Wind Farm under part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The project approval authorised the construction and operation of up to 73 wind turbines and associated infrastructure. The construction of the wind farm was completed in December 2014.

### 1.4. Pre-construction investigations of birds and bats at Gullen Range wind farm

During the pre-approval and pre-construction phases of the development, investigations have been undertaken by nghenvironmental that have informed the first BBAMP that was prepared in May 2012 (nghenvironmental 2012b). These have included:

- The original biodiversity assessment that was undertaken for the project (nghenvironmental, 2008).
- Pre-construction bird utilisation surveys (BUS) for the proposed Gullen Range Wind Farm. Surveys were undertaken by nghenvironmental zoologists in April 2011 as well as February, August and October 2012; one in each season to account for seasonal differences in bird activity and presence of species (due to migration).
- An Assessment of the Bat Fauna at the Gullen Range Wind Farm, NSW, was undertaken by nghenvironmental through Anabat surveys in February, August and October 2012.

The following sections review the information gathered during these surveys. In addition, BL&A has completed bird and bat monitoring at Gullen Range Wind Farm from January to June 2015 in line with the initial BBAMP. In addition, BL&A completed carcass searches in line with the BBAMP.

### 1.5. Initial post-operations bird and bat studies at Gullen Range wind farm

BL&A implemented the approved BBAMP (nghenvironmental 2012) between January and June 2015 including the following surveys:

- Monthly bird utilisation surveys (BUS) at nine survey locations as described below:
  - Observer was stationed at a survey point for 20 minutes, during which time all birds observed within 100x200 metres were recorded;
  - Species, number of birds and flight height were documented, with flight height being recorded in 20 metre intervals and later classified as below, at or above rotor swept area height (RSA height);
  - Twice daily surveys were undertaken during carcass searches to ensure 12 BUS are undertaken per month, covering 9 locations (same as pre-survey)

- Dusk and dawn monitoring for raptors at vantage points (twice daily surveys during carcass searches);
- Avoidance behaviour surveys; and
- Locality surveys (one per event to note weather patterns, land use changes, etc)
- Anabat Surveys
  - Bat activity surveys were undertaken using Anabat® or SongMeter ultrasonic bat detectors.
  - Four sites were monitored monthly for ten nights over six months.
- Carcass Searches

A carcass search involves intensively searching around a turbine for dead or injured birds and bats. Procedures for the carcass searches are detailed below.

- Monthly carcass searches were carried out at 30 to 32 turbine sites for six months. 16 turbines in focus areas and 14 to 15 turbines in non-focus areas. The non-focus area turbines were divided into four groups and rotated so that each turbine was searched over the six month period.
- The turbines were searched to a radius of 60 metres (turbine swept area plus 10m) four times per month.
- The searcher walked transects about 6m apart, searching a zone 3m either side for dead birds and bats across the circular search area.
- On finding a dead bird, feather-spot or dead bat, the searcher did:
  - Remove it from the site to avoid re-counting; and
  - Transfer it to a freezer at the site office for storage so it can be identified by an experienced birder and used in observer efficiency and scavenger trials (see below).
- Scavenger Trials

Scavenger trials have been undertaken in June 2015 to provide accurate avifauna mortality estimates from the wind farm and to adjust mortality monitoring frequency. These carcass scavenger trials are necessary to estimate the length of time bird and bat carcasses remain in the wind farm site.

Monthly reports were prepared for all these surveys.

### **1.6. Powerful Owl studies at Gullen Range wind farm**

The first targeted Powerful Owl survey was undertaken between March 29 and April 5, 2007 by ngenvironmental using call playback. A second targeted survey was undertaken in May 2011 by owl expert John Young of John Young Wildlife, on behalf of ngenvironmental (EECWU 2014).

In late October of 2014 an additional survey was conducted in the Pomeroy precinct of the Gullen Range Wind Farm in order to confirm the presence of any breeding pair of Powerful Owls (EECWU 2014).

A further survey was conducted in late January of 2015 to determine the presence of juvenile Powerful Owls (EECWU 2015).

The results to-date of these various studies are discussed in Section 2.

### **1.7. Additional Risk Assessment**

In addition to the surveys undertaken, BL&A undertook an assessment of the collision risk to Powerful Owl and Little Eagle in October 2014 (BL&A 2014). The aim of this investigation was to compare the relative impact of two alternative positions for turbines POM\_3, POM\_4, POM\_5 and POM\_6 in the Gullen Range Wind Farm on two threatened birds, the Powerful Owl and the Little Eagle.

## 2. PRE-CONSTRUCTION BIRD AND BAT INFORMATION

The results of investigations documented in Section 1.4 above are summarised in this section of the BBAMP. This information has informed the risk assessment in Section 3.

### 2.1. Bird Utilisation Surveys (BUS)

The methods and results of the Bird Utilisation Survey (BUS) are outlined in the ngenvironmental Bird and Bat Utilisation Surveys reports (ngenvironmental, 2012a, 2012c, 2012d). These survey reports are attached as Appendix 1-3 to this report.

The BUS was undertaken consistent with the methodology described in the original Gullen Range Bird and Bat Management Plan (ngenvironmental 2012b).

Four pre-construction bird utilisation surveys were undertaken in 2011/2012. This involved three survey days in autumn (12<sup>th</sup> to 14<sup>th</sup> April 2011), two survey days in summer (27<sup>th</sup> and 28<sup>th</sup> February 2012), three days in winter (15<sup>th</sup> to 17<sup>th</sup> August 2012) and three days in spring (24<sup>th</sup> to 26<sup>th</sup> October 2012).

A Birds Australia methodology was used involving 20 minute searches of two hectare areas (100x200 metres). Only birds within the search area were recorded including birds flying over the search area. Heights of flights were estimated to the nearest 20 metres. Eleven to seventeen searches (each of 20 minutes duration) were undertaken at varying locations across all four precincts.

The following information was recorded:

- Brief description of habitat type and condition, including landscape position
- Bird species observed or heard
- Abundance of bird species observed
- Flight height of bird species observed
- Flight behaviour for raptors (i.e. soaring, hovering, gliding, flapping, etc.)
- Perching observed (substrate)

The survey sites for each BUS survey are detailed in Table 2.

Table 2: Bird utilisation survey sites (nghenvironmental 2012d)

Precinct	Nearest turbine	Autumn 2011		Summer 2012		Winter 2012		Spring 2012		Cumulative no. surveys
		Date	Time	Date	Time	Date	Time	Date	Time	
Kiaiaia	KIA_01	11-Apr-12	16:05	28-Feb-12	14:40	16-Aug-12	13:40	26-Oct-12	7:40	4
	KIA_02			28-Feb-12	14:30	16-Aug-12	13:50	26-Oct-12	7:35	3
Bannister	BAN_04					17-Aug-12	10:10	25-Oct-12	7:50	2
	BAN_05					17-Aug-12	9:35	25-Oct-12	8:00	2
	BAN_13			27-Feb-12	13:17			25-Oct-12	15:00	2
	BAN_14	12-Apr-11	12:40	27-Feb-12	13:20			25-Oct-12	15:00	3
	BAN_17			27-Feb-12	15:20			25-Oct-12	14:10	2
	BAN_21			27-Feb-12	14:00			25-Oct-12	13:50	2
	BAN_27	12-Apr-11	16:15							1
Gurrundah	GUR_10	14-Apr-11	13:30	28-Feb-12	10:15	16-Aug-12	15:00	25-Oct-12	11:30	4
	GUR_16			28-Feb-12	10:05	16-Aug-12	15:15	25-Oct-12	11:40	3
	GUR_17			28-Feb-12	10:02			25-Oct-12	12:15	2
Pomeroy	POM_03	13-Apr-11	11:35	28-Feb-12	16:12	16-Aug-12	9:20	25-Oct-12	10:05	4
	POM_07	13-Apr-11	9:35	28-Feb-12	16:20	16-Aug-12	9:20	24-Oct-12	17:30	4
	POM_11	13-Apr-11	13:30			15-Aug-12	15:45	24-Oct-12	16:10	3
	POM_18	13-Apr-11	15:15			15-Aug-12	14:40	24-Oct-12	16:25	3
	POM_20			28-Feb-12	8:28			24-Oct-12	14:40	2
	POM_23	14-Apr-11	13:40	28-Feb-12	9:25	16-Aug-12	17:25	24-Oct-12	14:40	4
<b>Total</b>										<b>50</b>

### 2.1.1. Species Composition

A total of 70 bird species were recorded during the four seasonal surveys in autumn 2011 and summer, winter and spring 2012. The most commonly observed bird species were:

- Crimson Rosella
- Sulphur-crested Cockatoo
- Buff-rumped Thornbill
- Australian Magpie
- Superb Fairy-wren
- Grey Fantail
- Australian Raven
- Brown Thornbill
- Yellow-faced Honeyeater

Overall eleven species were recorded at Rotor Swept Area (RSA) height (30 to 130 metres), Sulphur-crested Cockatoo, Australian Raven, Galah, Red Wattlebird, Common Starling, Honeyeaters, Yellow-rumped Thornbill, Black-shouldered Kite, Tree Martin and Needle-tail and one species was recorded at higher than 100metres, the Wedge-tailed Eagle. All other species have been recorded on the ground or flying below 30 metres.

### 2.1.2. Notable observations on special groups from the BUS

#### Threatened Species

The majority of birds found to utilise the proposed wind farm site were common birds. Of the species recorded during the bird utilisation surveys the species below were listed as vulnerable under the *NSW Threatened Species Conservation Act 1995* (TSC Act) or as migratory species under the EPBC Act.

- Speckled Warbler (TSC Act: vulnerable)

The Speckled Warbler was recorded on one occasion during the survey in spring, when one bird was recorded flying below RSA height.

- White-throated Needletail (EPBC Act: migratory)

The White-throated Needletail was observed flying at the Gullen Range Wind Farm site during the bird utilisation survey in summer 2012. On two occasions 10 birds were observed: once flying below RSA height and the second time flying at RSA height.

No other threatened or listed bird species were recorded within the Gullen Range Wind Farm site during the pre-construction bird utilisation surveys in 2011/2012.

#### Raptors

Five raptor species were recorded during the surveys, comprising nine observations in total. The presence of these raptors varied between the seasons and generally they were recorded in low numbers.

Brown Falcon, Nankeen Kestrel, Brown Goshawk and Black-shouldered Kite were all recorded once during the survey. The Black-shouldered Kite flew at RSA height while the Brown Goshawk, Brown Falcon and Nankeen Kestrel were observed below RSA height. Over the survey period two Wedge-tailed Eagles were observed in autumn 2011 and summer 2012 below RSA height. Another Wedge-tailed Eagle was observed in spring 2012 at about 100m height within the RSA.

The Wedge-tailed Eagle is the most vulnerable raptor species to collision with operating turbines because of their soaring habits while foraging.

#### Waterbirds

Four waterbird species were recorded during the pre-construction BUS surveys, Australian Wood Ducks, Australian Grebe and Pacific Black Duck and White-faced Heron.

None of the waterbirds observed at Gullen Range Wind Farm were threatened or listed species, either under Commonwealth or state legislation.

### 2.2. Bat Utilisation studies

The methods and results of the pre-construction Bat Utilisation Studies at Gullen Range wind farm are outlined in the ngh environmental Bird and Bat Utilisation Surveys reports (ngh environmental, 2012a, 2012c, 2012d). These survey reports are attached as Appendix 1-3 to this report.

The bat surveys were undertaken consistent with the methodology described in the original Gullen Range Bird and Bat Management Plan (nghenvironmental 2012b).

Four pre-construction bat utilisation surveys were undertaken in 2011/2012. This involved three survey nights in autumn (11<sup>th</sup> to 14<sup>th</sup> April 2011), one survey night in summer (27<sup>th</sup> to 28<sup>th</sup> February 2012), two nights in winter (15<sup>th</sup> to 17<sup>th</sup> August 2012) and two survey nights in spring (24<sup>th</sup> to 26<sup>th</sup> October 2012).

Microbat utilisation was monitored using two to three Anabat detectors placed overnight for two to three nights, with microphones mounted on fence posts or trees at around one metre above ground level (nghenvironmental 2012a). The survey locations were changed after each night. The survey sites and times for each Anabat survey are detailed in Table 3.

**Table 3: Microbat (Anabat) survey sites (nghenvironmental 2012d)**

Precinct	Nearest turbine	Autumn 2011	Summer 2012	Winter 2012	Spring 2012	Cumulative no. surveys
Kialla	KIA_02	11-12-Apr-11		16-17-Aug-12	25-26-Oct-12	3
Bannister	BAN_14	12-13-Apr-11	27-28-Feb-12			2
	BAN_17		27-28-Feb-12			1
	BAN_21		27-28-Feb-12		25-26-Oct-12	2
	BAN_27	12-13-Apr-11				1
Gurrundah	GUR_16			16-17-Aug-12	25-26-Oct-12	2
Pomeroy	POM_03	13-14-Apr-11		15-16-Aug-12	24-25-Oct-12	3
	POM_11			15-16-Aug-12	24-25-Oct-12	2
	POM_18	13-14-Apr-11				1
	POM_23				24-25-Oct-12	1
Total						18

### 2.2.1. Species composition

A total of 13 bat species were recorded during the three seasonal surveys in summer, winter and spring 2012 (see Appendices 1-3). The most commonly observed bat species were:

- Large Forest Bat
- Chocolate Wattled Bat
- Little Forest Bat
- Gould's Wattled Bat
- Southern Forest Bat

These five species contributed most of the bat activity around the wind farm site. All of these species were considered common throughout the region.

### 2.2.2. Threatened species

Three threatened species listed as vulnerable under the NSW Threatened Species Conservation Act were recorded, the Eastern Bent-wing Bat, the Eastern Free-tail Bat and the Large-eared Pied Bat. The Large-eared Pied Bat is also listed as

vulnerable under the Environment Protection and Biodiversity Conservations Act (EPBC Act).

Between 1 and 24 calls of the Eastern Bent-wing Bat were recorded during seven nights of the survey, three probable calls of the Eastern Freetail Bat were recorded during one night in spring 2012 and two probable calls of the Large-eared Pied Bat were recorded during summer 2012.

### **2.3. Conclusions from the pre-construction BUS and bat surveys**

The conclusions from the BUS and other surveys in the Gullen Range Wind Farm area are presented below.

- The study area comprised paddocks and cropping land with a large forest area in the south. It supported common, predominantly farmland birds.
- The study area supported five raptor species in low numbers: Brown Falcon, Nankeen Kestrel, Brown Goshawk, Black-shouldered Kite and Wedge-tailed Eagle.
- Waterbirds were recorded in low numbers: Australian Wood Duck, Australian Grebe, Pacific Black Duck and White-faced Heron.
- Two species of listed birds were recorded utilising the study area namely Speckled Warbler and White-throated Needletail. Their activity levels in the study area were found to be comparatively low.
- Three threatened bat species were recorded in low numbers during the anabat surveys, the Eastern Bent-wing Bat, the Eastern Free-tail Bat and the Large-eared Pied Bat.

### 3. INITIAL OPERATIONAL BIRD AND BAT INFORMATION

Post-construction bird and bat surveys were undertaken by Brett Lane & Associates Pty Ltd (BL&A) from January 2015 after the completion of the wind farm in December 2014, following the methodology of the originally approved BBAMP (ngnvironmental 2012b) to meet the requirements of Condition of Approval 3.1.

The main approach to the implementation of the original BBAMP was the implementation of carcass search program to detect birds and bats that collided fatally with wind turbines. Bird utilisation and anabat surveys were also undertaken monthly between January and June 2015. Following the findings of Wedge-tailed Eagle carcasses under some turbines additional survey requirements for this key species were introduced to the monitoring regime.

#### 3.1. Bird Utilisation Survey

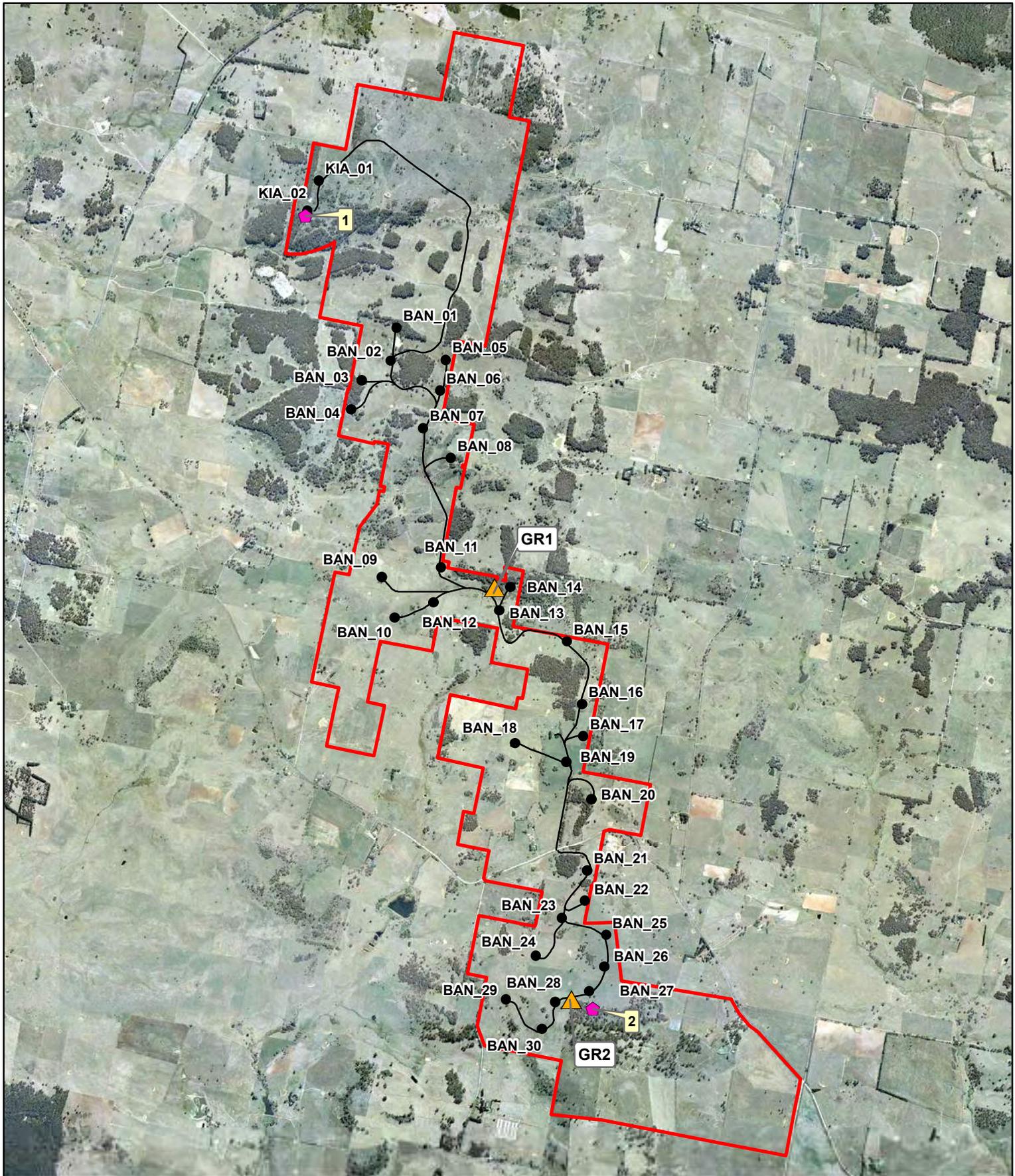
##### 3.1.1. Methodology

Bird utilisation surveys (BUS) were undertaken at the same nine survey locations used for pre-construction surveys (Autumn 2011).

The bird utilisation survey, consistent with the Birds Australia methodology, was undertaken over 9 days each month between January and May 2015 and involved a bird census over two hectares for 20 minutes at nine monitoring sites (Figure 2 and 3) within the wind farm. The methodology is described below.

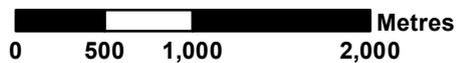
- An observer recorded all birds observed within 100x200 metre survey area including birds flying over the survey site
- Species, number of birds and flight height were documented, with flight height being recorded in 20 metre intervals that will later be classified as below, at, or above rotor swept area height (RSA height)
- Twice daily surveys were undertaken before and after the carcass searches to ensure 12 BUS are undertaken per month, covering nine locations (same as pre-survey)

Six afternoon and six dawn surveys were undertaken within each month between January and June 2015.



### Legend

- Wind farm boundary
- Tracks
- Turbines
- Bat recording sites
- Bird Utilisation Survey Sites



<b>Figure 2: Bird and Bat survey sites - North</b>		
<b>Project: Gullen Range Wind Farm</b>		
<b>Client: Goldwind Australia</b>		
Project No.: 14182	Date: 25/02/2015	Created By: M. Ghasemi / A. Stewart
<b>BL&amp;A</b> Bird Law & Associates Pty Ltd <small>Environmental Consultants &amp; Scientists</small>		
<b>Experience:</b> 20+ Years <b>Knowledge:</b> 20+ Years <b>Solutions:</b> 20+ Years	1/15, M. McClelland Road 3/15, M. McClelland Road 20 Ross St, Camberwell VIC 3184, Australia	Tel: (03) 9593 3111 / (03) 9593 3005 enquiries@ecolawandassociates.com.au <a href="http://www.ecologicalresearch.com.au">www.ecologicalresearch.com.au</a>





### 3.1.2. Species composition

A total of 82 species of birds were recorded within and close to the wind farm site during five months of observations, 61 of which were observed during the formal BUS surveys (see BL&A 2015a-e, monthly monitoring reports January to May).

The number of species recorded during the formal BUS count varied depending on the seasonal occurrence of birds in the region and weather conditions. The number of recorded species during each survey is listed below.

**Table 4: Number of species recorded during the BUS each month**

Month	Number of species
January 2015	41
February 2015	38
March 2015	36
April 2015	43
May 2015	30
June 2015	33

Although the number of species was similar between months, species composition (diversity) differed due to presence–abundance, activity and seasonal distribution of birds. Due to very high winds during the BUS, the May count of 30 species was lower than the other months (ranging from 33 to 43).

The most abundant species observed flying at RSA height were:

- Sulphur-crested Cockatoo
- Little Raven
- Yellow-faced Honeyeater
- Australian Raven
- Galah

The five most common birds at RSA heights were common species and fairly abundant over Gullen Range wind farm site.

The number of birds flying at RSA heights varied seasonally depending on their numbers at the wind farm site and the phase of their life cycle.

In addition to birds observed flying at RSA heights, two Wedge-tailed Eagles were observed over RSA heights (>130 m).

## 3.2. Raptor surveys

### 3.2.1. Methodology

A raptor survey was undertaken during the mornings between 10:00 and 11:00 am once the day had started to warm up and thermals were present. The survey involved standing at different vantage points each morning and recording all raptors that were observed flying in the vicinity of the turbines that could be viewed from these vantage points. Up to five turbines were visible from each of these vantage points.

Since a Wedge-tailed Eagle carcass was found under a turbine, on the 10<sup>th</sup> of January 2015, site wide surveys were undertaken. This involved roaming surveys starting on the 11<sup>th</sup> January 2015 where all raptors including Wedge-tailed Eagle were surveyed. All raptor flights observed were plotted on a map. Flight behaviour, heights, direction and the time of the flights were recorded.

### **3.2.2. Results**

It was observed that four pairs of Wedge-tailed Eagles inhabit the area around the wind farm site and frequently fly across areas with turbines.

## **3.3. Avoidance behaviour surveys**

### **3.3.1. Methodology**

Avoidance behaviour surveys were undertaken each morning between the times of 10:00 am and 11:00 am. This involved standing at a vantage point and recording bird behaviour close to turbines and noting if any avoidance behaviour was occurring.

### **3.3.2. Results**

No obvious avoidance behaviour of birds associated with turbines was observed during the surveys conducted between January and June 2015.

## **3.4. Bat Activity Surveys**

### **3.4.1. Methodology**

Bat activity surveys were undertaken monthly between January and June 2015 using SongMeter ultrasonic bat detectors. Surveys were undertaken at five different sites. Sites were located at areas representing woodland habitat over the wind farm, two sites were at the northern (BAN) section, two at the central (POM) section and one at the southern (GUR) section. These sites differ from the sites of the previous surveys undertaken by ngenvironmental but are considered to sample the most suitable bat habitat across the site.

It was agreed that the bat detectors were used over nine nights in January and over five nights each month between February and June 2015. The reason for the extended survey length of nine nights during January was to collect data that would be suitable for a statistical analysis should the BBAMP at some stage be modified to suit the most recent standards based on discussions of BL&A with the Office of Environment and Heritage (OEH) on other wind farms in NSW. Figure 2 and 3 show the locations of the sites (including one spare site should a SongMeter fail to record data for technical reasons). Monthly surveys from February to June were undertaken for five survey nights in accordance with the approved BBAMP.

Bat calls were analysed by Dr. Greg Richards (Greg Richards and Associates Pty Ltd.). Records of bat presence and absence were compiled for the common species and detailed call counts for the threatened species.

### 1.1.1. Results

During the January to June 2015 anabat surveys, 12 species of bat and one bat species complex (Bent-wing Bat/Forest Bat) were recorded.

The 12 species included 10 common and widespread species and two threatened species, the Eastern Bent-wing Bat and Large-eared Pied Bat, which were recorded in low numbers. Both species are listed as *vulnerable* in NSW under the NSW TCS Act.

The list of species is similar to that recorded previously by ngenvironmental in 2012. Note that the Southern Freetail Bat was recorded in 2012, but has not been recorded so far in 2015.

## 3.5. Bird and bat carcass searches

### 3.5.1. Methodology

In accordance with the currently approved BBAMP, the carcass searches involved intensively searching around a turbine for dead or injured birds and bats. Procedures for the carcass searches are detailed below.

- Monthly carcass searches were carried out at 30 to 32 target turbine sites, 16 turbines in focus areas and between 14 to 16 turbines in non-focus areas. Each turbine was surveyed four times each month.
- The turbines were searched to a radius of 60 metres (turbine swept area plus 10 metres).
- The searcher walked transects about six metres apart, searching a zone three metres either side for dead birds and bats across the circular search area.
- On finding a dead bird, feather-spot or dead bat, the searcher:
  - Removed it from the site to avoid re-counting; and
  - Transferred it to a freezer at the site office for storage so it can be identified and used in observer efficiency and scavenger trials (see below).

When a dead bird or bat is recorded from under a turbine the species is recorded as a carcass with a report number. When only feathers are recorded this is recorded as a feather spot. It is likely that feather spots represent a bird that has collided with a turbine and has then been scavenged and the feathers are all that remains after scavenging. An incidental record is a carcass that was found under a turbine outside the formal carcass searches, by either the observer or wind farm personnel.

The turbines listed below are the focus area turbines selected in the approved BBAMP.

- Kia 01
- Ban 01
- Ban 02
- Ban 04
- Ban 05
- Ban 14

- Ban 15
- Ban 21
- Pom 03
- Pom 07
- Pom 11
- Pom 18
- Pom 20
- Pom 23
- Gur 10
- Gur 16

The non-focus area turbines surveyed have been varied to ensure all 73 turbines have been searched at least once by the end of the six-month survey period of the initial BBAMP.

It is noted that the survey design for the approved BAMP does not permit an overall estimate of the numbers of birds and bats affected by the wind farm to be derived using available statistical methods. This limitation has been addressed in this revised BBAMP.

### **3.5.2. Results**

In January, twelve carcasses including nine bats and three birds were recorded under the searched turbines. Four feather spots were also recorded during this time and one bird carcass was recorded incidentally under a non-target turbine (Peregrine Falcon).

In February, 17 carcasses including 15 bats and two birds were recorded under targeted turbines. Four feather spots were recorded during this time and two bat carcasses were recorded incidentally under non-target turbines.

In March, 12 carcasses including 11 bats and one bird were recorded under targeted turbines. Eight feather spots were recorded.

In April, 15 carcasses including ten bats and five birds were recorded under targeted turbines. Four feather spots were also recorded.

In May, eight carcasses including two bats and six birds were recorded under targeted turbines. Three feather spots were also recorded during this time.

In June, five bird carcasses and no bat carcasses were recorded under targeted turbines.

No threatened bird or bat species have been recorded as casualties under turbines. Six Wedge-tailed Eagle carcasses were recorded under targeted turbines, one in January (POM20), one in March (POM17), two during the May surveys (BAN15 and POM17) and two in June (POM12 and GUR02). In accordance with Condition 2.37, payments have been made to WIRES for each carcass of a Wedge-tailed Eagle found during the monthly surveys.

The details of bird and bat carcasses found under turbines are provided in the BL&A monthly monitoring report (BL&A 2015 a-f) and summarized in Table 5.

**Table 5: Summary of monthly carcass results**

	Bats	Birds	Birds + Bats	Feather spots	Incidental
January	9	3	12	4	1
February	15	2	17	4	2
March	11	1	12	8	1
April	10	5	15	4	0
May	2	6	8	3	0
June	0	3	3	2	0
<b>Total</b>	<b>47</b>	<b>20</b>	<b>67</b>	<b>25</b>	<b>4</b>

In addition, a feather spot of a Spotted Harrier, a threatened species listed as vulnerable in Schedule 2 of the NSW threatened species TSC Act, was found in July 2015 and OEH has been notified of this.

The number of carcasses found within six month during the turbine carcass search program, excluding incidental observation at other turbines (91 carcasses/featherspots) seems to be high compared to other wind farms. Hence, BL&A undertook a comparison of the number of carcasses per turbine search found at GRWF with two wind farms in the same region.

The survey effort differed for these wind farms considerably as at GRWF each turbine was searched four times per month, whereas at other wind farms a selection of turbines is usually only searched once or twice per month. Moreover, usually a random selection including a third of all turbines are searched repeatedly each month, whereas at GRWF a fixed focus group of 16 turbines plus changing groups of 14-15 turbines have been searched each month (i.e. 30-31 turbines out of 73 turbines, which equates to over 40% of the turbines).

Table 6 shows the average number of carcasses found per turbine search at GRWF compared to the other two wind farm sites.

The comparison shows that the average number of carcasses found per turbine search does not differ considerably, 0.12 carcasses were found per turbine search at GRWF and 0.11 and 0.12 at the other two wind farm sites. The higher number of overall carcasses found is due to the much higher search effort at GRWF compared to other wind farms in the region.

Within six month of carcass monitoring, six Wedge-tailed Eagle carcasses have been found at GRWF (four during the formal turbine searches), resulting in 0.005 birds found per turbine search, compared to 0.022 at the first wind farm site used for comparison and 0.005 at the second wind farm site.

Table 6: Wind farm carcass per turbine search comparison

	No of turbine searches	Bird carcass		Bird featherspot		Wedge-tailed Eagle carcass		Wedge-tailed Eagle feather-spot		Bat carcass		Overall mortality totals	
		Total	Ave per search	Total	Ave per search	Total	Ave per search	Total	Ave per search	Total	Ave per search	Total	Average per search
GRWF	768	13	0.017	25	0.033	4 <sup>#</sup>	0.005	0	0.000	49	0.064	91	0.12
Wind farm 1	180	1	0.006	1	0.006	4	0.022	0	0.000	13	0.072	19	0.11
Wind farm 2	204	1	0.005	7	0.034	1	0.005	1	0.005	14	0.068	24	0.12

<sup>#</sup> plus incidental observations at other turbines

The GRWF search results involved six months from Jan - June 2015, while the other two sites include 12 months of data is from the first year of surveys. All totals exclude incidental observations and reference sites.

Wind farm 1: Carcass searches consisted of 1 monthly search at 15 turbines totalling 180 searches in the 1<sup>st</sup> year (October 2009 – September 2010). These searches were conducted in a 50m radius of each turbine for 40mins by 2 surveyors (20 mins each).

Wind farm 2: Monthly searches took place at 17 turbine sites from March 2010 – Feb 2011. Impact sites were selected randomly from 65 turbine sites. Sites were searched in 50 radius. Eight circular transects 6 metres apart were walked in each search area. An observer walked transects at a speed approximating 30 to 60 metres per minute.

## 4. RISK ASSESSMENT FOR GULLEN RANGE WIND FARM

### 4.1. Introduction to the Risk Assessment for Gullen Range Wind Farm

BL&A undertook a risk assessment for a number of species and bird groups considered to be at potential risk of turbine blade strike at the approved Gullen Range Wind Farm development in southern New South Wales.

The species and bird groups assessed were listed threatened and migratory species recorded on the site during the original impact assessment (nghenvironmental 2008) or subsequently during pre- and post-construction bird and bat investigations on the site. In addition, discussions and correspondence between staff from the Office of Environment and Heritage, NGRWF, and Brett Lane and Associates Pty Ltd have informed the short-list of species for risk assessment. The species and bird groups assessed included:

- Scarlet Robin
- Varied Sittella
- Powerful Owl
- Waterbirds
- White-throated Needletail
- Little Eagle
- Wedge-tailed Eagle
- Spotted Harrier
- All other raptors
- Eastern Bent-wing Bat

The objective of this risk assessment is to guide the development of the revised Bird and Bat Adaptive Management Program (BBAMP) for the Gullen Range Wind Farm by identifying those species or groups considered at greater potential risk from either collision with or disturbance by the operation of the wind farm. The outcomes of this risk assessment enable more targeted monitoring and management measures to be included in the revised BBAMP, focussing on species and groups at greater risk.

### 4.2. Risk Assessment Process

The risk assessment process was based on the Risk Evaluation Matrix Model used to measure the overall risk of a potential impact event, in this case birds or bats striking wind turbine blades or being deterred from using part of the wind farm due to disturbance, based on the *likelihood* of that event, and, should it occur, its *consequences*. This model is currently used across a wide range of industry sectors, in particular, assessing environmental risk.

The Risk Evaluation Matrix Model also complies with the ISO31000 Risk Assessment Standard: Applying the ISO31000 Risk Assessment Framework to Coastal Zone Management. Proceedings of the 20<sup>th</sup> NSW Coastal Management Conference (Rollason, V., Fisk, G. & Haines, P. 2011).

The model requires criteria to be developed for likelihood and consequence. These criteria are provided in Table 7 and Table 8 below. Table 9 shows the risk levels used and how they are determined.

**Table 7: Likelihood Criteria**

<i>Likelihood</i>	<i>Description</i>
<i>Certain</i>	It is very probable that the risk event could occur in any year
<i>Almost Certain</i>	It is more probable than not that the risk event could occur in any year
<i>Likely</i>	It is equally probable that the risk event could or could not occur in any year
<i>Unlikely</i>	It is less probable than not that the risk event could occur in any year
<i>Rare</i>	It is improbable that the risk event could occur in any year. The risk event is only theoretically possible, or would require exceptional circumstances to occur.

**Table 8: Consequence Criteria**

<i>Negligible</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>Severe</i>
Occasional individuals lost but no reduction in local or regional population viability.	Repeated loss of small numbers of individuals but no reduction in local or regional population viability.	Moderate loss in numbers of individuals, leading to minor reduction in localised or regional population viability for between one and five years.	Major loss in numbers of individuals, leading to reduction in regional or state population viability for between five and ten years.	Extreme loss in numbers of individuals, leading to reduction in regional or state population viability for a period of at least 10 years

**Table 9: Risk matrix defining risk level based on likelihood and consequence**

		Consequence				
		<i>Negligible</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>Severe</i>
Likelihood	<i>Certain</i>	<i>Negligible</i>	<i>Low</i>	<i>High</i>	<i>Severe</i>	<i>Severe</i>
	<i>Almost Certain</i>	<i>Negligible</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>Severe</i>
	<i>Likely</i>	<i>Negligible</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>High</i>
	<i>Unlikely</i>	<i>Negligible</i>	<i>Negligible</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>
	<i>Rare</i>	<i>Negligible</i>	<i>Negligible</i>	<i>Negligible</i>	<i>Low</i>	<i>Low</i>

The relevant likelihood and consequence levels were determined by using data recorded from the wind farm site and with reference to any available information on the local and regional status of the species and bird groups concerned. The reports below were used to determine the relevant likelihood and consequence of any impact.

### Previous bird and bat studies

This information has been generated from the Bird Utilization Survey (pre-construction), for birds and bats, and carcass monitoring since commissioning of the Gullen Range Wind Farm.

A list of bird and bat studies undertaken at the Gullen Range Wind Farm has been collated and is listed in Section 2 in the BBAMP.

The results of on-site investigations of birds and bats that have informed this risk assessment are summarised in the previous section of this report.

Table 10 provides the results of the likelihood and consequence assessment based on the inputs from the aforementioned sources and includes the following information as part of the risk assessment process:

- 1) Environmental value to be protected
- 2) Hazard or source event
- 3) Findings from bird utilization surveys (2008) and carcass searches since commissioning (2014/2015)
- 4) Consequence score and likelihood scores
- 5) Risk rating
- 6) Comments relating to risk rating scores
- 7) Risk management strategies
- 8) Residual consequence and Likelihood scores
- 9) Residual risk rating

Table 10 includes a summary of the previous findings for each considered species or group and their relevance to the assessment.

### 4.3. Risk Assessment Results

The final risk assessment for species and groups is the residual risk, which takes account of mitigation measures included in this BBAMP.

The risk associated with wind turbine collision and indirect habitat modification at the Gullen Range Wind Farm for most birds and for the Eastern Bent-wing Bat was rated as *Negligible*. The exceptions are described below.

The residual risk rating for White-throated Needletail was *Low* for collision and *Negligible* for disturbance given the extensive nature of this species' aerial habitat.

The residual risk rating for the Wedge-tailed Eagle was considered *Moderate* for collision and negligible for disturbance, given the presence of eagles at most wind farms, including breeding within 200 metres of operating turbines, and the occurrence of collisions involving this species at many.

The residual risk rating for Spotted Harrier was considered negligible for collision and disturbance, since no Spotted Harrier has been observed during the pre- and post-construction BUS surveys, except for one feather spot during carcass monitoring.

Other raptors were rated as at *Low* risk due to potential collision with turbines and at *Negligible* risk from disturbance.

**Table 10: Bird and Bat Risk Assessment – Gullen Range Wind Farm**

Value to be Protected	Hazard or Source Event	Studies to date	Threatened species status	Consequence	Likelihood	Rating	Comments	Residual Consequence	Residual Likelihood	Residual Risk Rating
Scarlet Robin	Collisions with operating turbines	Nil carcasses found	Vulnerable TSC Act	Negligible	Unlikely	Negligible	Flight height studies indicate that Scarlet Robin fly at heights of 20 metres or less. This is below the RSA. Has not been recorded as a turbine strike event.	Negligible	Unlikely	Negligible
Scarlet Robin	Indirect disturbance i.e. habitat modification	No evidence from on site observations that this species is affected indirectly by wind turbines	Vulnerable TSC Act	Negligible	Unlikely	Negligible	No evidence from on site observations that this species is affected indirectly by wind turbines.	Negligible	Unlikely	Negligible
Varied Sittella	Collisions with operating turbines	BUS surveys, and monitoring	Vulnerable TSC Act	Negligible	Unlikely	Negligible	Inhabits eucalypt forests and woodlands flying at canopy level. Up to 10 individuals seen during BUS survey.	Negligible	Unlikely	Negligible
Varied Sittella	Indirect disturbance i.e. habitat modification	BUS surveys, targeted surveys	Vulnerable TSC Act	Negligible	Unlikely	Negligible	Inhabits eucalypt forests and woodlands flying at tree canopy level. Up to 10 individuals seen during BUS survey.	Negligible	Unlikely	Negligible
Powerful Owl	Collisions with operating turbines	BUS surveys, targeted surveys	Vulnerable TSC Act	Low	Unlikely	Negligible	Inhabits eucalypt forests and woodlands flying at tree level. Nests identified and being monitored. Currently subject to seasonal turbine shutdown to protect dispersing juveniles	Negligible	Unlikely	Negligible
Waterbirds	Collisions with operating turbines	BUS surveys	N/A	Low	Unlikely	Negligible	Surveys to date indicate limited numbers of waterbirds in and around Gullen Range Wind Farm	Low	Unlikely	Negligible
Waterbirds	Indirect disturbance i.e. habitat modification	BUS surveys	N/A	Negligible	Unlikely	Negligible	Surveys to date indicate limited numbers of waterbirds in and around Gullen Range Wind Farm	Negligible	Unlikely	Negligible

Value to be Protected	Hazard or Source Event	Studies to date	Threatened species status	Consequence	Likelihood	Rating	Comments	Residual Consequence	Residual Likelihood	Residual Risk Rating
White-throated Needletail (WTN)	Collisions with operating turbines	Known to potentially occur in area	Listed / Marine Migratory Species EPBC Act	Moderate	Unlikely	Low	Highly migratory species. Known to follow storm systems and fronts. Occasional mortality on other wind farms in region and elsewhere. They typically fly well above the RSA.	Moderate	Unlikely	Low
White-throated Needletail (WTN)	Indirect disturbance i.e. habitat modification	Known to potentially occur in area	Listed / Marine Migratory Species EPBC Act	Negligible	Unlikely	Negligible	The presence of turbines is not expected to cause significant indirect disturbance to White-throated Needletail given their extensive movements	Negligible	Unlikely	Negligible
Little Eagle	Collisions with operating turbines	BUS surveys, targeted surveys	Vulnerable TSC Act	Low	Unlikely	Negligible	There have been no observations of Little Eagle on the wind farm site (to June 2015). An unconfirmed nest sighting was reported in 2011.	Negligible	Unlikely	Negligible
Little Eagle	Indirect disturbance i.e. habitat modification	BUS surveys, targeted surveys	Vulnerable TSC Act	Negligible	Unlikely	Negligible	There have been no observations of Little Eagle recently. An unconfirmed nest sighting was reported in 2011.	Negligible	Unlikely	Negligible
Wedge – tailed eagle	Collisions with operating turbines	Regularly identified during BUS surveys. Mortality noted to-date (5 carcasses in 2015)	N/A	Moderate	Almost certain	Moderate	Regular Wedge-tailed Eagle population in and around Gullen Range Wind Farm (min. four pairs).	Moderate	Almost certain	Moderate
Wedge tailed eagle	Indirect disturbance i.e. habitat modification	Regularly identified during BUS surveys. Mortality but not disturbance noted to-date	N/A	Negligible	Likely	Low	Wedge tailed eagle habitat mitigation measures to be incorporated into BBAMP. Eagles have been recorded breeding within 200 m of turbines in the region.	Negligible	Unlikely	Negligible

Value to be Protected	Hazard or Source Event	Studies to date	Threatened species status	Consequence	Likelihood	Rating	Comments	Residual Consequence	Residual Likelihood	Residual Risk Rating
Spotted Harrier	Collisions with operating turbines	Not recorded during pre- and post construction BUS surveys. One feather spot found in July 2015.	Vulnerable TSC Act	Negligible	Unlikely	Negligible	Surveys to date indicate very low numbers of Spotted Harrier in and around Gullen Range Wind Farm. None have been observed so far.	Negligible	Unlikely	Negligible
Spotted Harrier	Indirect disturbance i.e. habitat modification	Not recorded during pre- and post construction BUS surveys. One feather spot found in July 2015.	Vulnerable TSC Act	Negligible	Unlikely	Negligible	The presence of turbines is not expected to cause significant indirect disturbance to Spotted Harrier given their low numbers in the area.	Negligible	Unlikely	Negligible
All other Raptors	Collisions with operating turbines	Regularly identified during BUS surveys. Consistent population  Mortality of WTE noted to-date	N/a	Low	Likely	Low	Turbine strikes of other raptor species may occur, however this may not be striking species. Important to monitor and have a protocol to respond.	Moderate	Unlikely	Low
All other raptors	Indirect disturbance i.e. habitat modification	Numbers continue to be consistent across site	n/a	Low	Likely	Low	Roaming surveys indicate raptors continue to use the site and are not exclude from areas around turbines.	Low	Unlikely	Negligible

Value to be Protected	Hazard or Source Event	Studies to date	Threatened species status	Consequence	Likelihood	Rating	Comments	Residual Consequence	Residual Likelihood	Residual Risk Rating
Eastern Bent-wing Bat	Collisions with operating turbines	Nil carcasses found	Vulnerable TSC Act	Negligible	Unlikely	Negligible	<p>Carcass searches have recorded four common bat species but not Eastern Bent winged Bat.</p> <p>Bat utilization studies over a number of years on the wind farm have recorded low levels of activity on site. This indicates collision is likely to be a very rare event with no significant population consequences for the species.</p>	Negligible	Rare	Negligible
Eastern Bent-wing Bat	Indirect disturbance i.e habitat modification	Low numbers recorded on site.	Vulnerable TSC Act	Negligible	Unlikely	Negligible	Significant indirect impacts are not considered likely.	Negligible	Rare	Negligible

#### 4.4. Conclusions from the Risk Assessment for Gullen Range Wind Farm

Over the last 8 years, detailed studies during planning, pre- construction and most recently over the first 6 months of operations have been undertaken. This has included bird utilization surveys and targeted surveys for Powerful Owl, Little Eagle and Eastern Bent-wing Bat. Monthly carcass searches have been undertaken over 6 months since January 2015. The surveys to date, combined with the knowledge generated at other wind farms elsewhere in Australia, indicates that collision rates are within the average range of collision rates found at other wind farms in the region. This risk assessment indicates that no significant population-wide impacts are anticipated for species of concern.

Raptors are known to be vulnerable to collision with operating wind turbines. A number of raptor species have been recorded at the Gullen Range Wind Farm site during formal surveys. The Wedge-tailed Eagle is the most exposed to collision risk due to its common habit of soaring and circling at height while foraging. There is evidence of an initial moderate level of Wedge-tailed Eagle interaction at the Gullen Range Wind Farm. The mainland sub-species of the Wedge-tailed Eagle is not a threatened species, but has been identified during the risk assessment to be at *moderate* risk from collision with wind turbines. The Wedge-tailed Eagle has a population size of tens of thousands and wind farms occupy a very small percentage of the species range in NSW. Cumulative impacts are of concern at a regional scale (e.g. in the Goulburn region) and the proposed monitoring and mitigation measures are considered appropriate for this common and widespread species (see Section 5.2.2).

Little Eagle has been identified to have a negligible risk for collision and disturbance as an unconfirmed nest sighting was reported in 2011, but no observations of Little Eagle have been made recently, including during the quite intensive site investigations by experienced ornithologists briefed to search for the species.

White-throated Needletail is a migratory species considered to have similar flight behaviour to raptors. It should be noted that White-throated Needletail is listed as a migratory species under the EPBC Act and are unlikely to be locally common. Its conservation status is listed as secure both at a state and Commonwealth level.

Threatened species (TSC Act) recorded in the area, such as Scarlet Robin, Varied Sittella and the Powerful Owl were all recorded below 20m AGL and, therefore, below turbine rotor swept area (RSA) height. These species are not known to venture above tree canopy height. There are no reports of any of these species in the carcass searches to date. The Little Eagle was inferred to inhabit the area based on the recording of a nest in 2011 that was attributed to the Little Eagle. Little Eagle have not been recorded in recent surveys on the site, despite intensive survey effort.

A feather spot of a Spotted Harrier, vulnerable under the TSC Act, was found in July 2015. This species has not been recorded during pre- and post construction surveys at Gullen Range wind farm before and thus the risk to this species' population is considered low.

Large numbers of waterbirds are unlikely to use the site due to a lack of extensive wetland habitat. They have not been recorded in high numbers during the bird utilization surveys and are generally confined in very small number to the many small farm dams on the wind farm site.

## 5. FUTURE OPERATIONAL SURVEYS

This section describes revisions to the BBAMP to provide a more effective monitoring regime and decision triggers for relevant management mechanisms. The revision of the BBAMP has benefited from the results of the first 6 months of BBAMP investigations as well as experience at a broad range of wind farms.

A range of approaches will be utilised in future to meet the requirements of the relevant conditions of approval 3.1, 2.33, 2.36 and 2.37 as described in this section of the BBAMP.

Section 5.1 provides an overview of the changes to the BBAMP;

Sections 5.2 to 5.4 describe the revised survey methodologies (birds, bats and carcass surveys) that would be implemented once the BBAMP is approved by DPE.

### 5.1. Overview of changes to the BBAMP

The methodology of the initial BBAMP does not reflect the latest discussion with OEH and is not in accordance with the survey methodology more recently approved for other wind farm projects in the area. The approach to the carcass searches in the initial BBAMP does not provide for statistically robust analysis since turbines have not been chosen randomly, leading to possible bias in any estimates of mortality rates. In addition, the initial approach, whereby non-focus turbines are surveyed in rotating groups resulting in these only being surveyed every four months and not monthly leads to wider confidence limits on any estimates of mortality. Table 11 shows a comparison of the methodology prescribed by the initial BBAMP and the revised methodology presented in this BBAMP.

**Table 11: Comparison of initial BBAMP methodology and proposed revised methodology**

Initial BBAMP methodology	Revised BBAMP methodology	Justification
Monthly surveys for up to nine months	Monthly (carcass) surveys for another year (overall two years of surveys)	One year of surveys allows for a statistically robust estimate of mortality rate at the wind farm, something not possible given the current carcass search sampling design.
Monthly carcass searches of 16 focus area turbines and a changing 14-15 non-focus turbine group each month (=30 turbines) repeated four times per month up to nine months	Monthly carcass searches of a third of all turbines (24 randomly chosen turbines and five reference sites) for another year (including pulse searches, which repeats each turbine search within two days to provide an estimate of the rate at which carcasses appear)	Randomly chosen turbines repeatedly surveyed each month allow for a statistically robust estimate of bird and bat collision rates at the wind farm. One repeat survey of each turbine is sufficient each month (pulse search) to provide over the medium- to long-term, an estimate of the rate at which carcasses appear.
Scavenger search using chicken (one trial)	Scavenger and observer trials using local birds and bats (two trials, one when grass is high and one when grass is low)	Two scavenger and observer trials during different grass heights allow for more precise observer efficiency correction factors and changes to scavenging rate to be calculated.

Initial BBAMP methodology	Revised BBAMP methodology	Justification
Monthly BUS with a minimum of 12 BUS points surveyed per month, twice daily during carcass searches, 100 x 200m survey areas, 20 minutes, overall covering 9 locations	Four further BUS are proposed, one in each season	Current data collection is considered sufficient to compare pre- and post- operational bird species and numbers at survey points. Pre- and post-construction bird utilisation data have been collected using an alternative method, as specified in the approved BBAMP, with the consequence that detecting real wind farm impacts will not be possible with any statistical rigour. Further surveys are proposed post-construction at the request of OEH.
Monthly Anabat surveys with four surveys per month, overall covering 10 locations	Two more intensive Anabat surveys (one in late spring and one in late summer-early autumn), coinciding with the Eastern Bent-wing Bat migration season are proposed at 10 survey locations	Provides more data on bat activity collected in sufficient volume per site to enable detection of any migrating Eastern Bent-wing Bat
Monthly avoidance behaviour surveys during carcass searches	Avoidance behaviour will be noted during all surveys, if birds are observed in proximity to the Rotor Swept Area (RSA)	Current BBAMP design failed to detect avoidance behaviour due to low bird activity levels on the wind farm site. This is likely to be an infrequent occurrence for which it is hard to collect any meaningful data. Without a statistically useful volume of data (not feasible), it is unclear how this can inform management. Issues can effectively be dealt with through modelling, if required.
Monthly locality surveys, noting weather patterns and change in land use, etc	Weather patterns and changes in land use will be noted during each survey Wind farm operator collects very intensive weather observations and these can be referenced, if required.	Use of wind farm collected data considered valid and cost-effective.
Monthly reporting	Monthly summary reporting Full annual carcass search, mortality estimate, BUS and Anabat® reports.	Rationalises data analysis and reporting into short monthly progress reports and annual detailed analysis and reporting of all investigations.

Initial BBAMP methodology	Revised BBAMP methodology	Justification
Annual reporting without statistical analysis	Annual reporting including a statistical analysis estimating the mortality rate of birds and bats and associated confidence limits	A more comprehensive reporting strategy that allows for “whole of farm” mortality rate estimation.

The main approaches to the implementation of the BBAMP will be:

- BBAMP consistent with recent approaches for other NSW and Victorian wind farms; and
- A statistically robust carcass –monitoring program (random or stratified random design) to detect birds and bats that collide fatally with wind turbines as a basis for an annual estimate of bird and bat collision rates;
- Specific management plans and measures for key species and group;
- Surveys with a specific focus on at-risk species (e.g. Wedge-tailed Eagle or Powerful Owl) as identified in the risk assessment and/or initiated due to a specific impact trigger;
- Mitigation measures to reduce the possible interactions between birds and bats, and operating wind turbines.

The final scope and effort for post-construction monitoring and management will be agreed upon with OEH prior to seeking DPE approval of this revised BBAMP and implementing this BBAMP. More detailed descriptions of these approaches is provided in the following sub-sections.

Carcass-searches are expected to be carried out for a total of one year following commencement of the operational phase of the GRWF, with a review and compilation of all monitoring data undertaken in the first year to determine if further, more targeted, surveys will be required in the second year.

## 5.2. Bird Surveys

### 5.2.1. Point Count Bird Utilisation Surveys (BUS)

Experience from other wind farms indicates that ongoing bird utilisation surveys (BUS) provide varying levels of information. Bird utilisation data was collected during monthly surveys for the first ten months of operation of the GRWF in 2014/15. These surveys included both general utilisation surveys and specific raptor surveys and are considered sufficient to measure change in general utilisation by birds since construction of the GRWF.

Post-construction BUS surveys will be undertaken in all four seasons during the additional survey year as requested by OEH. Note that the utilisation surveys in the approved BBAMP have not been undertaken in a manner that enables meaningful pre- and post-construction comparison of control and impact areas, only of impact areas. Therefore attributing changes in bird activity to wind farm impacts will not be possible and although the data will provide an indication for the more abundant species of any changes over time, attributing these to the operation of the wind farm will not be possible for these historical reasons. Given this history and the scope of the approved BBAMP, OEH’s request for use of a BACI sampling design is too late. Thus it is recommended the results of the utilisation surveys be analysed and presented in the annual report for OEH’s benefit. At that time, the need for

continuation of this aspect of the BBAMP should be critically evaluated based on an objective view of its value in informing compliance and adaptive management.

More specific and targeted monitoring of “at risk” groups is considered much more valuable and the scope of these surveys is presented below. Data from these surveys can also rapidly inform adaptive management when (linked to impact triggers in this revised BBAMP).

### 5.2.2. *Wedge-tailed Eagle and other raptor surveys*

Since the significant impact trigger as defined in the original BBAMP has been reached for this species, further investigations are proposed as follows.

In order to better understand breeding success and the use of the wind farm site, further surveys are recommended. The monitoring of nearby eagle nests (within wind farm site and adjacent woodlands) will be continued. This would involve talking to landowners about eagle nests observations and checking on nests in nearby woodlands at a monthly basis.

Surveys of raptor flight paths and eagle activity at the wind farm site will be continued to understand better how this species and other raptors are using the area and therefore where the risk behaviour is coming from and how the site might be managed in a targeted way to reduce the incidence of risk behaviour. Monitoring ‘at risk’ groups

The key “at risk” groups have been identified through the risk assessment (see Section 4). These include:

- **Wedge-tailed Eagles (WTE).** A moderate risk to WTE has been assessed (Table 8). Accordingly, it is important that mitigation measures are implemented, to reduce WTE being attracted to the vicinity of the turbines and that further information is compiled on the WTE population at the locality and the flight behaviours that could present a risk to WTE.
- **Raptors and White-throated Needletail.** On site occurrence of these species will be recorded during the targeted eagle surveys described above.
- **Powerful Owl.** Risks to and responses for this species are considered in more detail in the Powerful Owl Management Strategy (POMS) (BL&A, in prep.), to be reviewed shortly by OEH. The approved POMS forms a species specific sub-plan of this BBAMP (Appendix 5) and it will be implemented concurrently with the activities described in this plan.

In the event that threatened birds (Scarlet Robin, Varied Sitella, Powerful Owl or Little Eagle) or threatened bats (Eastern-Bent-winged Bat, Large-footed Myotis and/or Eastern False Pipistrelle) are found during carcass searches, or incidentally, an appropriate response will be identified in consultation with OEH, as described in the procedure in Section 7 of this BBAMP.

### 5.3. Bat Migration Surveys

Monthly ultrasonic bat surveys involving four survey locations per month have been implemented over ten months since January 2015. This has generated data that will be reported upon at the end of the first year of monitoring. No further general bat activity surveys are warranted.

The risk assessment for the Eastern Bent-wing Bat indicated a negligible risk to the species from the Gullen Range Wind Farm. This is considered accurate based on experience at wind farms that are closer to the presumed migration route from Wee Jasper cave north-east and

east onto the Illawarra and nearby southern NSW coastal plain (G. Richards, pers. comm.) and based on knowledge of the usual flight height in cleared agricultural country of this and the related Southern Bent-wing Bat in Victoria (BL&A unpubl. data). However, concern over the presence of migrating Eastern Bent-wing Bat at other southern New South Wales wind farms indicates that two more periods of ultrasonic surveys (10 locations for each survey period) are warranted during the spring and late summer-early autumn migration periods for this species. Provided these surveys do not find evidence of migration across the wind farm site then no further surveys will be required.

The two 2015-16 bat migration surveys will involve the establishment of ten survey locations, for each period, in representative habitats across the wind farm site where detectors will be set up before the usual migration period of the species to and from the Wee Jasper and Drum maternity caves. Through liaison with Dr Doug Mills from OEH, who monitors the species' arrival and departure from the Wee Jasper cave, it will be possible to refine the survey timing to detect if regular migration by this species is occurring across the wind farm site. If an elevated rate of Eastern Bent-wing Bat activity is found compared with the baseline and post construction surveys undertaken to date is not found then no further bat activity surveys are considered necessary.

Note, as an additional monitoring measure, bat detectors were mounted at height, on the nacelles of two turbines, during the autumn 2016 Eastern Bentwing Bat migration period (D. Mills, OEH, pers. comm.). The bat utilisation data for the species collected to date will be analysed for an interim report.

#### 5.4. Carcass searches

The purpose of detecting mortality is to determine the actual impact of the wind farm on birds and bats by attempting to estimate the annual number of birds and bats that collide fatally with turbines. Mortality rates will be estimated for all bird species combined, and all bat species combined based on a modified sampling design, as recommended in this revised BBAMP. The locations of the randomly selected 24 turbines for carcass searches are shown in Figures 4 and 5, which also show the location of the five reference sites.

Mortality is defined as any dead bird or bat detected under wind turbines and within a distance of the turbines in which carcasses could potentially fall if struck. Detection can be either during the formal carcass searches (designed to generate an estimate) or at other times (incidental observation, often from wind farm operational staff).

Collision by birds and bats with wind turbines will be monitored through a rigorous carcass-search program for a minimum period of one year after the first twelve months of monitoring. This will build upon the initial monitoring, and will implement a systematic approach to ensure statistically useable and robust results are generated from the carcass monitoring program. The November carcass search period will be aligned with the migration season of the Eastern Bent-wing Bat.

As an additional measure, intensive carcass searches were undertaken during the known Eastern Bent-wing Bat (EBWB) autumn migratory period in 2016 (D. Mills, OEH, pers. comm.). No carcasses of this species were detected during this additional monitoring. An interim report on the autumn 2016 bat investigation, initiated at OEH's request, will be provided to OEH.

It will be assumed that any intact dead bird or bat or bird feather spot (defined as a clump of five feathers or more), detected beneath a turbine has died as a result of collision or interaction with a turbine, unless there are obvious signs of another cause of death (e.g.

being shot). Feather spots will be assumed to be remains of a bird carcass after scavenging and the scavenger correction factor will not be applied to them (see later). The number of feather spots will be corrected based on the number found at the proposed five reference search sites located at last 350 metres from operating wind turbines.

Ongoing monitoring of mortality from blade strike at operating wind farms typically serves to (i) provide data that can inform adaptive management of the collision risk (i.e. patterns of mortality related to seasonal changes or local conditions); and (ii) detect mortality of threatened and non-threatened bird and bat species, which can be used to understand actual bird and bat impacts.

The search protocol has been designed to optimally detect key species of interest and also any other species that have fatally collided with turbines. The consistent application of this protocol will ensure that statistically robust, spatially and temporally consistent data on all bird and bat mortality is collected.

To derive accurate mortality rates it is essential that the program is scientifically and statistically robust. A number of factors, such as scavenging and detectability, can affect mortality rate estimates and must be measured and included in any estimate of overall mortality rates. A scavenged carcass may increase the variability in mortality rate estimates and thus carcasses will be assessed for possible scavenging and rates will be estimated from experimental trials (sections 5.4.3 and 5.4.3). Human detectability of carcasses is also a potential confounding variable and protocols have been developed to control for this and incorporate this factor into the final mortality estimates.

The interpretation of carcass search results, including the design of the search program, scavenger trials and detectability trials (see sections 5.4.3 and 5.4.4) are determined by statistical considerations. In developing the methods for this plan, advice has been sought from Symbolix Ltd, who provided a statistical report for this plan (Appendix 2). The practical considerations that have informed the design of the trials are listed below.

- Very few carcasses are found under wind turbines in Australia compared with Northern Hemisphere wind farms (i.e. on average, less than half the number in the Northern Hemisphere based on BL&A data across ten wind farms);
- Carcasses of a suitable range of sizes for scavenger and detectability trials are difficult to source and usually involve a combination of carcasses found under turbines and those found along roads. It is illegal to source un-cleaned carcasses from poultry producers.
- For statistical reasons, it is likely to be very difficult to determine more than the grossest of differences in scavenging rate or detectability across the year and there is no evidence in the literature for significant differences between seasons in scavenger activity.
- It is known that detectability will be easier in short grass in the dry time of the year compared to in longer grass in the wet time of the year and trials have been scheduled accordingly.

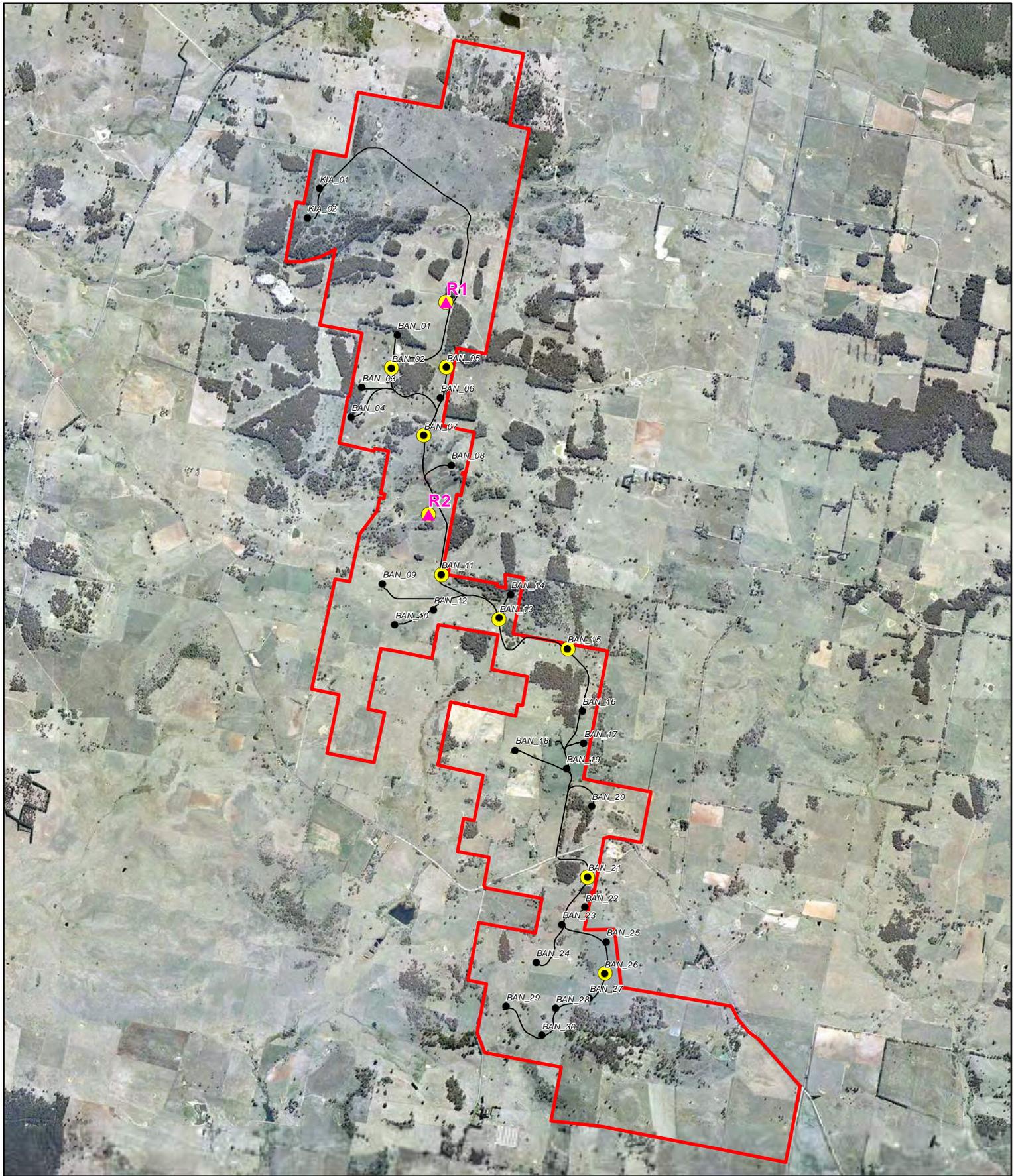
Appendix 2 provides a more detailed discussion of how the methods described herein have been developed. Similar methods have been recommended in a number of other approved bird and bat monitoring programs in New South Wales and Victoria (see section 1.1 for examples). Implementation of bird and bat monitoring programs in Australia is still in its infancy, however the techniques described here are based on the small number of programs already implemented (e.g. Hull *et al.* 2013, BL&A unpubl. data from nine

projects), knowledge of experimental design, sound statistical analysis and recent feedback from the regulatory authorities.

Mortality detection is proposed to be carried out for one additional year of GRWF operation following the initial, twelve months of monitoring. After one year of mortality monitoring a detailed report will be prepared reviewing the mortality detection program and providing recommendations for future monitoring activities.

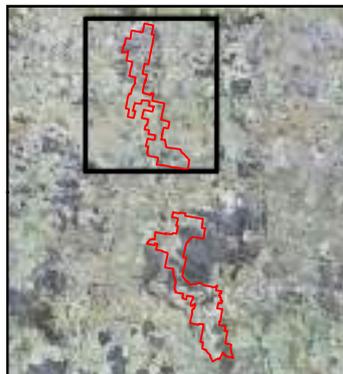
The following sections outline:

- **Turbine site selection for survey:** how the wind turbines will be selected for a search
- **Search protocol:** the size of area beneath turbines to be searched and how this area will be systematically searched and results recorded
- **Scavenger rates and trials:** definition of scavenging and how experimental trials will be conducted
- **Detectability and trials:** definition of detectability and the experimental trial methodology
- **Analysis and mortality estimation:** general outline of how the data will be analysed to gain estimates of bird and bat mortality.

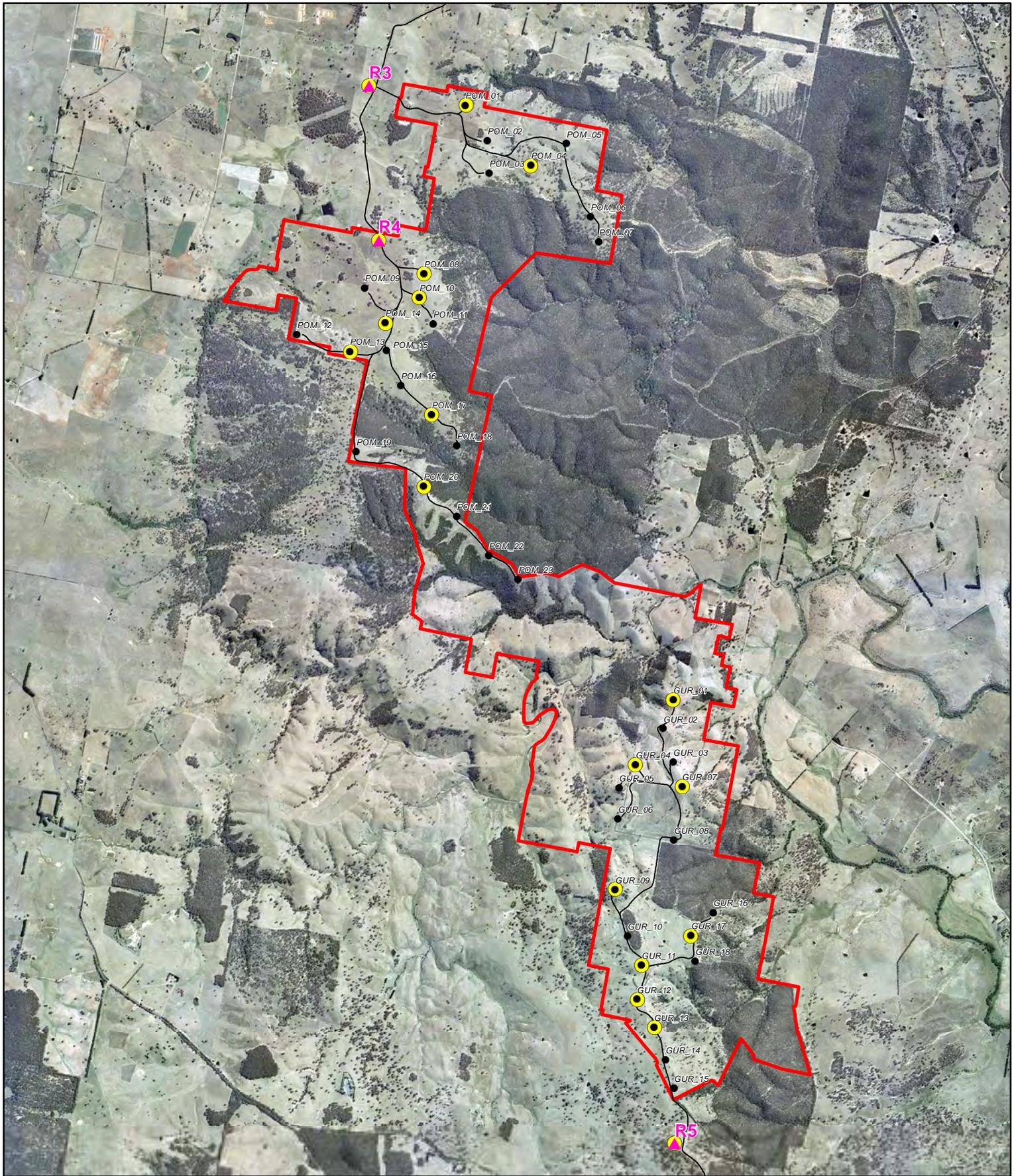


**Legend**

- Wind farm boundary
- Turbines
- Tracks
- ▲ Reference sites (2)
- Carcass search locations

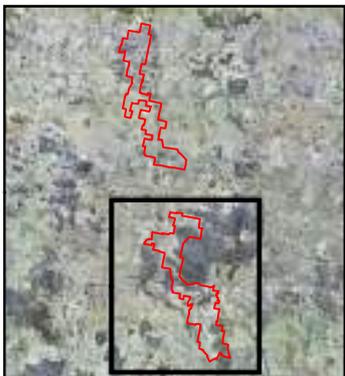


<b>Figure 4: Location of carcass searches - North</b>		
<b>Project: Gullen Range Wind Farm</b>		
<b>Client: Goldwind Australia</b>		
Project No.: 14182	Date: 4/04/2016	Created By: N. May / C. Doughty
<b>BL&amp;A</b> <small>Brett Lane &amp; Associates Pty Ltd</small> <small>Ecological Consultants &amp; Surveyors</small>		
<ul style="list-style-type: none"> <li><span style="color: gold;">●</span> Experience: New, S, M - 64 Carterswell Road</li> <li><span style="color: gold;">●</span> Knowledge: 30+ Years East, VIC, SA</li> <li><span style="color: gold;">●</span> Solutions: PO Box 307, Cooraburra, VIC 3206, Australia</li> </ul>	Ph 02 9863 3111 / 08 00 550 366 enquiries@ecologicalresearch.com.au <a href="http://www.ecologicalresearch.com.au">www.ecologicalresearch.com.au</a>	 N



**Legend**

- Wind farm boundary
- Turbines
- Tracks
- ▲ Reference sites (3)
- Carcass search locations



<b>Figure 5: Location of carcass searches - South</b>		
<b>Project: Gullen Range Wind Farm</b>		
<b>Client: Goldwind Australia</b>		
Project No.: 14182	Date: 4/04/2016	Created By: N. May / C. Doughty
<b>BL&amp;A</b> <small>Bent Law &amp; Associates Pty Ltd</small> <small>Ecological Research &amp; Assessment</small>		
<ul style="list-style-type: none"> <li><span style="color: gold;">●</span> Experience: New, S.M. - 64 Carterswell Road</li> <li><span style="color: gold;">●</span> Knowledge: 30 years experience, VIC, SA, NT</li> <li><span style="color: gold;">●</span> Solutions: 700 Bowden, Carterswell, VIC 3128, Australia</li> </ul>	Ph: 02 9863 3111 / 08 9295 550 566 enquiries@ecologicalresearch.com.au <a href="http://www.ecologicalresearch.com.au">www.ecologicalresearch.com.au</a>	 N

### 5.4.1. Turbine Selection

Turbines will be selected based on the rules below, which are based on a ‘stratified random’ sampling design.

- Each turbine within a stratum has an equal chance of being selected for the searches (randomly selected by number generation table);
- No stratum can have less than three turbines; and
- Once the turbines have been selected, the selection will not change.

The results from each stratum will be analysed separately to establish if there are differences in estimated mortality between them. They will then be combined for a whole-of-wind-farm mortality estimate using appropriate statistical methods for stratified estimates with constant selection probabilities within strata.

To ensure a valid dataset for statistical analysis, the mortality detection search will be based on 24 turbines (representing 33% of all turbines), split into the three operational areas of GRWF (assuming the addition of the two Kialla turbines to the Bannister area).

The number of turbines searched has been determined based on what will provide the most accurate mortality rate given the high variability in detected carcasses shown on other wind farms, and that humans will have search limits (e.g. OH&S) (Appendix 1). Each turbine that is selected for the searches will have the following recorded:

- Location (easting, northing)
- Distance to nearest turbine
- Identification number of nearest turbine
- Local vegetation (type, height, and density during each search to document change in vegetation cover over time)
- Distance to key habitat feature, such as dam/wetland or waterway, or woodland remnant.

In addition, five carcass search reference sites will be chosen and searched. Please note, as pre-construction carcass searches of turbine sites *and* reference sites were not undertaken, applying a BACI standard sampling design and analysis is now not possible.

### 5.4.2. Search protocol

The search area beneath each turbine has been determined to best detect bats and medium to large bird carcasses, based on the turbine dimensions (Hull & Muir 2010). Two different models of turbines are installed at GRWF. Based on the Hull and Muir model (2010) 95% of bat carcasses are found within 65 metres of the turbine, and carcasses of medium to large birds are reasonably evenly distributed out to 100 metres. Carcasses of very large birds (Wedge-tailed Eagle) may be found a little further out, but 95% are within 115 metres of the turbine.

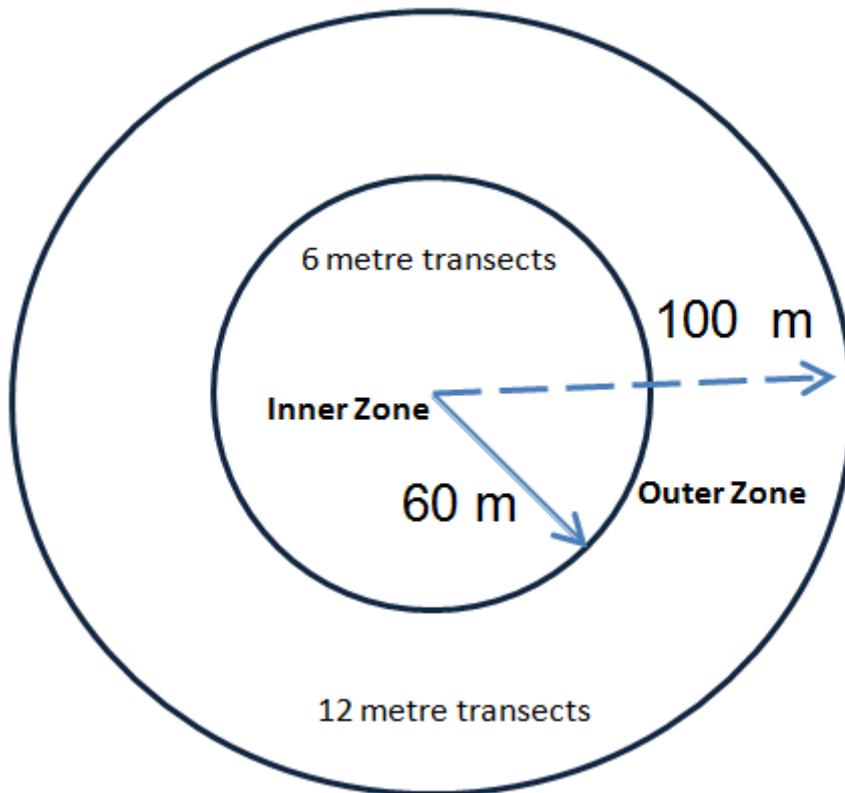
Given this evidence, inner and outer circular search zones have been designated. The inner zone targets the detection of carcasses of bats and small to medium and large sized birds. In the inner zone, a circle is formed with a 60 metre radius from the turbine and transects are spaced every six metres across this circle (Figure 3).

The outer zone will comprise the zone between the 60 metre and 100 metre radius circles. Although they are still recorded in the inner zone, the outer zone will ensure the adequate

detection of carcasses of medium to larger sized birds, which can fall further away from turbines. Search transects in the outer zone are spaced at 12 metres and carried out from the edge of the inner zone out to the edge of the outer zone (see Figure 6). Given that the defined transect spacing and total search area are based on experience and evidence from previous studies (e.g. Arnett *et al.* 2005, Hull and Muir 2010) they are considered to be ample to detect bats and the bird species of concern.

In each stratum all sampled turbines will be searched out to 100 metres once per month. A second follow-up search, a ‘pulse search’ will be undertaken to 60 metres once a month within several days of the first search to detect additional mortality of bats and birds. The selected turbines will be searched monthly and the order of turbines searched will be randomized, however the same turbines will be searched each month.

Figure 6: Inner and outer carcass search zones underneath the turbines



### Carcass detection protocol

If a carcass is detected (a 'find') the following variables will be recorded in the carcass search data sheet (see Appendix 4):

- GPS position, distance in metres and compass bearing of the carcass from the wind turbine tower;
- Substrate and vegetation, particularly if it was found on a track or hard-stand area without vegetation as this may assist in quantifying the number of carcasses not found in areas where ground cover makes carcasses less visible;
- Species, age, number, sex (if possible) signs of injury and estimated date of strike; and
- Weather (including recent extreme weather events, if any), visibility, maintenance to the turbine and any other factors that may affect carcass discovery.

The carcass will be handled according to standard procedures, as follows:

- The carcass will be removed from the site to avoid re-counting;
- The carcass will be handled by personnel wearing rubber gloves, packed into a plastic bag, wrapped in newspaper, put into a second plastic bag;
- The carcass will be clearly labelled to include the carcass to ensure that its origin can be traced at a later date, if required; and

- The carcass will be transferred to a freezer at the site office for storage so a second opinion on the species identity may be sought, if necessary, and for use in scavenger and/or detectability trials.

It will be necessary for the wind farm operator to obtain a permit from OEH under the *National Parks and Wildlife Act 1974* to handle and keep native wildlife (even dead wildlife) as part of the monitoring program. An application for this permit will be submitted in a timely manner to ensure approval has been obtained prior to commissioning of the turbines.

#### **5.4.3. Scavenger rates and trials**

It will be important to ascertain the rate at which carcasses are removed by scavengers. This can be used to develop a ‘correction factor’ that informs the estimate of wind farm impacts on birds and bats. Scavengers can include ground-based animals, such as foxes and rats (more likely to detect carcasses by scent), as well as aerial scavengers such as birds of prey and ravens (more likely to detect them visually). The scavenger trial described below is designed to ascertain the scavenging rate, usually expressed as average carcass duration.

An intact carcass will be defined as a carcass that does not appear to have been scavenged by a vertebrate scavenger. A partially eaten carcass will be any skeletal or flesh remains found. Feather and fur spots will be defined by their presence and the absence of any other remains (a feather spot being a cluster of five or more feathers). Intact or partial carcasses and feather/fur spots will all be recorded as a ‘find’. However, the scavenger correction factor will not be applied to fur and feather spots as these are most likely to represent the remains of carcasses after they have been scavenged.

Scavenger trials will be undertaken twice for the year of post-construction monitoring. The objective of having two trials is to account for the different vegetation conditions, so one will be held when the grass is long and one when the grass is short. Based on experience, grass is expected to be longest in late spring (most probably November), following rainfall and higher temperatures. Grass is expected to be short during the colder months of winter (July), or when stock have been grazing an area.

After this, the need and frequency of further scavenger trials will be reviewed and discussed with OEH.

#### **Scavenger Trials**

Scavenger Trials will be undertaken by a trained person (defined later) to determine the probability of scavenging loss, and the nature of scavenger removal (e.g. an early peak in scavenging, or scavenging that peaks after carcasses have been in place for a period of time). The search area for scavenger trials will be the same as in the search protocol (above) and will be located under operating turbines, selected based on the methodology outlined in section 5.4.2.

To determine potentially different scavenging rates on birds and bats, two size categories of carcass will be used. Different scavengers are active at different times of day and this will be accounted for by placing carcasses out during the early morning and late afternoon. This will reduce the potential for bias in the search intervals. Based on current mortality estimation software requirements, every endeavour will be made to find ten carcasses of each size category (Table 11). Improvements on this method would require an impractical

and unlikely availability of required carcass numbers, and do not lead to a commensurate improvement in the statistical power of estimates.

**Table 12: Number of replicates for each scavenger trial**

Time	Micro-bat	Medium to very large birds
Early Morning	5	5
Late Afternoon	5	5

The trials will be conducted at the same randomly-selected turbine sites used for mortality searches (see section 5.4.1). The first five carcasses of each size category (ten carcasses in total) will be randomly placed under different turbines in the morning (i.e. one carcass per turbine). Before placing the evening carcasses, the morning 10 will be checked, then each of the carcasses will be checked every 12 hours for the first three days, then daily for two days, then every 48 hours for the following four days and then every three days until they disappear or at the end of 30 days (see Table 11).

**Table 13: Scavenger trial search timetable**

Day (Time)
Day 1: Early morning
Day 1: Late afternoon
Day 2: Early morning
Day 2: Late afternoon
Day 3: Early morning
Day 3: Late afternoon
Day 4: Anytime
Day 5: Anytime
Day 7: Anytime
Day 9: Anytime
Day 12: Anytime
Day 15: Anytime
Day 18: Anytime
Day 21: Anytime
Day 24: Anytime
Day 27: Anytime
Day 30: Anytime

Additional procedures for scavenger trials are provided below.

- The timing of searches is based on experience and regulatory approval at a number of other wind farms (BL&A unpublished records) where scavenger trials have been undertaken that show almost all carcasses have been scavenged within five to ten days.

More frequent monitoring than that proposed herein will not significantly affect consideration of scavenging and its impact on mortality estimates (see Symbolix 2012 for more detailed explanation).

- A mix of small and medium to very large native bird and bat carcasses (if available) will be obtained for use in the scavenger trial. Where carcasses of the species of concern cannot be found, a similar-sized and coloured substitute will be used to reduce bias by visual predators.
- Latex gloves will be worn at all times while handling carcasses to minimise contact with human scent, which may alter predator responses around carrion and to minimise disease risk to the handler.
- At each trial site, one carcass (or more) will be placed randomly within the 60 metre search area, depending on the search protocol for that turbine. Carcasses will be thrown in the air and allowed to land on the ground to simulate at least some of the fall and allow for ruffling of fur or feathers.
- Carcasses used in the trial will have their coordinates recorded to ensure that they are not confused with an actual fatality found under a turbine during the trial searches.
- Notes will be taken on evidence remaining at sites where carcasses have been scavenged (e.g. scavenger scats, bones, feathers, animal parts and type of scavenging, if visible, such as tearing, pecking, complete removal of carcass, partial removal of carcass, bird or mammal predator evidence).
- Notes will be taken on the state of remaining carcasses in each search.

Conduct of two scavenger trials at seasonally different times is designed to account for occasional winter/spring increase in carrion use by some scavenger species. Previous studies have found that Red Foxes are reliant on rabbits and carrion in agricultural and forested areas (e.g. Brunner *et al.* 1975, Catling 1988, Molsher *et al.* 2000). Feral cats show little but uniform use of carrion throughout the year, whereas fox prey type is dependent on availability (Catling 1988). Catling (1988) found that foxes ate more carrion in winter/spring compared with summer/autumn, when they fed on adult rabbits. However, Molsher *et al.* (2000) found that there was no overall significant difference between seasons for carrion use. Seasonal differences only occurred in other prey types (not carrion), such as lambs, invertebrates and reptiles, as these are only available at certain times of the year.

The number of carcasses per animal and size category is based on obtaining a reasonable level of statistical confidence in the estimate of average carcass duration, as reflected in software requirements for current mortality estimation processes, whilst seeking to minimise the number of carcasses used, as they can be difficult to source. Large numbers of carcasses (e.g. on-site, road-kill) are difficult to obtain and it may be very complicated to find alternative sources (e.g. farmed and culled animals). It is also possible that large numbers of carcasses, more size categories and more replicates may attract more scavengers to the area. Previous studies (e.g. Molsher *et al.* 2000) have shown that fox prey use is related to availability and therefore more foxes may be attracted to the area if more carcasses are used, thereby biasing the resulting correction factor. In addition, raptors are potentially more susceptible to collision when preying on carrion beneath turbines. However, it is necessary to conduct these trials under turbines as some scavengers may alter their behaviour in response to the turbines. The final scavenger trial design is therefore a necessary compromise between high numbers of trials and practicality whilst

ensuring a statistically-valid trial design without altering either the behaviour of scavengers or birds that may collide with turbines.

**5.4.4. Detectability trials**

As outlined above, all searches will be supervised by a qualified ecologist and undertaken by trained ecologists or personnel trained and regularly assessed by the ecologist.

Detectability trials will be undertaken to assess the probability that a searcher will detect an existing carcass, given the prescribed mortality search protocol detailed for monthly carcass searches in section 5.4.2 (i.e. searching along the six metre and 12 metre transects). The most efficient use of time is therefore to conduct the detectability trials concurrently with the monthly searches. As humans are reliant on visual cues to determine carcass location, the two visibility categories of low and high grass cover will be compared (as described in section 5.4.3).

To account for observer variability in detecting carcasses, only personnel who have carried out monthly searches at GRWF will be involved in the detectability trials. Detection efficiency (percentage of carcasses detected) will then be incorporated into later analyses that derive mortality estimates. The number of carcasses to be employed in each trial is detailed in Table 12 and explained below. The carcass controller (not involved in monthly carcass searches) will throw each carcass into the air and allow it to land on the ground to simulate at least some of the fall and the potential ruffling of fur and feathers. The carcass controller will note the placement of carcasses (via GPS) and is free to decide how many are deployed under each turbine, however all bats should be located within the inner, 60 metre search zone.

**Table 14: Number of replicates per season for detectability trials, given two factors of size and visibility**

	Micro-bat	Medium to very large bird
Long grass	10	10
Short grass	10	10

Analysis indicates that there is a large confidence interval on the estimate of searcher efficiency, even for a high number of trials (plus or minus ten percent even with 50 replicates). This means that only relatively large seasonal changes in detection (~20 - 30% or more) will be resolvable from normal background variation. Sampling will be undertaken during the two periods that represent the greatest change in vegetation cover (therefore visibility), using a number of carcasses that is logistically manageable and aligned with the number and timing of scavenger trials (Table 12). Statistical confidence analysis indicates that this will result in a reasonably precise detectability estimate after one year, and optimal precision after two.

Any substitute carcasses for these trials will be of both similar size, colour and form to the species being represented or species of concern (i.e. brown mice rather than birds should be substituted for bats as birds do not have the same body shape, colour and appearance).

If sufficient carcasses cannot be obtained, then stuffed, realistic-looking artificial substitutes may be used. As humans are entirely visual searchers, it is not essential to use real carcasses as long as the substitutes appear similar once on the ground. Additionally, the artificial substitutes will not attract scavengers and should not increase the likelihood of

raptor collisions and the number of introduced predators on site. As these trials can be undertaken separately from scavenger trials, artificial substitutes may be ideal (i.e. mice substitutes for bats). Note, however, that it is considered to be more time efficient and cost effective to undertake scavenger and observer trails concurrently.

#### **5.4.5. Incidental Carcass Protocol**

Personnel at the Gullen Range Wind Farm may from time to time find carcasses within the wind farm site during normal day-to-day O&M activities. In this case, the carcass will be handled according to standard procedures outlined in section 5.4.2. All wind farm personnel will be made aware of this carcass handling protocol as part of their HS& E training and induction. If the find is made within five days prior to a scheduled carcass search, the carcass will be left *in situ* but photographed and its position recorded (GPS). A carcass search data sheet (Appendix 4) will be completed for each incidental carcass found.

#### **5.4.6. Analysis of results and mortality estimation**

The results of the mortality monitoring surveys will be analysed in order to provide information on:

- The species, number, age and sex (if possible) of birds and bats being struck by the turbines.
- Any variation in the number of bird and bat strikes.

The results will be detailed in the annual report and will provide a basis for identifying if further detailed investigations or mitigation measures are required.

Modern, statistically robust projections of bird and bat mortality for the entire wind farm site will be presented, based on the data collected from mortality searches. It is acknowledged that this is a current and dynamic aspect of research and that the outcomes from such programs may be equally dynamic. The current program is designed to provide an acceptably accurate and precise estimate of wind farm related bird and bat mortality within two years, so a full analysis and estimate will be provided in the second annual report, together with recommendations on the scope of future monitoring, if required.

All data will be analysed to provide the average estimated mortality of birds and bats, their standard error (variability) and ranges for the GRWF. The seasonal and annual mortality of each species (if estimates of individual species are possible) and size class detected will be calculated. If possible, the standard error and range of these estimates will be reported. Note that it may not be possible practically to provide this for each factor due to the likely low number of carcasses detected. Where this is an issue, it will be reported. Mortality estimates will also take into consideration the actual operational time of the turbines (obtained from the project operator).

The estimated mortality rate will be generated by modelling the scavenger losses and results of the human detectability trials, and using sampling inference to account for the selection and stratification of turbines. The data from the scavenger and detectability trials will be analysed using relevant techniques based on Generalised Linear Modelling (GLM) and (censored) Survival Analysis. Censored measurements are only partially known, such as the exact time of mortality or the exact time to scavenge loss (see, for example, Kaplan & Meier (1958)). In addition to providing mortality estimates, this analysis will determine if

any of the factors (i.e. size class or habitat stratification of turbine sites) are significant, where possible.

It is difficult to provide the actual details (e.g. fatalities/turbine/year) of the results, in this revised BBAMP, as it is subject to the results of the experimental trials and the variability of the data. As the results cannot be predicted (no pilot studies are available), results will be reported in a way that gives as much information as possible but with an accurate interpretation of the data. As stated above, it will be possible to provide the number, average (with attendant standard error) and other basic statistics of recorded fatalities per study population for the sampling time/effort. All species carcass data will be analysed and presented, if possible, with species-specific information.

### 5.5. Personnel Involved

This section of the plan outlines the personnel involved and any training required for the field work and report writing necessary for this BBAMP. All personnel working on this Plan will be trained thoroughly, including background theoretical training, knowledge of policies and other administrative matters (e.g. OH&S) and technical and field methods. NGRWF will ensure that it engages suitably qualified and trained people to supervise and implement the monitoring program.

A suitably experienced and qualified ecologist will oversee in detail and be involved in the implementation of the program, including the carcass searches, searcher efficiency trials and scavenger trials. Any person undertaking searches will be trained and supervised by a qualified ecologist who is familiar with the techniques. The searcher will receive training from the qualified ecologist in the following areas:

- Turbine searches ie. transect spacing in inner and outer zones, number and location of turbines to search and transect search methods
- Equipment usage ie. GPS
- Data recording
- Species identification

The qualified ecologist will supervise the initial carcass search to ensure that field methods are being undertaken correctly and undertake an audit in the first three months to ensure that methods are being implemented correctly. The qualified ecologist will also be responsible for identifying any recorded carcasses from photographs or from specimens transferred to the freezer on site after searches..

The first searcher efficiency trial will be initiated and set up by the ecologist, who will also train a separate person (the ‘carcass controller’) to run searcher efficiency trials. Training will include:

- Correct preparation and handling of trial carcasses
- Correct methods for the random placement of trial carcasses within a randomly selected sub-set of the search areas, and
- The need to place trial carcasses without the searcher knowing they are being placed.

If for some reason the searcher is unable to undertake the monthly searches as planned (due to illness etc) a back up person will be identified in advance. If a back-up person is required to undertake searches, they will also be trained and supervised by a qualified ecologist and will participate in searcher efficiency trials.

The scavenger trials will be set up by the qualified ecologist, with searches being undertaken by the trained searcher.

Analysis of mortality data will be undertaken by a qualified ecologist with support from a statistician. Annual reports and all investigations resulting from an impact trigger (see Section 7) will be prepared by a qualified ecologist and subject to an internal peer review process.

### **5.6. Injured Bird and Bat Protocol**

All on-site staff and monitoring personnel will be advised of the correct procedure for assisting injured wildlife. Wind farm personnel who find injured wildlife will be required to report the find to the wind farm site manager, who will be required to place the animal immediately into a dark place (e.g. box or cloth bag, if safe to do so) for transfer to the nearest wildlife carer or veterinarian.

Contact details of local veterinary staff and wildlife carers are provided below to ensure that if injured wildlife are found and cannot readily be released back to the wild, they are treated accordingly and in a timely manner.

- Crookwell Veterinary Surgery, 220 Goulburn St, Crookwell NSW 2583( 02) 4832 1977
- WIRES, Southern Tablelands: 02 4822 3888
- RSPCA ACT: (02) 6287 8113
- Canberra Connect: 13 22 81
- Wildcare Queanbeyan: (02) 6299 1966

This Injured Bird and Bat Protocol is valid for the operational life of the wind farm.

### **5.7. Routine Reporting and Review Meetings**

In accordance with the Project Approval condition, reports will be submitted to the Secretary and OEH on an annual basis. An annual report will be prepared within three months of the completion of the first year of operations phase monitoring (i.e. by March 2016). The results of the bat surveys and an assessment of the status of the Eastern Bent-wing Bat on the site will be provided in advance in time to inform decisions on migration seasons surveys for this species. This annual report will focus on presenting the results of the mortality searches and recommending refinements, where necessary to monitoring activities if required. OEH will participate in a review of the annual results to determine if further monitoring is warranted. Matters to be addressed in the annual report include, but will not be limited to:

- A brief description of the management prescriptions implemented and identification of any modifications made to the original management practices.
- The survey methods (including list of observers, dates and times of observations);
- Estimates of bird and bat mortality rates (avifauna impacted per turbine per year);
- Maps of turbines, indicating which ones produced carcasses of species of concern;
- A discussion of any turbines where numerous carcasses have been found analysing potential factors influencing bird and bat strike, e.g. landscape position and habitat in close proximity.

- Seasonal and annual variation in the number and composition of bird and bat strikes, where detectable including consolidated tables of carcasses and species records from individual monthly reports;
- A review of the risk assessment based on the results of BBAMP investigations;
- Any other mortality recorded on site but not during designated carcass searches (i.e. incidental records by site personnel);
- Identification of any unacceptable impacts or impact triggers, and application of the decision-making framework and relevant adaptive management measures.
- A summary of livestock carcass removal for the purposes of predator reduction;
- Details of any landowner feral animal control programs and their timing;
- A discussion of the results, including:
  - Whether indirect impacts on bird and bat use of the site are of significance at a regional, state or national level, or if species of concern have been affected.
  - Bird risk reduction measures.
  - Any further recommendations for reducing mortality, if necessary.
  - Whether the level of mortality was unacceptable for affected listed ('at risk') species of birds or bats.
  - Usage of the wind farm area by 'at risk' species and factors influencing this (ie. climatic, geographical and infrastructure).
  - Analysis of the effectiveness of the decision-making framework.
  - Recommendations for further monitoring.

#### **5.7.1. Comparison of pre and post construction BUS**

A pre-construction bird utilisation survey (BUS) was completed for GRWF. Additional post-operations phase surveys have been carried out in the first six months of operation of the GRWF (January to June 2015). The results of the pre construction and operations phase BUS will be reported upon at the end of the first year of operational monitoring.

#### **5.7.2. Review of BBAMP and adjustment of monitoring regimes**

The BBAMP will be reviewed on an annual basis in terms of its effectiveness together with consideration of the intensity of effort and resourcing and the level of risk to birds and bats.

At the end of the first year of operations phase monitoring (i.e. December 2015), an overall assessment will be made of all the data obtained during this phase, and details of the management practices implemented, as well as recommended adjustments to future investigations. The information from this assessment will inform the need for and scope of further detailed monitoring, if required. The results of the review and its implications will be discussed with OEH.

Annual reports prepared beyond the first year will include the results of any monitoring activities undertaken for that year and a discussion regarding any impact triggers or unacceptable impacts identified, mitigation measures implemented and application of the decision making framework. As this management plan is adaptive, further refinements to the program will be included in annual reports following the first year of post-construction

monitoring and will be based on the outcomes of monitoring surveys and any impacts, in consultation with OEH.

An interim report will be prepared presenting the results of the autumn 2016 bat monitoring and intensive carcass searches.

## 6. MITIGATION MEASURES TO REDUCE RISK

Mitigation involves the prevention, avoidance and/or reduction of the risk of an impact trigger occurring or continuing to occur. An ‘*impact trigger*’ is defined in section 7 as a threshold of impact on birds or bats that triggers an investigation and/or management response. This section outlines measures that will be undertaken during operation of the wind farm to prevent or reduce the potential for an impact to occur, and addresses condition of approval 3.1 (e).

The overall objective of mitigation measures is to ensure that the operation of GRWF does not lead to unacceptable impacts on threatened or non-threatened birds and bats.

### 6.1. Carrion removal program and stock forage control

A moderate risk to WTE has been identified for GRWF. In order to reduce the risk of raptors colliding with turbines, a regular carrion removal program will be implemented during operation, to reduce the attractiveness of the site to raptors and therefore reduce the chances of fatal collisions by this group of birds. Carrion is defined as the dead and decaying flesh of an animal that often serves as a food source for animals.

To provide for the regular removal of carcasses likely to attract raptors to areas near turbines the procedures below will be adopted.

- Designate a suitable person (such as a wind farm employee or landowner) to perform the function of Carrion Removal Coordinator who will undertake the following activities:
  - Weekly inspections of POM turbines to search for any stock, introduced or native mammal and bird carcasses that may attract raptors (e.g. kangaroos, pigs, goats, foxes, rabbits, dead stock). This search will be undertaken via vehicle and visual checks in addition to using binoculars to look for large carcasses within 200 metres of each POM turbine.
  - Additional, opportunistic observations by operators during normal inspections and work routines and by landowners as they travel around their properties provides further opportunity to identify and report carcasses of stock or feral animals so that timely collection can be undertaken to remove them. This can be addressed by operator and landowner protocols.
  - Any carcasses and/or remains found that are within 200 metres of turbines, will be collected and disposed of as soon as possible, in a manner that will avoid attracting raptors close to turbines. In addition, any other carrion observed in proximity to site roads and infrastructure will be collected and disposed of.
  - Consult with landowner or site or asset manager in relation to the appropriate disposal of collected carrion, to be located at least 200 metres away from the closest turbine.
  - Wind energy facility maintenance staff and landowners will be required to notify the Carrion Removal Coordinator immediately following identification of carrion on site in between monthly searches.
  - Carcass occurrence and removal will be recorded in a “management log book” maintained by NGRWF asset manager.

- In order to reduce collision risks to birds, the practice of feeding stock close to turbines should be discontinued when the wind farm starts operation as it could cause unnecessary impacts. As such, with landowner agreement, stock will not be fed grain within a 200 metre radius of wind turbines as this may also attract parrots and cockatoos that can then collide with turbines.
- Any feral animal control on the wind farm site should involve the removal and appropriate disposal of carcasses.
- If a large number of rabbit or other feral animal carcasses or active rabbit presence are incidentally observed during monitoring surveys, it may be necessary to conduct an integrated rabbit control program (to reduce site attractiveness to Wedge-tailed Eagles) within 200 metres of turbines. Methods to control rabbits include borrow destruction, poisoning and shooting (DPI 2014). Any rabbit control program will require cooperation and agreement from the landowner. At OEH's request, rabbit control should not involve poisoning of animals.
- An annual summary of carcass removal, based on the 'management log' will be provided in the annual monitoring reports.

The need for continuation of the carcass removal program and effort required will be assessed after one year of operation. In general, the criteria for continuation will be based on the frequency of carcass finds. For example, if carcass frequency is particularly low (e.g. one or two per quarter) outside of turbine search zones (i.e. not beneath turbines) the intense program may be discontinued or reduced considerably, subject to agreement from OEH. Alternatively, if peaks occur at specific times with intervening periods of low numbers, the effort may be focussed on the peak periods.

## 6.2. Lighting on turbines and buildings

It has long been known that sources of artificial light attract birds, as evidenced by night-migrating birds in North America and Europe. Lighting is probably the most important factor under human control that affects mortality rates of birds and bats colliding with all structures (Longcore, et al. 2008). Most bird mortality at communication towers for example, occurs in poor weather with low cloud in autumn and spring, i.e. during migration periods (Longcore, et al. 2008).

It is postulated that bright lights may temporarily blind birds, causing them to fly toward the light source and colliding with the structure (Gauthreaux and Belser 2006). They would appear prone to saturation of their retinas, causing temporary blindness when subjected to bright light (Beier 2006) and mortality of both birds and bats can result from collisions with lit structures. Birds can also become disoriented or 'trapped' in the field of light (Longcore et al. 2008).

Bats are also attracted to the increased numbers of insects that may congregate near bright light sources.

Measures to reduce the impact of lighting include using low pressure sodium or mercury lamps with UV filters to reduce brightness. The colour of lighting may also be important. Some studies have found that red lights resulted in a lower mortality than white lights (Longcore et al. 2008), but more recent research on oil rigs at sea suggests that blue or green lights may result in lower mortality than red or white lights (American Bird Conservancy 2014).

For the above reasons, building lighting should be baffled and directed to avoid excessive light spillage and security lighting should be baffled to direct it towards the area requiring lighting and not skyward.

### **6.3. Marking of power lines**

A new section of 33kV powerlines was constructed as part of the GRWF wind farm development. Wind farm personnel will inspect the powerline route periodically and if regular bird mortality is detected, consideration will be given to marking the powerline to reduce the number of birds affected significantly.

## 7. IMPACT TRIGGERS AND DECISION-MAKING FRAMEWORK

This section identifies the circumstances that will result in notification, further investigation and additional mitigation for both threatened and non-threatened birds and bats ('impact triggers'). If an impact trigger is met, there must be an investigation into the cause of the impact, and whether the event was likely to be a one-off occurrence or occur regularly.

The impact trigger may be an unacceptable impact in itself, or may lead to an unacceptable impact.

Note that the approach developed in this section is based on the preparation of numerous bird and bat monitoring programs for wind farms in both New South Wales and Victoria, and up to date feedback from regulators on the implementation of approved plans (see section 1.1 for details).

Ultimately, the asset manager will be responsible for implementation of this BBAMP and the decision-making that goes with it, with technical support provided by the agreed expert (i.e. Brett Lane & Associates Pty Ltd).

### 7.1. Threatened Species

#### 7.1.1. *Definition of Impact Trigger and Unacceptable Impact*

Generally, an impact trigger is where there is evidence of death or injury to birds and/or bats by collision or other interaction with turbines. Under this program, the circumstances that define an impact trigger and unacceptable impact for threatened birds and/or bats are detailed below.

**Impact Trigger for Threatened Species:** A threatened bird/bat species (or recognisable parts thereof) listed under the Commonwealth *EPBC Act* or NSW *Threatened Species Conservation Act 1995*, is found dead or injured under or close to a wind turbine during any mortality search or incidentally by wind farm personnel.

#### **Definition of Unacceptable Impact on Threatened Species:**

- Where population numbers are known and reported by OEH for the period concerned, an unacceptable impact is any impact that is likely to reduce the total species' population by more than 1% over a five year period; OR
- Where population numbers are not known, an unacceptable impact is more than three carcasses found of one threatened species over a two month period.

#### 7.1.2. *Decision Making Framework and Reporting*

If a threatened species impact trigger occurs, further investigation will immediately be triggered and the decision making framework outlined below and in Figure 7 will be followed. This section complies with Condition 3.1 (c) of the conditions of approval.

- Immediate reporting of the occurrence of an impact trigger to NGRWF's responsible manager, who will report it to the relevant statutory planner at OEH (Queanbeyan) within two business days of it being recorded.
- Immediate investigation (to be completed within 10 days) by an appropriately qualified ecologist to determine the cause of death or injury. If the cause of death is considered to be due to turbine collision, an investigation will be undertaken to identify any

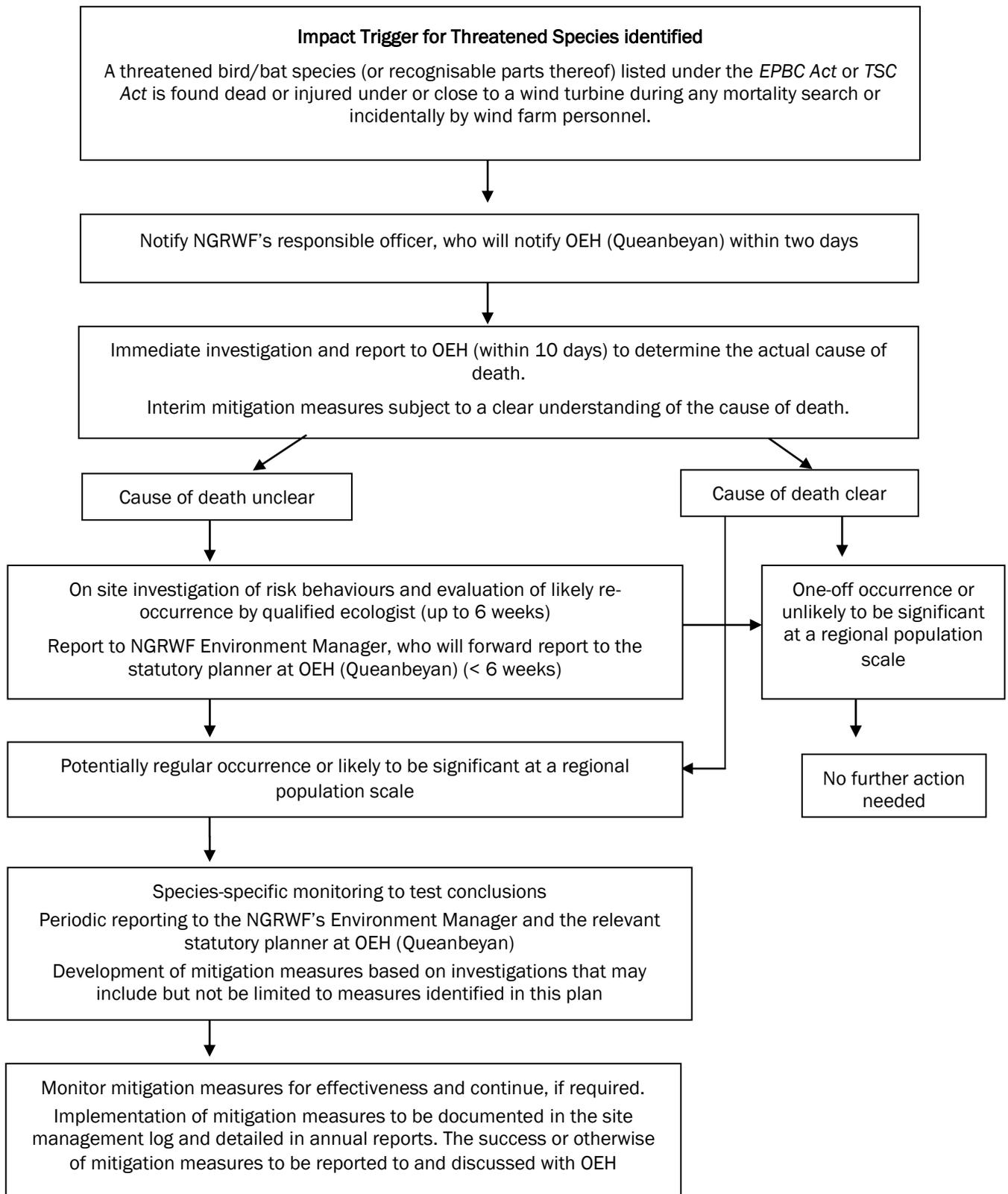
particular risk behaviours that could have led to the collision and an evaluation of the likelihood of further occurrences. The impact trigger may be one-off or cluster events.

- The rapid 10 day investigation will assess the most effective mitigation and will ensure that the mitigation is implemented correctly and quickly, if possible, subject to a clear understanding of the cause of the impact, informed, where required, by on-site investigations of the occurrence of the species on the wind farm site.
- If following this investigation, the fatality is deemed to be a one-off occurrence or the ongoing risk is unlikely to be significant at a population scale, further action is not considered necessary. This decision will be made in consultation with OEH and will be determined based on available evidence and using a precautionary approach. Note that the successful execution of this requirement relies upon OEH providing timely and definitive input to this process.
- If the cause of the impact trigger is not clear, further on-site investigation of risk behaviours and evaluation of likely re-occurrence will be required over the following weeks. If these investigations suggest that the impact trigger was a one-off event or the ongoing risk is unlikely to be significant at a population scale, no further action would be necessary. This decision will be determined in consultation with OEH, based on available evidence.
- If the onsite investigation suggests that the impact trigger may be a regular occurrence, species-specific monitoring may be required. During the monitoring period, periodic reports will be provided to NGRWF and OEH.
- Responsive mitigation measures will be developed and implemented as needed and in a timely manner. Examples of mitigation measures may include but are not limited to those outlined in Sections 6 and 7.3.

Any evaluation of impacts and decisions regarding mitigation measures and further investigations required will be undertaken in consultation with OEH. Any required investigation, and recommended management and supplementary mitigation measures, will be documented in the site management log and detailed in annual reports. This log will be available for inspection by OEH or on the request of the Director-General.

It is recommended that the DPE approved specialist for implementation of the BBAMP be responsible for implementation of this decision-making framework and to discuss decision making with OEH and DPE.

**Figure 7: Decision making framework for identifying and mitigating impact triggers for threatened species**



## 7.2. Non-threatened Species

### 7.2.1. Definition of Impact Trigger and Unacceptable Impact

The circumstances that define an impact trigger and significant impact for non-threatened birds and/or bats under this Management Plan is detailed below. Note that impacts on common farmland birds, including magpies, ravens, pipits, White Cockatoos, corellas and introduced bird species are not considered of conservation significance and are therefore not subject to adaptive mitigation or this impact trigger.

**Impact Trigger for Non-threatened Species:** In any two successive monthly carcass searches, two or more bird or bat carcasses (or parts thereof) of a non-threatened species, other than ravens, magpies, White Cockatoos, corellas, pipits and introduced species, are found at the same turbine (i.e. a total of four or more carcasses of the same species in two successive searches at the same turbine).

Where population numbers are known and reported by OEH for the period concerned, the definition of an unacceptable impact on non-threatened species is any impact that is likely to:

- lead to a greater than 50% reduction over a five year period in the immediate population (i.e. local population, where known) that utilises the wind farm; AND
- act in an ongoing way to reduce the wider, regional population (where known) by more than 30% over a five year period; OR
- reduce the total species' population (where known) by more than 10% over a five year period.

Where population numbers are not known, the definition of an unacceptable impact on non-threatened species is:

- More than four carcasses of one non-threatened species (including raptor species, magpies, ravens, pipits and introduced species) are found during both formal and incidental carcass searches in a two month period.

Note that although the impact trigger does not include ravens, magpies, White Cockatoos, corellas, pipits and introduced species, detected mortalities for these species will still be reported as part of the annual reporting process.

### 7.2.2. Decision Making Framework

In the event that an impact trigger for non-threatened species is detected the following steps will be followed:

- OEH (Queanbeyan) will be **notified** of the impact trigger within seven days of recording the event (other than in the case of Wedge-tailed Eagle, in which case this time period will be two days). An appropriate scale to consider population effects of the impact trigger will be agreed between OEH and the proponent on a case-by-case basis with consideration given to the species in question.
- An **evaluation** of impacts to the non-threatened species will be undertaken.
- A **report** on the investigation will be delivered to the relevant statutory personnel at OEH (Queanbeyan) within three weeks.

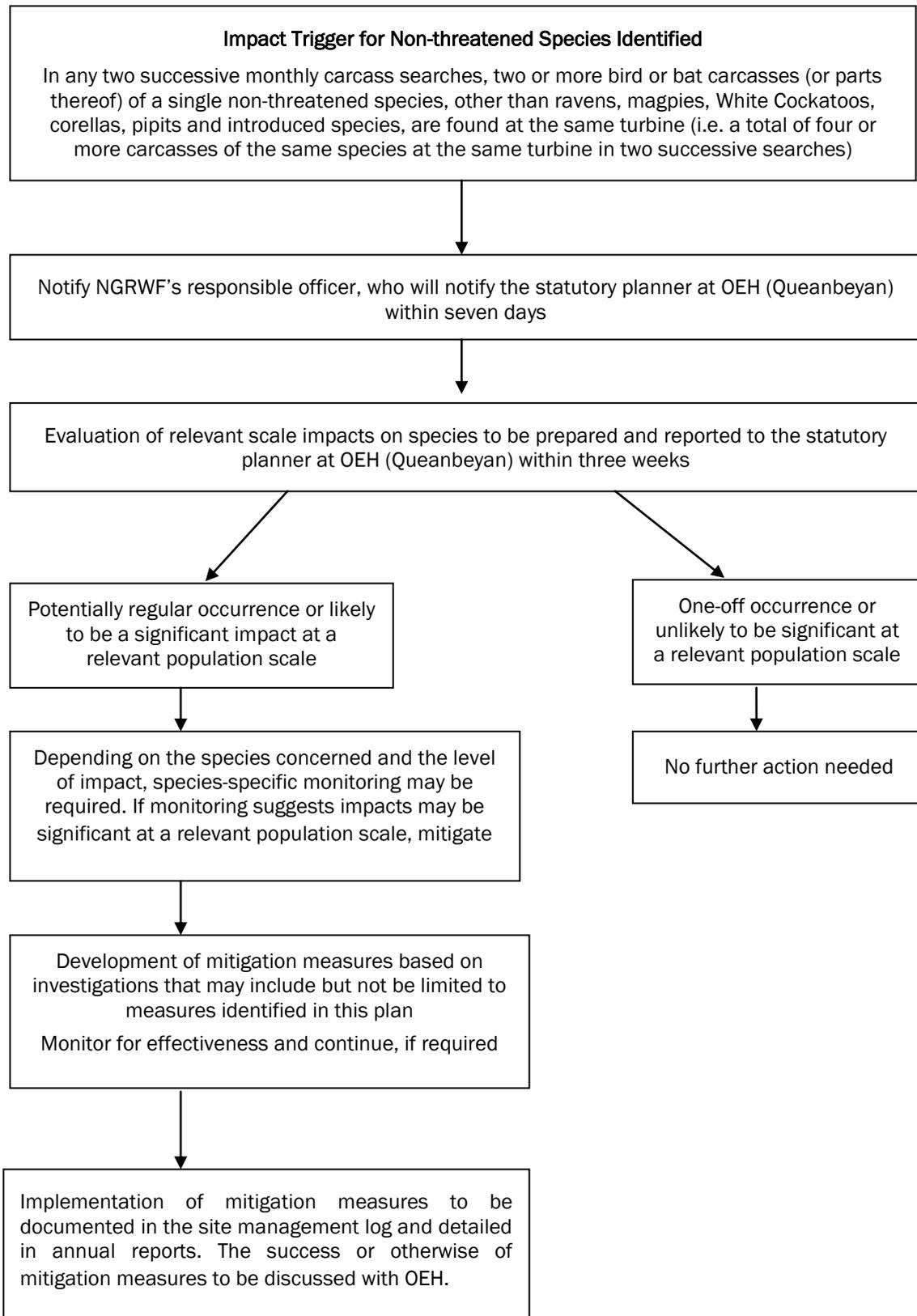
If the evaluation indicates that the event was a one-off occurrence or is unlikely to be an unacceptable impact at a relevant population scale for the species in question, no further action will be necessary (as outlined in Figure 8).

If the event is deemed to be a potentially regular occurrence or likely to lead to an unacceptable impact on the species in question, species-specific monitoring may be required (Figure 8). If further monitoring confirms that impacts are likely to lead to an unacceptable impact on the species, mitigation measures will be required. Potential mitigation measures are outlined in section 7.3, however specific mitigation measures will be determined based on the species involved and the outcome of investigations.

Any evaluation of impacts and decisions regarding mitigation measures and further investigations required will be undertaken in consultation with and agreement from OEH. Any required investigation, and recommended management and supplementary mitigation measures, will be documented in the site management logs and detailed in annual reports. This log will be available for inspection by OEH or on the request of the Director-General.

Whenever a dead or injured **Wedge-tailed Eagle** is found under a turbine this event is to be reported to NGRWF's responsible manager, who will report it to the relevant statutory planner at OEH (Queanbeyan) within two business days of it being recorded.

Figure 8: Decision making framework for identifying and mitigating impact triggers for non-threatened species



### 7.3. Supplementary Mitigation Measures

Supplementary mitigation measures will be implemented in consultation with OEH in the event that an impact trigger occurs. The purpose of supplementary mitigation measures will be to prevent the impact from continuing to occur. Specific mitigation measures will be implemented depending on the nature, cause and significance of any impact recorded and in response to the results of investigations of the event and of the species concerned on the wind farm site.

It is difficult at this stage to know what the cause of an unacceptable impact trigger will be, therefore possible examples of impacts and potential mitigation measures specific to the impact trigger, and the time taken to implement these measures, are detailed in Table 15. Note that in implementing mitigation measures, a suite of measures that may or may not include those in Table 14 would need to be implemented, depending on the circumstances.

Although it is unknown what supplementary mitigation measures may be required in response to a particular situation, some hypothetical examples are provided in Table 15 below. These are examples of potential issues not considered to-date but describe useful and tested responses from other wind farms in addressing the issues. Should these be implemented as a management response at GRWF the response of birds and bats to these measures will be recorded.

The purpose of investigations will be to identify clearly the most relevant and effective mitigation measures.

In the event that turbine shutdown is considered necessary by OEH, a species management strategy (e.g. for the Powerful Owl) will be prepared with OEH that sets out:

- The nature of the ongoing unacceptable impacts, including the level of risk to the species' regional and overall populations, where known;
- The findings of detailed investigations undertaken in response to the impact trigger, focussing on the species' use of the immediate area around affected turbines;
- Clear scope for on-going monitoring to identify triggers for turbine shut-down;
- Agreed triggers for turbine shutdown and restart; and
- Reporting and consultation arrangements.

### 7.4. Specific management objectives, activities, timing and performance criteria

Table 15 below summarises specific management objectives, activities, timing and performance criteria for the implementation of this BBAMP. It can be used for monitoring and reporting on the implementation of this plan.

Table 15: Supplementary mitigation measures in the event of an unacceptable impact trigger occurring

Hypothetical cause of impact	Mitigation Measure <sup>2</sup>	Likelihood of impact continuing following mitigation	Time to implementation
Foraging source identified that attracts threatened species to impact areas	Consider the use of acoustics (ie. loud music/irregular noise) to discourage birds from foraging in this location where such noise would not impact neighbours	Low	Implement as soon as possible.
	Encourage species into alternative areas outside of the wind farm boundary, where available, through the use of social attraction techniques offsite (decoys and audio playback systems)		
	Investigate and, if considered appropriate, remove foraging habitat from the wind farm site. These works would only be undertaken after consultation with OEH and may require additional permits.		Before removal of foraging habitat is undertaken, alternative mitigation measures should prove to be ineffective in reducing collision risk to acceptable levels.
Farming practice attracts threatened species to risky areas (e.g. grain feeding of stock)	Investigate whether farming practice is a contributing factor and if so, relocate farming further from turbines to reduce risk	Low	Immediately
Wind/rain/fog causing low visibility	Where low visibility is identified as an issue, carcass searches will be repeated during periods of low visibility to measure mortality rates. Temporary shutdown of those turbines found to cause the problem may be necessary during periods of extreme low visibility – to be implemented only in the event that threatened species are experiencing unacceptable impacts.	Low	Immediately low visibility is identified as the cause of unacceptable impacts on threatened species.
Attraction to lights on the wind farm site	Avoid high intensity lighting within the wind farm site (e.g. use of light hoods) or switch off lighting temporarily while species is on or near the wind farm site. Alternative measures include: <ul style="list-style-type: none"> <li>• Synchronise any flashing lights,</li> <li>• Use red rather than white or yellow lights, or</li> <li>• Remove lights, where practicable</li> <li>• All lights switched off except when needed for service work</li> </ul>	Low	If lights can be switched off, this should occur immediately. Alternative measures should be implemented as soon as practicable after recording the impact trigger.
Attraction to small dams on site	Subject to landowner agreement, fill in dam and provide alternative stock watering arrangements	Low	Implement as soon as possible after recording the impact trigger if the dam is the cause of the problem.
Nest site close to turbine	Discourage nesting close to turbines. These works would only be undertaken after consultation with OEH and may require additional permits.	Low	Prior to breeding season.

<sup>2</sup> Note that the mitigation measures in this table are examples of what may be possible. Ultimately, the chosen mitigation measure will be identified as part of the impact-trigger investigations shown in Figures 5 and 6, and may not include any of these examples if they are not relevant.

Table 16: Specific management objectives, activities, timing and performance criteria

Management objectives	Management activities and controls	Timing	Performance criteria for measuring success of methods	Completed (yes/no)
Baseline surveys	Obtaining pre-construction baseline bird and bat utilisation data	Pre-construction (completed)	<ul style="list-style-type: none"> <li>Bird utilisation surveys (point count and transect surveys) undertaken as described in this BBAMP</li> <li>Bat utilisation surveys undertaken as described in this BBAMP.</li> </ul>	
	Obtaining post-construction bird and bat mortality data	Post-construction	<ul style="list-style-type: none"> <li>As per results of the mortality monitoring in this BBAMP.</li> </ul>	
Mortality monitoring	24 turbines to be surveyed each month to 100 metres in accordance with the inner- and outer zone search protocol. The same turbines will be searched each month until the end of 2015, following which the need for further surveys will be reviewed based on the results of the first year.	Post-construction – monthly until end 2016	<ul style="list-style-type: none"> <li>Post-construction mortality surveys undertaken monthly at at least 24 turbines for two years, with a review after the first year to determine if a change in the methodology is required.</li> </ul>	
	Calculating annual mortality of birds and bats per turbine based on post-construction repetition of monitoring activities. Mortality estimates should include correction factors from scavenger and detector efficiency trials.	Post-construction – at the end of each year of mortality monitoring	<ul style="list-style-type: none"> <li>Scavenger and detector efficiency trials undertaken</li> <li>Estimates of mortality for birds and bats made after full year of monitoring</li> </ul>	
Annual Reports	Preparation of Annual Reports to be submitted to Director-General and OEH for two years after the completion of a year's monitoring activities.	Post-construction – after years one and two.	<ul style="list-style-type: none"> <li>Annual reports for two years delivered within three months of completion of yearly monitoring.</li> <li>Annual reports to include (but not be limited to) results of monitoring surveys for that year, any impact triggers or unacceptable impacts identified, mitigation measures implemented, application of the decision-making framework and recommendations for the following year.</li> </ul>	
Mitigation measures to reduce risk	Carrion removal program - stock and kangaroo carcasses will be removed from within 200 metres of wind turbines on a monthly basis and disposed of.	During operation	<ul style="list-style-type: none"> <li>Carcasses removed</li> <li>Activity recorded in management log book</li> <li>Increase frequency of stock and kangaroo carcass removal and disposal if required</li> </ul>	
	Subject to landowner agreement, restrict lambing to paddocks at least 200m from turbines.		<ul style="list-style-type: none"> <li>No increase in raptor mortality during lambing season</li> </ul>	
	Subject to landowner agreement, stock will not be fed grain underneath turbines		<ul style="list-style-type: none"> <li>No increase in bird mortality due to grain underneath turbines</li> </ul>	
Mitigation measures to reduce risk	Pest control program - Implement rabbit control if the carrion removal program suggests rabbit carcasses are an issue	During operation	<ul style="list-style-type: none"> <li>Monitor effectiveness of rabbit control and, where bird mortality is clearly related to rabbit numbers, increase the effectiveness of rabbit control</li> </ul>	
	Habitat improvement or protection to encourage animals to use habitats away from turbines.	During construction	Protection of offset site located in woodland habitat.	
	Minimising external lighting. If required. There are only low levels of lighting on the wind farm.		If mortality at turbines near light sources significantly exceeds that of activity at unlit turbines, type and duration of lighting will need to be reviewed, subject to security and OH&S limitations.	
	Remove permanent lights on buildings and sub-stations to avoid light spillage and visibility from above.			
	Baffle security lighting to avoid light spillage and visibility from above.			
Use of deterrents – Where required, overhead powerlines should have marker balls and/or flags where they cross waterways		No incidental records of bird mortality from power line collision around waterways.		

## 8. REFERENCES

- AusWEA (2005) Wind Farms and Birds: Interim Standards for Risk Assessment, prepared by Brett Lane & Associates Pty Ltd and Aria Environmental Pty Ltd for AusWEA
- Auswind (2006) Best Practice Guidelines for the implementation of Wind Energy Projects in Australia, Australian Wind Energy Association.
- American Bird Conservancy 2014,  
[http://www.abcbirds.org/newsandreports/stories/080319\\_oil.html](http://www.abcbirds.org/newsandreports/stories/080319_oil.html) Accessed 25th January 2014.
- Arnett EB, Erickson WP, Kerns J and Horn J 2005. Relationships between bats and wind turbines in Pennsylvania and West Virginia: An assessment of fatality search protocols, patterns of fatality, and behavioural interactions with wind turbines. A final report submitted to the Bats and Wind Energy Cooperative. Bat Conservation International. Austin, Texas, USA.
- AusWEA (Australian Wind Energy Association) 2005. Wind Farms and Birds: Interim Standards for Risk Assessment. Report prepared by Brett Lane and Associates and AIRA Professional Services; Report No. 2003.35(2.2), July 2005.
- AusWEA 2006. Best Practice Guidelines for Implementation of Wind Energy Projects in Australia. AusWEA, Australia.
- Bilney, R. J. (2013). Home-range, diet and breeding of a Powerful Owl *Ninox strenua* in East Gippsland, Victoria', Australian Field Ornithology. 30:40–46.
- BirdLife International 2013, 'Datazone - Species: White-throated Needletail *Hirundapus caudacutus*' [www.birdlife.org/datazone](http://www.birdlife.org/datazone), viewed 30 April 2013.
- Beier, P 2006. Effects of artificial night lighting on terrestrial mammals. Pp 19-42 In "Ecological Consequences of Artificial Night Lighting". (Rich, C. and T. Longcore, eds.). Island Press. Washington, D.C.
- Bloomfield, T & Rosier, M 2007, *Landcare Notes. Rabbits: Using Integrated Rabbit Control*, Department of Primary Industries [www.dpi.vic.gov.au](http://www.dpi.vic.gov.au) Accessed 26/03/08
- Brett Lane and Associates 2009, Bald Hills Wind Farm, Bat and Avifauna Management Plan, Report No. 9067 (2.0), September 2009.
- Brett Lane & Associates 2011a, Mt Gellibrand Wind Farm, Bird and Avifauna Management Plan, prepared for Acciona Energy Oceania Ltd, Report No. 8229 (4.13), approved December 2011.
- Brett Lane & Associates 2011b, Capital Wind Farm, Bird and Bat Adaptive Management Program, Report No. 9142 (1.2) approved in Dec 2009 and revised in 2010 and 2011. Prepared for Renewable Power Ventures Ltd (now Infigen).
- Brett Lane & Associates 2011c, Woodlawn Wind Farm, Bird and Bat Adaptive Management Program, prepared for Infigen Energy Ltd, Report No. 11035 (1.4), October 2011.
- Bilney, R. J. (2013). Home-range, diet and breeding of a Powerful Owl *Ninox strenua* in East Gippsland, Victoria', Australian Field Ornithology. 30:40–46.

- Brett Lane & Associates 2012a, Hawkesdale Wind Farm, Bird and Avifauna Management Plan, prepared for Union Fenosa Wind Australia Ltd, Report No.9067 (2.4), February 2012.
- Brett Lane and Associates 2012b, Mount Mercer Wind Farm, Bat and Avifauna Management Plan, Report No. 8076 (2.8), approved September 2012.
- Brett Lane & Associates 2012c, Mortlake South Wind Farm, Bird and Avifauna Management Plan, prepared for Acciona Energy Oceania Ltd, Report No.12020 (1.16), approved December 2012.
- Brett Lane & Associates 2012d, Ryan Corner Wind Farm, Bird and Avifauna Management Plan, prepared for Union Fenosa Wind Australia Ltd, Report No.9067 (4.4), February 2012.
- Brett Lane & Associates 2013a, Berrybank Wind Farm, Flora and Fauna Management Plan, Report No. 7152 (10.8) approved in August 2013. Prepared for Berrybank Development Ltd.
- Brett Lane & Associates 2013b, Crowlands Wind Farm, Bird and Bat Management Plan, prepared for Pacific Hydro, Report No. 11176 (1.10), April 2013.
- Brett Lane & Associates 2013c, Lal Lal Wind Farm, Bird and Bat Management Plan, prepared for WestWind Energy Ltd, Report No. 6150 (5.0), February 2013.
- Brett Lane & Associates 2014, Taralga Wind Farm, Construction Environmental Management Plan, Report No. 8129 (1.12). Prepared for CBD Energy, January 2014.
- Brett Lane & Associates (2014), Gullen Range Wind Farm – Assessment of Collision Risk to Powerful Owl and Little Eagle.
- Brett Lane & Associates (2015a), Gullen Range Wind Farm BBAMP – Monthly Monitoring Report, January 2015.
- Brett Lane & Associates (2015b), Gullen Range Wind Farm BBAMP – Monthly Monitoring Report, February 2015.
- Brett Lane & Associates (2015c), Gullen Range Wind Farm BBAMP – Monthly Monitoring Report, March 2015.
- Brett Lane & Associates (2015d), Gullen Range Wind Farm BBAMP – Monthly Monitoring Report, April 2015.
- Brett Lane & Associates (2015e), Gullen Range Wind Farm BBAMP – Monthly Monitoring Report, May 2015.
- Brett Lane & Associates (2015f), Gullen Range Wind Farm BBAMP – Monthly Monitoring Report, June 2015.
- Brunner, H, Loyd, JW and Coman, BJ 1975. Fox scat analysis in a forest park in south-eastern Australia, *Australian Wildlife Research*, 2: 147-154.
- Catling, PC 1988. Similarities and contrasts in the diets of foxes, *Vulpes vulpes*, and cats, *Felis catus*, relative to fluctuating prey populations and drought, *Australian Wildlife Research*, 15: 307-317.
- Churchill, S (2008). Australia Bats. Jacana Books, New South Wales.

- Clean Energy Council 2013. Best Practice Guidelines for Implementation of Wind Energy Projects in Australia. Clean Energy Council, Australia.
- Department of the Environment 2013. Matters of national environmental significance – Significance impact guidelines 1.1. Department of the Environment, Canberra.
- Department of Primary Industries 2014, Rabbit Control, viewed 25<sup>th</sup> January 2014. Website: <http://www.dpi.nsw.gov.au/agriculture/pests-weeds/vertebrate-pests/pest-animals-in-nsw/rabbit-control>
- Duncan, D.H. and Wintle, B.A. (2008) 'Towards Adaptive Management of Native Vegetation in Regional Landscapes' in Duncan [ed.] Landscape analysis and visualisation pp159-182, Springer, Australia
- Dwyer, P. (1995). Common Bentwing-bat (*Miniopterus schreibersii*). In: The Mammals of Australia (Ed: R. Strahan). Reed New Holland, Australia.
- EcoFocus Environmental Consulting and Wildlife Unlimited (2014). Gullen Range Wind Farm Powerful Owl and Little Eagle Survey 2014. Report prepared for Goldwind.
- Gauthreaux Jr., S A & Belser C G 2006. Effects of artificial night lighting on migrating birds. Pp 67–93. In "Ecological Consequences of Artificial Night Lighting". (Rich, C. and T. Longcore, eds. ). Island Press. Washington, D.C.
- Gregory R.D., Gibbons D.W., Donald P.F. (2004) 'Bird census and survey techniques', In: Sutherland W.J.,
- Hall, L. and Richards, G (2003). Flying around underground: cave bats. Pages 111 – 126 IN: Beneath the Surface: A Natural History of Australian Caves (Eds: B. Finlayson and E. Hamilton-Smith), University of New South Wales Press, New South Wales.
- Hull, C L & Muir, S, 2010, Search areas for monitoring bird and bat carcasses at wind farms using a Monte-Carlo method. Austr. J. Env. Management 17:77-87.
- Hull, C L, E M Stark, Peruzzo, C and Sims, C C, 2013, Avian collisions and two wind farms in Tasmania, Australia. NZ J Zool 40:47-62
- Kaplan, E. and Meier, P. 1958. Non parametric estimation from incomplete observations. Journal of the American Statistical Association. 53: 457-481.
- Kunz, T., Arnett,E., Cooper, B., Erickson, W., Larkin, R., Mabee, T., Morrison, M., Strickland, M. And Szewczak, J. (2007) 'Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document' Journal of Wildlife Management, vol 71: 8: 2449-2486
- Longcore, T, Rich, C & Gauthreaux Jr., S 2008, Height, guy wires, and steady-burning lights increase hazard of communication towers to nocturnal migrants: A review and meta-analysis, The Auk, 125(2): 485-492
- Newton I., Green R. E. [eds.] Bird Ecology and Conservation: a Handbook of Techniques, Oxford University Press, Oxford: 17-56
- nghenvironmental (2008), Biodiversity Assessment: proposed development the Gullen Range Wind Farm, southern tablelands of New South Wales, prepared for Gullen Wind Farm Pty Ltd.
- nghenvironmental (2012a), Gullen Range wind farm – Bird and Bat utilisation surveys - Biodiversity Assessment: Summer survey methods and results, prepared for Goldwind, March 2012.

- nghenvironmental (2012b), Bird and Bat Adaptive Management Plan and Monitoring Program, Gullen Range Wind Farm for Goldwind, May 2012.
- nghenvironmental (2012c), Gullen Range wind farm – Bird and Bat utilisation surveys - Biodiversity Assessment: Winter survey methods and results, prepared for Goldwind, September 2012.
- nghenvironmental (2012d), Gullen Range wind farm – Bird and Bat utilisation surveys - Biodiversity Assessment: Spring survey methods and results, prepared for Goldwind, November 2012.
- nghenvironmental (2012). Powerful Owl Management strategy (GR-PM-PLN-0013). Report Prepared for Goldwind.
- Richards, G. and Hall, L (2012). A Natural History of Australian Bats: Working the Night Shift. CSIRO Publishing, Victoria.
- Richards, GC 2012. An investigation into landscape characteristics of turbine locations in relation to bat fatalities at the Capital Wind Farm, NSW. Report prepared for Infigen Energy, September 2012.
- Thelander, C.G. (2004) 'Bird fatalities in the Altamont Pass Wind Resource Area: a case study, part 1 in Savitt Schwarz, S. [ed] Proceedings of the Wind Energy and Birds/Bat Workshop: understanding and resolving bird and bat impacts, 18-19 May 2004.

**Appendix 1: ngenvironmental (2012a) – Gullen Range wind farm – Bird and Bat utilisation surveys - Biodiversity Assessment: Summer 2012**

20 March 2012

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Dear Kristina,

**RE – Gullen Range Wind Farm Bird & Bat Monitoring Plan Stage 1 (1983)**

I write in reference to the summer bird and bat utilisation surveys undertaken at Gullen Range Wind Farm (GRWF) in February 2012 as part of Stage 1 of the Bird & Bat Monitoring Plan (BBMP). The purpose of the surveys is to gather baseline pre-construction and operation data against which to compare data gathered during the operation phase of the monitoring program.

As per our proposal (refer to email dated 20 February 2012), we have prepared a letter of methods and results suitable for incorporation in the larger monitoring report in due course (overleaf). There has been no analysis of Anabat call files; these would be undertaken at a later date.

Yours sincerely,



Brooke Marshall  
Manager - South Coast & Snowy Mountains

Ph 6492 8303

**ngh**environmental

# SURVEY TIMING AND WEATHER CONDITIONS

Summer baseline bird and bat surveys were undertaken at Gullen Range Wind Farm between 27 and 28 February 2012. The surveys were scheduled to extend to 29 February however were cut short due to severe storms and flooding. The last few days of February were unstable in terms of weather; with the highest minimum and maximum daily temperature, the lowest minimum and maximum daily temperature and the highest daily rainfall for the month of February (Yass). The weather conditions recorded at the Goulburn Airport and Yass weather stations for the survey period are given in Table 1. Heavy rainfall was patchy over the locality, as shown by rainfall records for the period at Goulburn compared to nearby Yass. The survey area is between 20 and 35 kilometres north-west of Goulburn and 50 kilometres north-east of Yass.

Table 1 Daily weather conditions during the scheduled survey period 27-29 February 2012 (source: Bureau of Meteorology 2012)

*Nr = not recorded, Var. = variable*

Date	Temperature (°C)		Rainfall (mm)	Wind 3pm (km/hr)
<b>YASS</b>	<b>Minimum</b>	<b>Maximum</b>		<b>Direction &amp; speed</b>
<b>27 Feb. 2012</b>	5.5	23.5	1.6	Nr
<b>28 Feb. 2012</b>	19.5	22.5	1.6	WNW 2
<b>29 Feb. 2012</b>	16.3	19.0	39.3	Var. 9
<b>GOULBURN</b>				
<b>27 Feb. 2012</b>	18	24.3	3.8	WNW 28
<b>28 Feb. 2012</b>	17.6	23.3	0	NW 17
<b>29 Feb. 2012</b>	14.8	17.7	59.2	SE 28

The following planned survey locations were not visited:

- BAN\_01 (property access not pre-arranged with land owner)
- BAN\_02 (property access not pre-arranged with land owner)
- BAN\_04 (property access not pre-arranged with land owner)
- BAN\_05 (property access not pre-arranged with land owner)
- BAN\_15 (access difficulties due to weather; BAN\_17 surveyed instead)
- POM\_18 (field trip cut short due to rain)
- POM\_11 (field trip cut short due to rain)

## METHODS & RESULTS

The following survey types were undertaken in accordance with Protocol 1 in BBMP (**ngh**environmental 2012) to document the use of the site by birds and bats during the summer:

- Bird utilisation surveys
- Bat utilisation surveys

# BIRD UTILISATION SURVEYS

## Methods

A 20 minute, 2ha search was used for this survey, based on Birds Australia methodology. Where possible, the shape of the survey area was 100m by 200m (care must be taken that survey areas do not overlap where turbines are located close together). Only birds within the search were recorded, including birds flying over the search area. The height at which each bird flies when passing through the survey area was estimated to the nearest 20 metres. Dawn and dusk surveys for raptors from high vantage points were not undertaken due to foggy and rainy conditions which limited visibility.

The following information was recorded for bird utilisation surveys:

- Brief description of habitat type and condition, including landscape position
- Bird species observed or heard
- Abundance of bird species observed
- Flight height of bird species observed
- Flight behaviour for raptors (i.e. soaring, hovering, gliding, flapping, etc.)
- Perching observed (substrate)

## Survey effort

Eleven full bird utilisation surveys were undertaken across all four precincts. Two additional 10 minute surveys were undertaken; these surveys were cut short by heavy rain. Three Anabat units were placed out for one overnight survey at Bannister precinct. Overall, there were six repeat survey locations and 10 new survey locations, (i.e. first time survey locations) (Table 2). Eleven surveys were undertaken in focus areas. Full survey details are given in Attachment 1.

Table 2 Bird survey location

Survey no	Nearest turbine	New location or repeat location <sup>1</sup>
1	BAN_13	New & non-focus area
2	BAN_14	Repeat & focus area
3	BAN_17	New & non-focus area
4	BAN_21	New & focus area
5	GUR_10	Repeat & focus area
6	GUR_16	New & focus area
7	GUR_17	New & non-focus area
8	KIA_01	Repeat & focus area
9	KIA_02	New & non-focus area
10	POM_03	Repeat & focus area
11	POM_07	Repeat & focus area

<sup>1</sup> Focus areas: these turbine locations are a higher priority for monitoring based on blade-strike risk (refer to Appendix C.1.1 of BBMP), and would be surveyed during every monitoring event

Non-focus areas: these turbine locations are a lower priority for monitoring and would be surveyed at a lower frequency

Survey no	Nearest turbine	New location or repeat location <sup>1</sup>
12	POM_20	New & focus area
13	POM_23	New & focus area

## Survey limitations

### Effect of weather conditions

Bird utilisation surveys did not appear to be affected by the intermittent drizzle on 27 and 28 February, with good diversity and abundance of birds recorded. However, visibility was generally low throughout the day due to low cloud, mist and rain and this may have influenced the low number of raptors recorded. By the second afternoon, the rain was heavier (and localised; no rain being recorded at the Goulburn weather station) and this affected survey duration (two surveys at Pomeroy cut short) and results during those surveys.

## Results

Bird survey results have been tabulated by precinct for all baseline surveys to date (autumn 2007, autumn 2011, summer 2012), and provided as an excel worksheet (.xlsx file). Bird utilisation surveys have found a diverse avifauna throughout the four precincts. The 15 bird species listed below were recorded for the first time at Bannister, Pomeroy and Gurrundah. Of these species, several are partial migrants and are likely to be summer visitors (listed in bold below).

### Bannister

- Red-browed Finch *Neochmia temporalis*

### Pomeroy

- Brown-headed Honeyeater *Melithreptus brevirostris*
- **Bronze-Cuckoo species *Chrysococcyx sp.***
- Golden Whistler *Pachycephala pectoralis*
- Jacky Winter *Microeca fascinans*
- **Leaden Flycatcher *Myiagra rubecula***
- **White-throated Gerygone *Gerygone olivacea***

### Gurrundah

- Buff-rumped Thornbill *Acanthiza reguloides*
- Crested Pigeon *Ocyphaps lophotes*
- Eastern Spinebill *Acanthorhynchus tenuirostris*
- Grey Shrike-thrush *Colluricincla harmonica*
- **Leaden Flycatcher *Myiagra rubecula***
- **Noisy Friarbird *Philemon corniculatus***
- Superb Fairy-wren *Malurus cyaneus*
- White-browed Scrubwren *Sericornis frontalis*

Paper data sheets have been stored with the project file, and information will be entered into a spreadsheet as part of the broader BBMP.

## BAT UTILISATION SURVEYS

### *Survey effort*

Microbat utilisation was monitored using three Anabat detectors placed overnight for one night, with hi-mics mounted on fence posts or trees at around one metre above ground level (Table 3).

Table 3 Bat survey location

Survey no	Nearest turbine	New location or repeat location
1	BAN_14	Repeat & focus area
2	BAN_17	New & non-focus area
3	BAN_21	New & focus area

### *Survey limitations*

#### **Effect of weather conditions**

It rained overnight on 27 February, and this is likely to have affected the bat utilisation survey results as the microphone sensitivity is affected by both temperature and humidity. Additionally, rain can cause interference with the Anabat's ability to detect microbat ultrasonic calls. Results have not yet been analysed, but it can be expected that rain will have affected the quality of the recordings.

### *Results*

Calls will be analysed as part of the broader BBMP post wind farm construction. The digital files will be stored with the project file.

## REFERENCES

Bureau of Meteorology (2012) *New South Wales Weather Observations*, online <http://www.bom.gov.au/nsw/observations/index.shtml>

# ATTACHMENT 1

## SURVEY DETAILS

### Table key:

**Datum:** GDA Geocentric Datum of Australia 1994                      ADG Australia Geodetic Datum 1966

**Weather:** Wind reported according to the Beaufort Wind Scale. Cloud cover is reported in octas (eighths) of the sky that is occupied by cloud

Rain = blank- no rain, 1 - drizzle to light rain, 2 - drizzle to heavy rain, 3 - heavy rain

Datum	Zone		Easting	Northing	Survey type	Survey no	Nearest turbine
GDA			723852	6174853	Bat utilisation	1	BAN_14
GDA	55	H	724559	6173636	Bat utilisation	2	BAN_17
ADG	55		724340	6172242	Bat utilisation	3	BAN_21
GDA	55	H	723852	6174816	Bird utilisation	1	BAN_13
GDA	55	H	723846	6174852	Bird utilisation	2	BAN_14
GDA	55	H	724529	6173610	Bird utilisation	3	BAN_17
GDA	55	H	724440	6172448	Bird utilisation	4	BAN_21
GDA	55	H	727450	6158904	Bird utilisation	5	GUR_10
GDA	55	H	728233	6159147	Bird utilisation	6	GUR_16
GDA	55	H	728061	6158856	Bird utilisation	7	GUR_17
GDA	55	H	722112	6177967	Bird utilisation	8	KIA_01
GDA	55	H	722163	6178261	Bird utilisation	9	KIA_02
GDA	55	H	726105	6166187	Bird utilisation	10	POM_03
GDA	55	H	727290	6165804	Bird utilisation	11	POM_07
GDA	55	H	727365	6158961	Bird utilisation	12	POM_20

Datum	Zone		Easting	Northing	Survey type	Survey no	Nearest turbine
GDA	55	H	726350	6162395	Bird utilisation	13	POM_23

Survey no	Nearest turbine	Surveyor	Time (min)	Area (ha)	Location description	Weather
1	BAN_14		o/n	n/a	Near edge of forest, but in forest, on stake marking proposed turbine location at about 0.5m above ground height	WIND 2 nw, TEMP 22 at day, CLOUD 8/8, RAIN 1 day, 2 night
2	BAN_17		o/n	n/a	On fence line adjacent to open woodland & paddock on upper slope.	WIND 2 nw, TEMP 21c at day, CLOUD 8/8, RAIN 1 day, 2 night
3	BAN_21		o/n	n/a	In open, attached to fence adjacent to woodland patch on slight slope.	WIND 2 nw, TEMP 21c at day, CLOUD 8/8, RAIN 1 day, 2 night
1	BAN_13	FG	20	2	Open area adjacent to woodland on slight slope	WIND 2 nw, TEMP 20c, CLOUD 8/8
2	BAN_14	BH	20	2	Around and within forested area on hilltop	WIND 2 nw, TEMP 20c, CLOUD 8/8
3	BAN_17	BH	20	2	Upper slope I paddock with scattered trees and small patches of woodland below. Larger patches of forest ~200m away	WIND 2 nw, TEMP 21c, CLOUD 8/8
4	BAN_21	BH	20	2	Ecotone between patch of forest and pasture with trees	WIND 2 nw, TEMP 22c, CLOUD 8/8, RAIN 1
5	GUR_10	BH/FG	20	2	In patch of woodland on hill (out of wind where possible)	WIND 2 nw, TEMP 20c CLOUD 8/8, RAIN 1
6	GUR_16	BH	20	2	Regrowth woodland and forest on slopes around GUR_16. Av dbh 20-30cm, patchy Acacia midstorey, grassy and sclerophyllous ground cover and small shrubs - survey follows gully	WIND 2 nw, TEMP 20c CLOUD 8/8
7	GUR_17	FG	20	2	Woodland adjacent to paddock on slope	WIND 2 nw, TEMP 20c CLOUD 8/8
8	KIA_01	BH	20	2	Wattle forest regeneration I paddock & tall open forest along gully	WIND 2 nw, TEMP 19c CLOUD 8/8, RAIN 1
9	KIA_02	FG	20	2	Woodland adjacent to paddock	WIND 2 nw, TEMP 20c CLOUD 8/8, RAIN 1
10	POM_03	FG	10	2	Regrowth woodland adjacent to paddock on slight slope with patches of thick shrubby understorey	WIND 2 nw, TEMP 19c, CLOUD 8/8, RAIN 2
11	POM_07	BH	10	2	Open forest with grassy understorey & ecotone to paddock	WIND 2 nw, TEMP 19c, CLOUD 8/8, RAIN 2

Survey no	Nearest turbine	Surveyor	Time (min)	Area (ha)	Location description	Weather
					with scattered trees - on slope below proposed POM_07	
12	POM_20	FG	20	2	Woodland on slope	WIND 2 nw, TEMP 20c, CLOUD 8/8
13	POM_23	BH	20	2	Scribbly gum forest av. Dbh 30cm, grassy groundcover.	WIND 2 nw, TEMP 20c, CLOUD 8/8

**Appendix 2: ngenvironmental (2012c) – Gullen Range wind farm – Bird and Bat utilisation surveys - Biodiversity Assessment: Winter 2012**

4 September 2012

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Dear Ben,

**RE – Gullen Range Wind Farm Bird and Bat Management Plan, baseline winter surveys 2012**

Winter baseline bird and bat surveys were undertaken at the Gullen Range Wind Farm site between 15 - 17 August 2012 as part of Stage 1 of the Bird and Bat Monitoring Plan (BBMP). The purpose of the surveys is to gather baseline data against which to compare data gathered during the operation phase of the monitoring program (Stages 2 and 3).

This letter provides a brief report of the survey results, suitable for incorporation in the larger monitoring report in due course. The methods, survey conditions and survey results are summarised overleaf.

Please do not hesitate to contact me should you wish to discuss these results.

Yours sincerely,



Manager, South Coast & Snowy Mountains  
Certified Environmental Practitioner (CEnvP)

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# GULLEN RANGE BASELINE BIRD AND BAT SURVEYS

## SURVEY EFFORT

### Winter

Eleven 20 minute bird surveys and four overnight Anabat surveys were undertaken between Wednesday 15 - Friday 17 August 2012, by two ecologists, Bianca Heinze and Bryson Lashbrook (see Table 1). Survey sites were directed toward focus areas identified in the BBMP and covered all four precincts; Kialla, Bannister, Pomeroy, Gurrundah. Surveys were undertaken using the methodology described in the *Gullen Range Bird and Bat Management Plan* (ngnenvironmental 2012).

### Cumulative

Tables 1 and 2 show the survey locations (with reference to the nearest proposed turbine) and cumulative survey effort across all four precincts for baseline bird and microbat surveys undertaken to date.

**Table 1 Cumulative record of bird survey sites (note: all surveys were 20 minutes duration, survey start times given in 24-hour time)**

Precinct	Nearest turbine	Autumn		Summer		Winter		No. survey/site
		Date	Time	Date	Time	Date	Time	
Kialla	KIA_01	11-Apr-12	16:05	28-Feb-12	14:40	16-Aug-12	13:40	3
	KIA_02			28-Feb-12	14:30	16-Aug-12	13:50	2
Bannister	BAN_04					17-Aug-12	10:10	1
	BAN_05					17-Aug-12	9:35	1
	BAN_13			27-Feb-12	13:17			1
	BAN_14	12-Apr-11	12:40	27-Feb-12	13:20			2
	BAN_17			27-Feb-12	15:20			1
	BAN_21			27-Feb-12	14:00			1
	BAN_27	12-Apr-11	16:15					1
Gurrundah	GUR_10	14-Apr-11	13:30	28-Feb-12	10:15	16-Aug-12	15:00	3
	GUR_16			28-Feb-12	10:05	16-Aug-12	15:15	2
	GUR_17			28-Feb-12	10:02			1
Pomeroy	POM_03	13-Apr-11	11:35	28-Feb-12	16:12	16-Aug-12	9:20	3
	POM_07	13-Apr-11	9:35	28-Feb-12	16:20	16-Aug-12	9:20	3
	POM_11	13-Apr-11	13:30			15-Aug-12	15:45	2
	POM_18	13-Apr-11	15:35			15-Aug-12	14:40	2
	POM_20			28-Feb-12	8:28			1
	POM_23	14-Apr-11	13:40	28-Feb-12	9:25	16-Aug-12	17:25	3

**Table 2 Cumulative record of microbat (Anabat) survey sites (all passive overnight surveys)**

Precinct	Nearest turbine	Autumn	Summer	Winter	No. survey/site
Kialla	KIA_02	11-12-Apr-11		16-17-Aug-12	2
Bannister	BAN_14	12-13-Apr-11	27-28-Feb-12		2
	BAN_17		27-28-Feb-12		1
	BAN_21		27-28-Feb-12		1
	BAN_27	12-13-Apr-11			1
Gurrundah	GUR_16			16-17-Aug-12	1
Pomeroy	POM_03	13-14-Apr-11		15-16-Aug-12	2
	POM_11			15-16-Aug-12	1
	POM_18	13-14-Apr-11			1

The following planned survey locations were not visited during the winter surveys due to poor weather (refer below):

- BAN\_14.
- BAN\_15.
- BAN\_21.

## WINTER SURVEY CONDITIONS AND LIMITATIONS

Overall, weather conditions over the course of the three day survey period were windy and very cold. Table 2 shows weather records for the Goulburn airport automatic weather station, located between 20 and 35 km from the site. The temperature on Friday reached maximum during the morning, and steadily declined from around 9am; the precipitation on Friday fell as sleet, hail and snow. As the snowy and rainy conditions were forecast to continue throughout the day, the surveys at BAN\_14, BAN\_15 and BAN\_21 were not undertaken.

**Table 3 Weather conditions measured at the Goulburn automatic weather station (BOM 2012)**

Date	Temperature (°C)		Max wind speed (km/hr) and direction	Precipitation (mm)
	Minimum	Maximum		
<b>GOULBURN</b>				
<b>Wednesday 15/08/12</b>	-3.5	15.8	46 km/hr, west-north-west	0
<b>Thursday 16/08/12</b>	-1.7	13.8	50 km/hr, west-north-west	0
<b>Friday 17/08/12</b>	0.7	13.1	72 km/hr, north-west	1.4

### Limitations

In general, the detectability of birds will be compromised when (DEWHA 2010a p.8):

- The wind velocity exceeds about 10 km per hour.
- Rainfall intensity is above a drizzle.
- Conditions are misty or foggy.
- Temperatures are well below or above the seasonal average.

Generally, it is recommended to avoid any one or a combination of these weather conditions (DEWHA 2010a). Surveys for microbats should generally be undertaken in warm weather and “*should not be conducted on windy, cold or rainy nights*” in order to “*maximise the probability of detection*” (DEWHA 2010b p.7) Weather conditions during the survey were a

combination of the above listed conditions (high wind velocity, snow and temperatures well below the seasonal average). Thus, the diversity and abundance of bird and bat species observed will have been negatively affected by poor detectability.

However, the intention of baseline surveys is to gather bird and bat data across a range of seasonal and weather conditions before wind farm construction to enable comparison with data collected during the operational phase. Data collection should be undertaken across the range of survey conditions that may be encountered during the operational period, rather than restricting surveys to conditions that are 'ideal' for bird detection. Therefore, although survey conditions were not ideal for maximum bird detection, they are considered representative of the site at this time of year and suitable for comparison with data gathered in future winter surveys.

## SURVEY RESULTS

### Birds

Bird survey results have been tabulated by precinct for all baseline surveys to date (autumn 2007, autumn 2011, summer 2012 and winter 2012) and provided as an excel worksheet (.xlsx file). The seven bird species listed below were recorded for the first time in the nominated precinct.

#### Bannister

- Tree Martin *Hirundo nigricans*.

#### Kialla

- Eastern Spinebill *Acanthorhynchus tenuirostris*.
- Silvereye *Zosterops lateralis*.

#### Gurrundah

- White-eared Honeyeater *Lichenostomus leucotis*.

#### Pomeroy

- Noisy Miner *Manorina melanocephala*.
- Pied Currawong *Strepera graculina*.
- Brown Gerygone *Gerygone mouki*.

Paper data sheets have been stored with the project file, and individual survey data will be entered into a spreadsheet as part of the broader BBMP.

### Bats

Our proposal for baseline surveys does not include analysis of Anabat data. Calls will be analysed as part of the broader BBMP post wind farm construction. The digital files will be stored with the project file.

## REFERENCES

- Bureau of Meteorology (2012) *New South Wales Weather Observations* [online]. Available from <http://www.bom.gov.au/nsw/observations/index.shtml> [accessed 3 September 2012]
- DEWHA (2010a) *Survey Guidelines for Australia's Threatened Birds*, Department of Environment, Water, Heritage and the Arts, Commonwealth of Australia
- DEWHA (2010b) *Survey Guidelines for Australia's Threatened Bats*, Department of Environment, Water, Heritage and the Arts, Commonwealth of Australia
- ngnvironmental (2012) *Bird and Bat Adaptive Management Plan - Gullen Range Wind Farm*, report prepared for Goldwind Pty Ltd

**Appendix 3: ngenvironmental (2012d) – Gullen Range wind farm – Bird and Bat utilisation surveys - Biodiversity Assessment: Spring 2012**

2 November 2012

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Dear Ben,

**RE – Gullen Range Wind Farm Bird and Bat Management Plan, baseline spring surveys 2012**

Spring baseline bird and bat surveys were undertaken at the Gullen Range Wind Farm site between 24 - 26 October 2012. The spring surveys conclude the 12 month Stage 1 baseline program of the Bird and Bat Monitoring Plan (BBMP). This letter provides a report of the bird and bat utilisation survey results over the period, suitable for incorporation in the larger monitoring report in due course. The methods, survey conditions and survey results are summarised overleaf.

It is noted that construction has commenced at the Pomeroy precinct and operation would be expected to begin in the next year. **ngh**environmental have previously provided a 'ballpark' annual costing forecast for operational bird and bat monitoring at Gullen Range Wind Farm. We would be happy to provide a more formal costing and approach for the first two years of operational monitoring. Please let me know how you would like to proceed.

Please do not hesitate to contact me should you wish to discuss these results or operational monitoring.

Yours sincerely,



Manager, South Coast & Snowy Mountains  
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# GULLEN RANGE BASELINE BIRD AND BAT SURVEYS

## SURVEY EFFORT

### Spring 2012

Seventeen 20 minute bird utilisation surveys and six overnight Anabat surveys were undertaken between Wednesday 24 - Friday 26 October 2012 by two ecologists, Bianca Heinze and Bryson Lashbrook (see Table 1). Survey sites were directed toward focus areas identified in the BBMP and covered all four precincts; Kialla, Bannister, Pomeroy, Gurrundah. Surveys were undertaken using the methodology described in the *Gullen Range Bird and Bat Management Plan* (ngnenvironmental 2012).

### Cumulative

Tables 1 and 2 show the survey locations (with reference to the nearest proposed turbine) and cumulative survey effort across all four precincts for baseline bird and microbat surveys undertaken to date. Fifty bird surveys have been undertaken as part of Stage 1 monitoring. The original Biodiversity Assessment included surveys in all precincts during 2007; these results have been included in the species lists and analysis. Surveys undertaken in 2007 have been amalgamated into one survey per precinct for the purposes of counting number of surveys; therefore a total of 54 surveys inform the results presented herein. Eighteen Anabat surveys have been undertaken as part of Stage 1 monitoring.

**Table 1 Cumulative record of microbat (Anabat) survey sites (all passive overnight surveys)**

Precinct	Nearest turbine	Autumn 2011	Summer 2012	Winter 2012	Spring 2012	Cumulative no. surveys
Kialla	KIA_02	11-12-Apr-11		16-17-Aug-12	25-26-Oct-12	3
Bannister	BAN_14	12-13-Apr-11	27-28-Feb-12			2
	BAN_17		27-28-Feb-12			1
	BAN_21		27-28-Feb-12		25-26-Oct-12	2
	BAN_27	12-13-Apr-11				1
Gurrundah	GUR_16			16-17-Aug-12	25-26-Oct-12	2
Pomeroy	POM_03	13-14-Apr-11		15-16-Aug-12	24-25-Oct-12	3
	POM_11			15-16-Aug-12	24-25-Oct-12	2
	POM_18	13-14-Apr-11				1
	POM_23				24-25-Oct-12	1
Total					18	

**Table 2 Cumulative record of bird utilisation survey sites (note: all surveys were 20 minutes duration, survey start times given in 24-hour time)**

Precinct	Nearest turbine	Autumn 2011		Summer 2012		Winter 2012		Spring 2012		Cumulative no. surveys
		Date	Time	Date	Time	Date	Time	Date	Time	
Kialla	KIA_01	11-Apr-12	16:05	28-Feb-12	14:40	16-Aug-12	13:40	26-Oct-12	7:40	4
	KIA_02			28-Feb-12	14:30	16-Aug-12	13:50	26-Oct-12	7:35	3
Bannister	BAN_04					17-Aug-12	10:10	25-Oct-12	7:50	2
	BAN_05					17-Aug-12	9:35	25-Oct-12	8:00	2
	BAN_13			27-Feb-12	13:17			25-Oct-12	15:00	2
	BAN_14	12-Apr-11	12:40	27-Feb-12	13:20			25-Oct-12	15:00	3
	BAN_17			27-Feb-12	15:20			25-Oct-12	14:10	2
	BAN_21			27-Feb-12	14:00			25-Oct-12	13:50	2
	BAN_27	12-Apr-11	16:15							1
	Gurrundah	GUR_10	14-Apr-11	13:30	28-Feb-12	10:15	16-Aug-12	15:00	25-Oct-12	11:30
	GUR_16			28-Feb-12	10:05	16-Aug-12	15:15	25-Oct-12	11:40	3
	GUR_17			28-Feb-12	10:02			25-Oct-12	12:15	2
Pomeroy	POM_03	13-Apr-11	11:35	28-Feb-12	16:12	16-Aug-12	9:20	25-Oct-12	10:05	4
	POM_07	13-Apr-11	9:35	28-Feb-12	16:20	16-Aug-12	9:20	24-Oct-12	17:30	4
	POM_11	13-Apr-11	13:30			15-Aug-12	15:45	24-Oct-12	16:10	3
	POM_18	13-Apr-11	15:35			15-Aug-12	14:40	24-Oct-12	16:25	3
	POM_20			28-Feb-12	8:28			24-Oct-12	14:40	2
	POM_23	14-Apr-11	13:40	28-Feb-12	9:25	16-Aug-12	17:25	24-Oct-12	14:40	4
<b>Total</b>										<b>50</b>

## SPRING SURVEY CONDITIONS AND LIMITATIONS

Overall, weather conditions over the course of the three day survey period were windy and warm. Table 3 shows weather records for the Goulburn airport automatic weather station, located between 20 and 35 km from the site.

**Table 3 Weather conditions measured at the Goulburn automatic weather station (BOM 2012)**

Date	Temperature (°C)		Max wind speed (km/hr) and direction	Precipitation (mm)
	Minimum	Maximum		
<b>GOULBURN</b>				
<b>Wednesday 24/10/12</b>	-2.6	22.5	WNW 37	0
<b>Thursday 25/10/12</b>	1.3	26.1	WNW 78	0
<b>Friday 26/10/12</b>	6.6	19.4	WNW 54	0

### Limitations

The limitations of high wind speed and other weather conditions for bird and Anabat surveys were discussed in our last results letter (dated 4 September 2012). Generally weather conditions were reasonable for detecting birds, although high winds were expected in parts of the site particularly during Thursday. Thus, the diversity and abundance of bird and bat species observed will have been negatively affected to some extent by poor survey conditions. As discussed in previous correspondence, although survey conditions were not ideal for maximum bird detection, they are considered representative of the site at this time of year and suitable for comparison with data gathered in future spring surveys.

## SURVEY RESULTS

### Birds

Bird utilisation survey results have been tabulated by precinct for all baseline surveys to date (autumn 2007, autumn 2011, summer 2012, winter 2012 and spring 2012) and provided as an excel worksheet (.xlsx file). The following basic analysis has been undertaken on bird surveys undertaken at Gullen Range Wind Farm to date:

- Number of species by precinct and by survey site.
- Frequency of species observation by precinct and by survey site.

A summary of precinct results is given in Table 4. As can be seen in the table, Crimson Rosella was widely recorded, being observed at a frequency of greater than 50% at every precinct. All bird species observed at the Kialla precinct were recorded more than once, while many bird species were observed at other precincts only once. The most commonly recorded species at each precinct (Table 4), that is species recorded at a frequency equal or greater than 50%<sup>1</sup>, may be suitable species to monitor during operational bird utilisation surveys to draw conclusions about impacts of wind farm operation.

---

<sup>1</sup> i.e. species was recorded in 50% of surveys.

**Table 4 Summary of baseline bird survey results by precinct for the Gullen Range Wind Farm**

Precinct	Kialla	Bannister	Pomeroy	Gurrundah
No. survey sites	2	7	6	3
Total no. surveys	7	15	20	10
Total no. species	43	56	79	62
No. species recorded only once	0	30	39	38
<b>Most commonly recorded species (equal to or greater than 50% frequency) ('common species')</b>				
Australian Magpie	86%	80%		50%
Australian Raven				50%
Brown Thornbill	57%			50%
Crimson Rosella	86%	80%	65%	60%
White-throated Treecreeper	100%	67%		50%
Black-faced Cuckoo-shrike			50%	
Grey Fantail	71%		65%	
Sulphur-crested Cockatoo	71%		60%	
Laughing Kookaburra	71%			
Superb Fairy-wren	71%			

## Bats

Our proposal for baseline surveys does not include analysis of Anabat data. Calls will be analysed as part of the broader BBMP post wind farm construction. The digital files will be stored with the project file and are available upon request.

## RECOMMENDATIONS FOR STAGE 2 – OPERATIONAL MONITORING

### Managing operational monitoring

The BBMP states that operational monitoring (both bird and bat utilisation and carcass searches) will need to begin at Gullen Range Wind Farm once turbines become operational and acknowledges that construction (and therefore operation) of the wind farm will be staged over several years. The BBMP does not fully account for progressive commencement of operational monitoring, but rather states that *“the period of Stage 2 [higher intensity operational monitoring] would commence with the full operation”* of Gullen Range Wind Farm (ngnenvironmental 2012 p.17). That is, the monitoring would not be considered to have commenced at ‘full operation’ until all turbines in all precincts are operating, despite needing to monitor as turbines come online. Given that construction appears to be staged by precinct, an alternative may be to run the monitoring program by precinct also. For example, if the Pomeroy precinct begins operation in early 2013 then operational monitoring at the Pomeroy precinct would begin in concert. If the Kialla precinct begins operation and monitoring in 2014; Pomeroy would be in the second year of monitoring while Kialla in the first. This is a viable option as baseline monitoring results have been gathered and analysed by precinct.

### Survey sites

As documented in previous letters, weather conditions and access issues have been survey limitations throughout the baseline monitoring phase. The consequence has been more survey sites and less survey repetition per site. Although all

sites ought to be equally accessible following construction of the wind farm, operational surveys should be streamlined choosing to focus effort and repetition at sites where the most baseline data has been gathered. For example, Anabat survey sites with only one survey may not be the ideal focus for operational monitoring as insufficient baseline data may have been gathered from these points for meaningful comparisons to be drawn.

## REFERENCES

- Bureau of Meteorology (2012) *New South Wales Weather Observations* [online]. Available from <http://www.bom.gov.au/nsw/observations/index.shtml> [accessed 1 November 2012]
- DEWHA (2010a) *Survey Guidelines for Australia's Threatened Birds*, Department of Environment, Water, Heritage and the Arts, Commonwealth of Australia
- DEWHA (2010b) *Survey Guidelines for Australia's Threatened Bats*, Department of Environment, Water, Heritage and the Arts, Commonwealth of Australia
- ngghenvironmental (2012) *Bird and Bat Adaptive Management Plan - Gullen Range Wind Farm*, report prepared for Goldwind Pty Ltd

Appendix 4: Carcass Search Data Sheet

GULLEN RANGE WIND FARM - BIRD AND BAT MORTALITY MONITORING PROGRAM CARCASS SEARCH DATA-SHEET*				
Please fill out all details above the heavy line for each site searched All details below the line are required if a carcass is found Do not move a carcass until the details below have been completed				
Gullen Range WF				
Date:				
Start Time:				
Finish Time:				
Turbine Number:				
Wind direction and strength in preceding 24 hours:				
Any unusual weather conditions in last 48 hours?				
Distance of Carcass from Tower(m):				
Bearing of Carcass from Tower (deg):				
Preliminary Species Identification:				
Photo Taken**		Yes / No		
Signs of injury:				
How old is carcass estimated to be (tick category):	<24 hrs	1-3 days	> 3 days	Other
Other Notes (ie. sex/age of bird):				
<b>Post Find Actions:</b> 1. Place carcass in sealable plastic bag then wrap it in newspaper and take to freezer at site office.				
* One form should be completed for each carcass found				
** Please attach photo to this form				

# APPENDIX J WEED & PEST MANAGEMENT PLAN



# Weed & Pest Management Plan (GR-PM-PLN-0018)

GULLEN RANGE WIND FARM

OCTOBER 2013



*Document Verification*

Revision	Date	Prepared by	Checked by	Approved by
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## 2 INTRODUCTION TO THIS DOCUMENT

### 2.1 BACKGROUND

This Weed and Pest Management Plan (WPMP) has been prepared to address key requirements such as the management and control of noxious weeds and pest animals within the operational boundary of Gullen Range Wind Farm.

The WPMP has also been prepared to comply with the Submissions Report Statement of Commitment (SRSoC) 22 which requires the Proponent to prepare a *“Pest Animal Control Program, to reduce the attractiveness of the site to foraging raptors, rabbits would be controlled on the turbine ridges, carrion would be removed from the site as quickly as possible”*.

All relevant Conditions of Approval are also incorporated into Appendix A of the Operational Environmental Management Plan (OEMP).

### 2.2 SCOPE

This plan covers all operational areas of the Gullen Range Wind Farm assets and is only relevant to the operational phase of the project.

This plan is intended to be an adaptive management document.

### 2.3 PURPOSE

The purpose of this WPMP is to describe how impacts associated with noxious weeds and pest animals can be managed during operation.

### 2.4 AIMS AND OBJECTIVES

The aims of the WPMP are to categorise areas for management, identify removal and control techniques and undertake monitoring and corrective actions where required.

The operational objectives are as follows:

- Prevent spread and incidence of weeds within operational work area
- Removal of weeds introduced as a result of development at site
- No new invasive weeds species introduced to operational work area
- Reduce rabbit population to a manageable level

### **3 CONSULTATION ADJACENT LANDOWNERS**

The program for removal of weeds introduced or spread as a result of the development at site will be coordinated with adjacent landowners where possible. As required by L&ECO 7.5, the weed management removal program is included in the Landscape Management Plan.

Landowners will be notified prior to the setting of baits for rabbit control.

## 4 RESPONSIBILITIES

Operational responsibilities are outlined in Section 4 of the OEMP. Responsibilities specific to noxious weed and pest management are detailed below.

**Table 4-1** Personnel with specific environmental responsibilities

Role	Responsibility	Authority
Owner's management team	<p>Ensure Environmental Policy is communicated throughout business</p> <p>Responsible for providing the required resources to complete the required tasks and to facilitate company corporate support. Resources being financial, technical and includes external resources</p> <p>Develop and implement objectives and targets for environmental and safety management</p> <p>Delegates to Project Manager – Owners Representative</p>	Authority to limit and stop works
Project Manager – Owner's Representative	<p>Oversee the implementation of all environmental management plans and monitoring programs required under the planning approval</p> <p>Determining sequence and interaction of staff, resources and processes</p> <p>Ensure communications and reporting framework in place</p> <p>Ensure the goals of the OEMP (and sub-plans) are achieved and maintained</p> <p>Report incidents to agencies</p> <p>Ensure mitigation plans are appropriate and resourced</p> <p>Make changes to OEMP and communicate to relevant stakeholders</p> <p>Communication with stakeholders including agencies, public and other identified stakeholders</p> <p>Reviews OEMP</p> <p>Manages environmental compliance obligations (set out in Section 4) and any consultants required in relation to this work</p> <p>Designs and Implements environmental induction</p>	<p>All aspects of the environmental performance of the project.</p> <p>Authority to update OEMP and implement upon DoPI/Agency Approval</p> <p>Stop Work orders</p>
Operational Manager	<p>Responsible for delivery of operational activities including routine and non-routine maintenance works</p> <p>Ensure inductions and training are completed in</p>	Authority to stop works

Role	Responsibility	Authority
	<p>accordance with the OEMP and sub-plans</p> <p>Ensure environmental impacts are minimised and environmental obligations set out in the OEMP and sub-plans are met</p> <p>Approves EWMS &amp; JSEA's</p> <p>Ensures records are maintained</p> <p>Delegates to Operational Site Supervisor and Health and Safety Manager</p> <p>Reports incidents to agencies</p>	
Operational Site Supervisor	<p>Responsible for implementing the OEMP in relation to maintenance activities (set out in Section 5)</p> <p>Ensure all activities on site are undertaken in accordance with the OEMP, sub-plans and Safety Management Plan</p> <p>Reporting of environmental incidents</p> <p>Ensure management measures relating to wind farm performance are maintained</p> <p>Responsible for ensuring any subcontractors engaged in relation to this project are inducted and the OEMP (and sub-plans) are implemented.</p> <p>Identifies all environmental and safety risks associated with maintenance works</p> <p>Creates /reviews EWMS and JSEAs for operational staff and contractors</p> <p>Reports incidents to agencies</p> <p>Maintains site records</p>	Authority to limit and stop works
GWA Project Services Manager - Health, Safety and Quality Manager	<p>Ensures goals of Safety Management Plan are achieved</p> <p>Ensure that environmental auditing is undertaken in accordance with all relevant project Environmental Management Systems and Safety Management System and their associated ISO standards (where applicable)</p> <p>Reports incidents to agencies</p>	Authority to limit and stop works
Environmental Representative	<p>Be the principal point of advice in relation to the environmental performance of the project</p> <p>Oversee the implementation of all environmental management plans and monitoring programs required under the planning approval, and the Proponent upon</p>	Authority to require environmental actions to be undertaken.

Role	Responsibility	Authority
	<p>the achievement of these plans/programs</p> <p>Consider and advise the Proponent on its compliance obligations against all matters specified in the conditions of the planning approval and the Statement of Commitments and all other licences and approvals related to the environmental performance and impacts of the project</p> <p>Ensure that environmental auditing is undertaken in accordance with all relevant project Environmental Management Systems</p> <p>Be given the authority and independence to require reasonable steps be taken to avoid or minimise unintended or adverse environmental impacts, and failing the effectiveness of such steps, to direct that relevant actions be ceased immediately should an adverse impact on the environment be likely to occur.</p>	
<p>Consultants/Nominated experts</p>	<p>Provide specialist input and advice on environmental matters</p> <p>Design and assist in implementing monitoring programs</p> <p>Undertake surveys and inspections</p> <p>Preparation of environmental reports</p> <p>Ensure environmental impacts are minimised and environmental obligations are met</p> <p>Undertake activities in accordance with the relevant JSEA's and agreed procedures</p> <p>Report any activity that has resulted, or has the potential to result in an environmental incident</p>	<p>Suggest Stop Work orders <i>(stop work permitted if action deemed unsafe)</i></p> <p>Recommend actions to the owner to address compliance issues</p>



## 5 WEED MANAGEMENT

This section provides guidance on weed management and is further supported by the Landscape Management Plan which includes the weed removal program for the Wind Farm.

### 5.1 WEED CLASSIFICATION

For the purpose of this plan, weeds have been classified as follows:

1. **Target Weed Species** – These are known weed species to occur on site and are of particular concern (i.e. Noxious Weeds, WONS and priority weeds identified by the Upper Lachlan Shire Council).
2. **Priority Weed Species** – Weed species of particular concern (as above) but not previously recorded on the site.
3. **General Weed Species** – Weed species commonly occurring in the area and of no specific threat to the environment

This plan addresses Target Weed and Priority Weed Species.

### 5.2 WEED IDENTIFICATION

Agricultural pasture species and weeds are common across all precincts. Six noxious weeds declared under the *Noxious Weeds Act 1993* (NW Act) as Class 4 weeds were recorded. Class 4 weeds are plants that pose a potentially serious threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area. The NW Act states that Class 4 weeds must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction.

The six noxious weeds recorded on site, including their distribution at the site are indicated below.

**Table 5-1** Noxious weeds recorded at the precincts

Species	Class	Distribution at the Wind Farm
Blackberry ( <i>Rubus fruticosus</i> sp agg)	4*	Scattered in pasture on Bannister and common in areas of Pomeroy
Nodding Thistle ( <i>Carduus nutans</i> )	4*	Common in pasture on Bannister and Pomeroy
Scotch Thistle ( <i>Onopordum acanthium</i> )	4*	Locally common in pasture on Bannister
Serrated Tussock ( <i>Nassella trichotoma</i> )	4*	Widespread and abundant on Pomeroy, and a few plants were detected in the southern part of Bannister
Sweet Briar ( <i>Rosa rubiginosa</i> )	4*	Scattered sparsely on Pomeroy and Bannister

## 5.3 WEEDS OF CONCERN & CONTROL METHODS

The relevant weeds of concern and associated control measures are identified in Table 5-2.

**NB:** *GRWF employees and Sub- contractors are made aware of the weed management areas and the relevant procedures for weed spread prevention. This information will be included in the project specific induction, tool box and pre-start meetings and during site environmental inspections.*

**Table 5-2** Relevant Weed Species and Associated Control Methods

Weed Species and listing	Image	Growth Season	Dispersal	Control methods	Control Timing	General Management Requirements
<b>Target Weed Species</b>  <b>Scotch Thistle</b> <i>Onopordum acanthium</i> C4, PW		Varies depending on rainfall but often Spring	Wind, slashing, contaminated soil or hay and stock.	Small Infestations: Chip and/or spot spray Large Infestations: Boom spray with selective broad-leaf herbicide, Maintain/establish a vigorous competitive pasture. Chemical: MCPA 500 or 2,4-D Ester	Best control from seedling to rosette. Requires higher rate as plant seeds. Best timing in mid to late winter.	Areas of infestation are not to be traversed by vehicle. Areas in proximity to vehicle paths are to be fenced off to avoid accidental access.
<b>Serrated Tussock</b> <i>Nassella trichotoma</i> C4, PW		Plant germination usually takes place in autumn or winter. Flowering stems emerge in spring.	Wind, in the gut of stock, contaminated feed, in soil, on vehicles and by water.	Effective when herbicide application is combined with physical removal. Dig, spot or boom spray prior to seeding. For large infestations cultivate and/or spray and direct drill to establish competitive pasture species. Maintain other pasture plants in vigorous condition. Chemicals: Glyphosate or Flupropanate	Best control while vegetative, from autumn to early spring.	Soil movement from areas of infestation is to be avoided.

Weed Species and listing	Image	Growth Season	Dispersal	Control methods	Control Timing	General Management Requirements
<p><b>Sweet Briar</b> <i>Rosa rubiginosa</i> C4, PW</p>		Perennial	<p>Birds and foxes at the branch tips where they touch ground and root suckers.</p>	<p>Spray, slashing to reduce tall clumps, Dig out, and and/or introduction of blackberry rust, in wet summers.</p> <p>Chemicals: Grazon Extra (Triclopyr, Picloram and Aminopyralid)</p>	<p>Treat in late spring to autumn.</p>	<p><b>No specific management requirements</b></p>
<b>Priority Weed Species</b>						
<p><b>Blackberry</b> <i>Rubus fruticosus</i> C4, PW</p>		Perennial	<p>Birds and foxes at the branch tips where they touch ground and root suckers.</p>	<p>Spray, slashing to reduce tall clumps, Dig out, and introduction of blackberry rust, in wet summers.</p> <p>Chemical control: Grazon Extra (Triclopyr, Picloram and Aminopyralid)</p>	<p>Treat in late spring to autumn.</p>	<p><b>No specific management requirements</b></p>

Weed Species and listing	Image	Growth Season	Dispersal	Control methods	Control Timing	General Management Requirements
<b>Nodding Thistle</b> <i>Carduus nutans</i> C4, PW		Spring	Wind, water, slashing, contaminated soil or hay and on stock.	Small infestations: Chip and/or spot spray Large infestations: Boom spray with selective broad-leaf herbicide, Maintain/establish a vigorous competitive pasture.  Chemical control: MCPA 500 or 2,4-D Ester	Spray at early rosette stage; re-treatment is required (Often spring)	Soil movement from areas of infestation are to be avoided.
<b>Spiny Burrgrass</b> <i>Cenchrus incertus</i> C4, PW		Perennial	Burs cling to animals, clothing, vehicle tyres and machinery. In contaminated hay.	Dig and/or spot spray before seeding. Seed is short-lived in the soil so prevention of seeding for 3 years can eradicate this weed.  For dense infestation, cultivation and establishment of a vigorous perennial pasture.  Chemical control: Glyphosate or MSMA	Actively growing plants before seeding. Non-selective.	Areas of infestation are not to be traversed by vehicle.  Areas in proximity to vehicle paths are to be fenced off to avoid accidental access.

**Key**

- C2 NW Act Class 2 Noxious Weed
- C4 NW Act Class 4 Noxious Weed
- C5 NW Act Class 5 Noxious Weed
- WONS Weed of National Significance
- PW Priority Weed

## 5.4 PESTICIDE USE

1. In reference to the “Noxious and Environmental Weed Control Handbook 2004-2005” and site conditions, determine if the use of herbicide is the preferred control measure. If using herbicide, the recommended herbicide is ‘Roundup Biactive’ or ‘Macspred Glyphosate Bi Dri’ (both glyphosate based). Due to their short residual lives and aquatic-safe surfactants, these are the safest products for people and the environment.
2. No chemicals are to be used without the express permission of a GRWF representative
3. Chemical retailers can provide information on registered chemical products that are available in their store. They can also supply a ‘Material Safety Data Sheet (MSDS)’ which outlines the health and safety issues associated with the use of a product
4. Chemical application is only to be carried out by trained, accredited persons
5. Users of chemical products must always read the label and any Permit, before using the product and strictly comply with the directions on the label so that specific instructions relating to the rate, timing, application and safety are noted
6. Particular regard should be paid to the residual impacts of chemical use. To this extent, consideration of the residual characteristics should be made:
  - a. When selecting a herbicide, whether a suitable alternative herbicide with less residual impacts is available for use
  - b. When using herbicides near waterways or waterbodies, both select appropriate herbicides and use them in a manner to avoid any contact with waters

## 5.5 VEHICLE HYGIENE CERTIFICATION

ALL vehicles/machinery/plant prior to commencing any work on the site **MUST**:

- Be thoroughly washed to remove all soil/mud and plant material
- Complete a state “Weed Hygiene Declaration” form (if applicable)
- Be inspected by an authorised person to conduct weed hygiene inspections
- Forward all documentation to the GRWF Site Supervisor for filing
- Keep all documentation on file for a minimum of two years

## 5.6 WEED REMOVAL PROGRAM

The weed removal program is only applicable to the operational boundary of the Wind Farm assets. The limits of the weed and pest management plan are expressed within the Landscape Management Plan (GR-PM-PLN-0018)

## 6 PEST MANAGEMENT

Pest management will focus on the control of rabbits and is limited to the turbine ridges to reduce the attractiveness of the site to foraging raptors (SRSoC 22).

### 6.1 MANAGEMENT OF RABBITS

The *Rural Lands Protection Act 1998* (RLP 1998) is the principal legislative instrument governing the management of vertebrate pests in NSW. Rabbits are declared pests under the RLP Act.

According to the NSW Department of Primary Industries, poisoning following by harbour destruction is the most effective ways to control rabbits.

Poisoning is more effective during the non-breeding season (when rabbits are less territorial and less tied to warrens) and feed is scarce. The best time is usually during mid to late summer.

1080 and Pindone are toxins registered for the control of rabbits. Both are covered by product labels and Pest Control Orders (PCO) issued by the NSW Office of Environment and Health.

The objective of poisoning is to remove 90% or more of rabbits, which will prevent the population from quickly recovering, allowing time to implement follow up control. Carrots are the preferred feed material for rabbits, but oats and pellets may be used.

The warren provides shelter and protection for rabbits, to avoid extremes of weather and predators. Rabbits do not readily dig new warrens, so destruction of warrens greatly inhibits resurgence and re-colonisation of treated areas.

### 6.2 POISONING

#### 6.2.1 Poisoning with 1080

Rabbit poisoning with 1080 in NSW is regulated by the *Pesticides Act 1999* and can be carried out only under the conditions set down in the *Pesticide Control (1080 Liquid Concentrate and Bait products) Order 2010* (1080 PCO).

Poisoning with 1080 is a cost effective method to reduce medium and high density rabbit numbers to a manageable level. To conduct a 1080 poisoning program, contact your Livestock Health and Pest Authority (LHPA). All 1080 users are required to have chemical risk management training at Australian Qualifications Framework level 3 (AQF3).

A minimum of three 'free' feeds (without toxin) are required prior to laying 1080 poison bait except where an Authorised Control Officer recommends otherwise. Using carrots, 3 free feeds at 2 to 3 day intervals are best.

#### 6.2.2 Poisoning with Pindone

Pindone is an anticoagulant poison that requires at least two 'free' feeds (without toxin) followed by a minimum of three Pindone feeds to kill a high proportion of rabbits. Pindone has an antidote (vitamin K1) and is safer to use in closer settled areas.

### 6.2.3 Carrion Removal

During the poisoning program, the control area will be regularly inspected to identify and remove carrion.

## 6.3 HARBOUR DESTRUCTION

Warren ripping is highly target specific, and can be successfully employed during the breeding season (when poisoning programs are less effective).

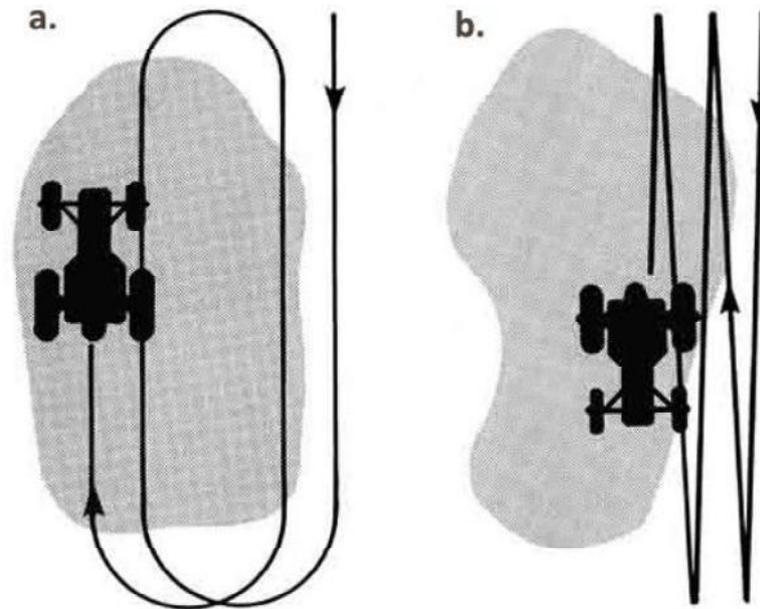


Figure 6-1 Typical ripping patterns a) on flat ground and b) on hilly terrain

The aim of warren ripping is to simultaneously destroy the structure of the warren and kill all of the rabbits. It is best to use dogs to force surface rabbits into warrens before the start of ripping. Note that warrens may extend under fences, buildings, rock ledges and the root system of large trees. These inaccessible burrows should be fumigated some hours before ripping.

Rabbits may also live among surface shelter, such as dense vegetation and weeds. Other rabbit harbour includes blackberry, lantana, fallen logs, farm refuse, old machinery and rock piles. Blackberry will be targeted as part of the weed management measures (Refer to Section 5).

## 6.4 RABBIT CONTROL PROGRAM

The objective is to reduce the population to a manageable level by a poisoning program during the non-breeding season, followed by harbour destruction during the breeding season, if deemed necessary. After poisoning has been undertaken, a pest inspection will be conducted each year in coordination with the Goulburn LHPA pest inspector to assess whether harbour destruction is required.

**Table 6-1** Rabbit control program

Control Type	Spring (Sept – Nov)	Summer (Dec – Feb)	Autumn (Mar – May)	Winter (Jun – Aug)
Poisoning		✓		
Harbour Destruction				✓

## **7 INSPECTION & MONITORING**

An annual review of the pest control program will be undertaken in spring each year to determine how the program is progressing against the objectives and to guide future control methods.

Refer to the *Landscape Management Plan* for details on review and monitoring for the weed removal program.

Environmental inspections and auditing will be undertaken as detailed in the OEMP.

# **APPENDIX K OPERATIONAL NOISE MANAGEMENT PLAN**

Consisting of Appendix K - Operational Noise Management Plan and Appendix K1 - revised Noise Impact Assessment

# Gullen Range Wind Farm

## Operational Noise Management and Noise Compliance Plan



# Gullen Range Wind Farm

## Operational Noise Management and Noise Compliance Plan

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## 1.0 Introduction

Goldwind Australia Pty Ltd (GWA) is planning to commence operation of the Gullen Range Wind Farm (“the Wind Farm”), located approximately 20km west of Goulburn, NSW. The Wind Farm will be comprised of 73 wind turbines, built in two sections along a north-south oriented ridgeline of the Great Diving Range.

The Wind Farm received approval from the NSW Minister for Planning in August 2010, and Project Approval S07/00846 (“the Project Approval”) was issued.

This Operational Noise Management and Noise Compliance Plan has been developed in accordance with Condition 2.21 and Condition 7.5a of the Project Approval.

This Plan defines the methodology for managing, verifying, and ensuring the ongoing operational noise compliance of the Wind Farm in accordance with the Project Approval.

This Plan is structured in two parts:

### *Part A: Operational Noise Management Plan*

This part of the Plan defines:

- Measures for ongoing management of operational noise, including the Noise Operating Strategy for the Wind Farm;
- Procedures to be followed in the event that a non-compliance of the Wind Farm noise is identified;
- Noise complaints management procedures.

### *Part B: Noise Compliance Plan*

This part of the Plan defines:

- The locations where noise compliance monitoring will be undertaken;
- The noise monitoring and analysis procedures that will be used;
- A methodology for the identification and assessment of tonality and other potential ‘annoying’ characteristics;
- The noise compliance monitoring schedule;

Appendix A presents a summary table listing the sections in this Plan where each specific requirement of the Project Approval conditions is addressed.

A glossary of the acoustic terms used in this Plan is presented in Appendix B.

This Plan is intended to follow the management structure outlined in the Gullen Range Wind Farm Operational Environmental Plan (OEMP) where roles and responsibilities are defined in achieving this Plan’s goals.

## 2.0 Project Approval Conditions

There are 12 conditions included in Project Approval S07/00846 which relate to operational noise from the Wind Farm (Conditions 2.15 to 2.24, 3.2, and 7.5a). Conditions 2.21 and 7.5a are the conditions that specify the requirements for this Noise Compliance and Operational Noise Management Plan. Conditions 2.21 and 7.5a are reproduced below. The full Project Approval is presented in Appendix C.

### Condition 2.21

*The Proponent shall prepare a Noise Compliance Plan which shall be submitted to the Director-General prior to commissioning of the wind turbines. The Noise Compliance Plan shall include, but not be limited to:*

- a) *an assessment of the performance of the project against the noise predictions contained in conditions 2.15 and 2.16;*
- b) *a commitment to operate the Project in accordance with any Noise Operating Strategy that is implemented in accordance with condition 2.17;*
- c) *a commitment that noise monitoring will be undertaken within three months of the commissioning of the wind turbines. If prevailing meteorological conditions do not allow the required monitoring to be undertaken in this period, the Director-General shall be notified and an extension of time may be sought; and*
- d) *a requirement that all noise compliance monitoring results are submitted to the Director-General within one month of completion of the monitoring. The Director-General may request that additional noise monitoring be undertaken and completed within a specified timeframe.*

*The Noise Compliance Assessment shall be undertaken generally in accordance with the procedures presented in SA Guidelines 2003, except that all sounds [sic] power levels and wind speeds shall be referenced to hub-height.*

### Condition 7.5a

*As part of the Operation Environmental Management Plan required under condition 7.4, the Proponent shall prepare and implement, but is not limited to the following Management Plans:*

- a) *a **Noise Management Plan** to outline measures to minimise noise emissions from the operation of the project. The Plan must include, but not necessarily be limited to:*
  - i) *details of procedures to ensure ongoing compliance with the operational noise limits specified in condition 2.14 [sic]<sup>1</sup> as they apply to identified receptors. This should include identification of monitoring requirements.*
  - ii) *identification and implementation of best practice management techniques for minimisation of noise emissions where reasonable and feasible;*
  - iii) *measures to be undertaken to rectify annoying characteristics resulting from the operation of the project, such as, but not limited to, infrasound or adverse mechanical noise from component failure; and*
  - iv) *procedures and corrective actions to be taken if non-compliance is detected.*

---

<sup>1</sup> Condition 7.5a i) refers to the noise limits specified in Condition 2.14. It is believed that this is meant to refer to Condition 2.15, as Condition 2.14 relates to notification of blasting during construction.

## PART A - OPERATIONAL NOISE MANAGEMENT PLAN



### 3.0 Introduction to Operational Noise Management Plan

Pursuant to Condition 7.5a of the Project Approval for Gullen Range Wind Farm, this Operational Noise Management Plan prescribes how noise associated with the operation of Gullen Range Wind Farm will be managed.

### 4.0 General Noise Management

Operational noise from the wind farm shall be managed to ensure ongoing compliance with the operational noise limits prescribed by the Project Approval, and to minimise noise impacts from operational activities on surrounding receivers.

The following measures will be implemented to manage general operational noise:

- The wind turbines at the Wind Farm shall be operated in accordance with the Noise Operating Strategy for the Wind Farm (see Section 5.0).
- An ongoing wind turbine maintenance program shall be implemented at Wind Farm to ensure the wind turbines are properly serviced and do not generate excessive noise emissions due to faults or wear.
- Where a fault or wear is found to result in increased noise emissions from a wind turbine, the issue will be rectified as soon as possible after identification.
- If increased noise due to the issue results in the noise emissions from the Wind Farm exceeding the noise limits, the faulty wind turbine shall be shut down until such time as the problem has been rectified.
- Wind Farm site traffic shall be limited to 40 km/h on the roads and tracks within the Wind Farm to control vehicle noise emissions to a reasonable level.
- All site vehicles shall be fitted with properly maintained engine exhaust mufflers.
- Where reasonable and feasible, no audible movement warning alarms (reverse beepers) will be fitted to site vehicles.
- Maintenance and service activities will generally be limited to the hours of 7am to 6pm Monday to Friday, and 8am to 12pm Saturday, except in the case of emergency repair works or works that cannot reasonably be completed within the above hours.
- Where works outside the above hours are proposed and noise from equipment such as cranes or power tools may impact on surrounding receivers, the potentially impacted receivers shall be notified of the proposed works at least one week in advance, except in the case of emergency repair works. Council will also be notified and consultation with the public will be undertaken.
- Any portable generators used during maintenance works shall be fitted with properly maintained exhaust silencers.
- The equipment, processes, and scheduling of maintenance works will be determined with consideration to minimising noise emissions and noise impacts to surrounding dwellings. JSEAs (Job Safety and Environmental Analysis) will be used to detail the prescriptive mitigation measures to be implemented for specific activities. ESAMs (Environmental and Social Assessment and Management) will be used to identify any potentially affected noise sensitive receivers.
- Noise from radios / music will be kept to a reasonable level during maintenance works.
- Any noise complaints shall be managed in accordance with the Noise Complaints Management Procedure (see Section 9.0) and will complement the measures defined in the OEMP.

## 5.0 Noise Operating Strategy

### 5.1 Overview

In accordance with Condition 2.17 of the Project Approval, if the noise levels due to the Wind Farm are predicted to exceed the noise limits specified by Condition 2.15 without noise mitigation measures applied, a Noise Operating Strategy must be implemented. The Noise Operating Strategy is required to specify the noise mitigation measures to be implemented to ensure that operational noise levels due to the Wind Farm do not exceed the noise limits.

The noise levels due to the proposed wind farm have been predicted in the *Gullen Range Wind Farm Revised Noise Impact Assessment, Report No. Rp 002 R03 2012154SY, dated 25 September 2013* ("the Revised Noise Assessment"). A copy of this report is presented in Appendix D.

In accordance with the findings of the Revised Noise Assessment, it is predicted that the operation of four wind turbines will need to be curtailed in order to comply with the noise limits specified by Condition 2.15. The following subsections set out details of the curtailment measures that will be applied. These measures form the Noise Operating Strategy that will be implemented for Gullen Range Wind Farm in accordance with Condition 2.17 of the Project Approval.

### 5.2 Wind Turbines to be Curtailed

During normal operation of the Wind Farm, the operation of the following wind turbines shall be curtailed in accordance with the curtailment measures presented in Section 5.3.

**Table 1** Wind Turbines to be Curtailed

Turbine No.	Make / Model	Turbine Location (UTM WGS84)	
		Easting	Northing
BAN_8	GW100/2500	723327	6175886
BAN_13	GW100/2500	723736	6174579
BAN_14	GW100/2500	723832	6174779
BAN_15	GW100/2500	724314	6174314

### 5.3 Curtailment Measures

In order to ensure compliance with the noise limits specified by Condition 2.15, the wind turbines nominated in Section 5.2 will be programmed to operate with a permanently curtailed solution that will reduce the rotor speed of the wind turbines when the hub height wind speeds are in the range of 9 m/s to 11.5 m/s. This reduction in rotor speed results in reduced Sound Power Levels from these four wind turbines and will ensure compliance at nearby residences.

### 5.4 Review of Noise Operating Strategy

#### 5.4.1 Verification of Noise Operating Strategy

The adequacy of the Noise Operating Strategy shall be verified through noise compliance monitoring in accordance with the procedures presented in Section 11.0 of this Plan. The adequacy of the Noise Operating Strategy shall be verified if the noise compliance monitoring demonstrates compliance with the noise limits specified by Condition 2.15 of the Project Approval.

In the event that the Noise Operating Strategy is implemented and a non-compliance of the Wind Farm noise levels is identified following commissioning of the Wind Farm, the Non-Compliance Procedures outlined in Section 8.0 of this Plan shall be followed.

#### 5.4.2 Update of Noise Operating Strategy

The Noise Operating Strategy may be updated in the following circumstances:

- 1) The measured operational noise levels due to the wind farm are found to be lower than predicted in Revised Noise Assessment, and it is determined that operational noise due to the Wind Farm would comply with the noise limits specified by Condition 2.15 without curtailment of wind turbines, or with a reduced level of curtailment.
- 2) Technological advancements or other changed circumstances allow for the Wind Farm to be operated within the noise limits specified by Condition 2.15 without curtailment of wind turbines, or with a reduced level of curtailment.
- 3) A non-compliance of the Wind Farm noise is identified and further curtailment of wind turbines is determined to be required on an ongoing basis in order to comply with the noise limits specified by Condition 2.15.

Proposed updates to the Noise Operating Strategy shall be supported by noise modelling verification.

Details of any updates to the Noise Operating Strategy shall be advised to the Director-General and the Environment Protection Authority (EPA).

Following implementation of any such updates to the Noise Operating Strategy, noise compliance monitoring shall be repeated at a location (or locations) where the Wind Farm noise levels are representative of those at the dwelling(s) potentially most-affected by the changes to the Noise Operating Strategy. The noise compliance monitoring shall be performed in accordance with the procedures presented in Section 11.0 of this Plan.

## 6.0 Noise Compliance Monitoring

Noise compliance monitoring shall be undertaken as required in accordance with the Noise Compliance Plan, to verify that operational noise due to the Wind Farm complies with the noise limits prescribed by Condition 2.15 of the Project Approval.

## 7.0 Addressing 'Annoying Noise Characteristics'

In accordance with Condition 7.5a of the Project Approval, if any tonality or 'annoying noise characteristics' are identified due to the Wind Farm the following measures shall be taken to address the characteristics:

- 1) In the first instance the wind farm operator / owner shall determine if the annoying characteristics are the result of a repairable mechanical fault (e.g. bearing failure). If the annoying characteristics are due to a repairable mechanical fault the fault shall be repaired as soon as practicably possible.
- 2) In the event that the annoying characteristics are not due to a repairable mechanical fault, objective assessment of the annoying characteristic(s) shall be performed in accordance with the Section 11.6 of the Noise Compliance Plan to determine if the annoying characteristics warrant any penalty adjustment to be applied and if the Wind Farm noise levels, including any applicable penalty adjustment comply with the requirements of the Project Approval.
- 3) If the objective assessment finds that the annoying characteristics result in a non-compliance, then the Non-Compliance Procedures prescribed in Section 8.0 will be implemented to address the source of the annoying characteristics.
- 4) If the objective assessment finds that the annoying characteristics do not result in a non-compliance then any further investigation or action shall be undertaken at the discretion of the Wind Farm operator / owner, or as required by the Director-General.

## 8.0 Non-Compliance Procedures

In the event that a reportable non-compliance of the operational noise due to the Wind Farm is identified, the following course of action will be taken:

- 1) Upon identification of a confirmed non-compliance, a report will be provided to the Director-General and the EPA outlining the methodology and results of the noise measurements that have confirmed the non-compliance, and the particular meteorological conditions under which the non-compliance has been found to occur. If the non-compliance is identified as a result of a complaint from a member of the community, a report will also be provided to the complainant if requested, outlining the investigation process and the results of the investigation.
- 2) In the event that a potential non-compliance requires further verification, additional noise monitoring may be undertaken at the discretion of the Wind Farm Owner or as directed by the EPA or Director-General. For example, this may be required if background noise influences are considered to have adversely affected the noise monitoring results. In such instances, it may be necessary to conduct additional monitoring at an alternative location closer to the Wind Farm, or away from sources of background noise such as trees and other vegetation, in order to verify whether or not there is a non-compliance. If such additional verification is required, the report provided to the Director-General at Item 1 shall state this requirement, and shall include a program for any additional noise monitoring proposed.
- 3) If a non-compliance is verified, the operation of the wind turbine (or wind turbines) causing the non-compliance will be curtailed to ensure that the Wind Farm noise complies with the noise limits while a permanent solution is being investigated. Curtailment may include measures such as power curve management, wind sector management, time-based operational constraints, or complete shut-down of the relevant wind turbine(s), as deemed appropriate by the Wind Farm Owner or through orders issued by the EPA.
- 4) An investigation will be commenced to determine the cause of the non-compliance and identify a permanent solution to achieve noise compliance.
- 5) The Director-General and EPA shall be kept informed of the actions being taken during Steps 2) to 4) above. Details of the proposed permanent solution shall be submitted to the Director-General, prior to resuming operation with the permanent solution implemented.
- 6) After implementing a permanent solution, noise compliance monitoring shall be repeated in accordance with the procedures presented in Section 11.0 at the location (or locations) where non-compliance was identified.
- 7) A report on the methodology and results of the repeat noise monitoring shall be provided to the Director-General and the EPA within one month of completing the repeat noise monitoring.
- 8) If the noise monitoring confirms that noise compliance is achieved, the Noise Operating Strategy for the Wind Farm (see Section 5.0) shall be updated to reflect any additional operational constraints that have been determined to be required to achieve noise compliance, and the updated Noise Operating Strategy shall be submitted to the Director-General. No further action will be required. This will be undertaken using the update process outlined in the OEMP and all controlled copy holders will be informed of the changes.
- 9) If the repeat noise monitoring does not confirm compliance of the operational noise due to the Wind Farm with the prescribed noise limits, then the above steps shall be repeated until such time as compliance is able to be demonstrated.
- 10) If a permanent solution cannot be reasonably achieved through noise mitigation measures at the Wind Farm, the Wind Farm Owner may offer screening measures and/or building acoustic treatments to the affected landowners at the cost of the Wind Farm Owner. These measures may be implemented to address any noise limit exceedance at the discretion of the landowner, in accordance with Project Approval Condition 2.22. The landowner / resident shall be made aware of the noise and other implication prior to agreeing screening measures or building acoustic treatments, and evidence shall be kept to demonstrate that this has been done. Other mitigation measures and/or agreements may also be considered by the Wind Farm Owner.
- 11) If no agreement can be reached with the affected landowner(s) then the turbine(s) causing the non-compliance must remain curtailed or shut-down as required to achieve compliance with the noise limits.

## 9.0 Noise Complaints Management Procedure

### 9.1 Complaints Recording

A telephone number or other means of contact will be made available to enable members of the public to lodge complaints and other feedback relating to the Wind Farm. This is outlined in Section 10.1 of the OEMP.

All noise complaints will be recorded in a complaints log. The following details will be recorded in the log:

- Time and date of the complaint;
- Name and address of complainant;
- Nature of the complaint, including a description of the noise causing the annoyance;
- A description of how long the noise has been impacting on the complainant's acoustic amenity;
- Any detail the complainant can provide about the local atmospheric conditions at the residence at the time of the noise annoyance, including approximate wind direction, speed, and temperature;
- A description of any follow-up or investigative action which has been discussed with the complainant; and
- If appropriate, a description of what action will be taken to avoid future complaints of the same nature.

### 9.2 Complaints Investigation

Any noise complaints shall be provided to the Wind Farm Owner and Operations Manager for initial evaluation and action.

The Wind Farm Owner shall liaise with the complainant to identify the source of the complaint and determine if the complaint is a result of an equipment failure, or if it is due to another reason.

If deemed appropriate by the Wind Farm Owner or directed to do so by the Director-General and/or EPA, noise compliance monitoring will also be undertaken to determine if the Wind Farm noise is exceeding its noise limits.

The Wind Farm Owner shall record in the complaints log what measures are taken to investigate the complaint, and any measures that are taken to rectify the cause of the complaint.

### 9.3 Reporting

If a complaint is due to a non-compliance with the Wind Farm noise limits, the Wind Farm Owner shall keep the complainant informed of the course of action being taken to rectify the cause, and the predicted time for this to be completed.

## PART B - NOISE COMPLIANCE PLAN



## 10.0 Introduction to Noise Compliance Plan

Pursuant to Condition 2.21 of the Project Approval for Gullen Range Wind Farm, this Noise Compliance Plan prescribes how operational noise from Gullen Range Wind Farm will be measured and assessed to verify compliance with the noise limits prescribed by Condition 2.15 of the Project Approval.

Pursuant to Condition 2.21b, this Plan also provides a commitment that the Wind Farm will be operated in accordance with the Noise Operating Strategy detailed in Section 5.0 of the Operational Noise Management and Noise Compliance Plan.

## 11.0 Noise Compliance Monitoring Procedures

### 11.1 Monitoring Requirements

Noise compliance monitoring with the wind farm fully operational is required by Condition 2.21c of the Project Approval.

The Project Approval requires noise from the wind farm to be assessed against the criteria specified in the pre-construction noise impact assessment report, in general accordance with the *South Australian EPA Environmental Noise Guidelines: Wind Farms 2003* (SA Guidelines 2003).

### 11.2 Noise Measurement Methodology

The measurement methodology will be in accordance with the SA Guidelines 2003. In brief, this will comprise noise monitoring with an unattended noise logger configured to measure  $L_{A90}^2$  sound pressure levels in 10-minute intervals.

The microphone of the noise logger will be set up at the same location as used previously for the background noise monitoring, or if at a location where background noise monitoring has not previously been conducted, set up in accordance with the requirements of the SA Guidelines 2003 and the Project Approval (i.e. at the most affected point within the residential boundary, or at the most affected within 20m of the dwelling where the dwelling is more than 20m from the boundary).

Note: Where the previously used background noise monitoring locations are not within 20m of the dwelling in accordance with Condition 2.18 of the Project Approval, noise monitoring will either be conducted:

- 1) At an alternative location within 20m of the dwelling; or
- 2) At the background noise monitoring location, with an adjustment applied to the measured noise levels to account for the predicted differences between the noise levels at the background noise monitoring location and the location within 20m of the dwelling.

The option used shall be selected by the acoustic engineer performing the monitoring, with consideration of:

- The likelihood of the background noise levels differing significantly between the previously used background noise monitoring location and any potential monitoring location within 20m of the dwelling;
- The suitability of the previously used background noise monitoring location for further monitoring, with respect to vegetation, animals, air-conditioning units, and other practical considerations;
- The suitability of potential monitoring locations within 20m of the dwelling, with respect to vegetation, animals, air-conditioning units, and other practical considerations; and
- Factors such as topography and screening, which may influence the Wind Farm noise levels at each location and affect the accuracy with which the noise levels within 20m of the dwelling can be calculated from noise levels measured at the previously used background noise monitoring location.

It is noted that to comply with the SA Guidelines 2003 a minimum of 2000 10-minute sound pressure level vs wind speed data points are required to be analysed for the worst case wind direction for each assessment location.

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<sup>2</sup> Note: In accordance with the SA Guidelines 2003,  $L_{A90}$  sound pressure levels are used to represent the  $L_{Aeq}$  wind farm noise levels due to the challenges associated with measuring  $L_{Aeq}$  sound pressure levels directly in windy conditions.  
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The worst case wind direction refers to the scenario where the wind direction is +/- 45 degrees from the direction that places the receptor directly downwind of the nearest wind turbines.

However, it may not be practical to obtain 2000 data points for the worst case direction if the prevailing winds are such that the noise monitoring location is generally upwind of the wind farm. The current (2009) version of the SA Guidelines recognises this and clarifies that the analysis requires 2000 data points in total, of which 500 must be for the worst case wind direction. Accordingly, it is proposed that 500 data points in the worst case direction would be considered sufficient for the purpose of the noise compliance monitoring.

### 11.3 Instrumentation

In accordance with the SA Guidelines 2003, Type1 or Type 2 noise monitoring equipment will be utilised.

### 11.4 Monitoring Locations

The Project Approval does not specify the number of locations where operational noise compliance monitoring must be undertaken, however it does state in Condition 2.15 that the proponent shall design, operate and maintain the project so that noise from the project does not exceed the noise limits at each of the residential receiver locations identified in Section 5 of the Marshall Day Acoustics Report dated 5 June 2008 (assumed to mean Section 7 not Section 5). In the Marshall Day report, the potentially most affected receptors have been represented by 17 key receptors, and background noise monitoring was conducted at these 17 locations.

Noting the number of receptors in the vicinity of the wind farm and the layout of the wind farm in relation to the receptors, this number of receptors is considered appropriate for the compliance noise monitoring and it is proposed that monitoring will be conducted at all of these receptors, subject to approval by the relevant landowners.

Where adequate monitoring of the Wind Farm noise cannot be undertaken at one or more of the above locations due to either background noise influences or the landowner not granting approval, then the Acoustic Engineer shall determine if the affected location may be excluded from the monitoring programme (due to the results of the noise monitoring at the other locations providing satisfactory evidence of noise compliance), or if noise monitoring at an alternative location is necessary to satisfactorily demonstrate compliance.

Where it is opted to conduct noise monitoring at an alternative location, the preferred approach shall be to locate the noise monitor at a representative location closer to the wind farm, away from any significant sources of background noise, and calculate the wind farm noise level at the receptor from those measurements, taking into account the difference in position relative to the wind farm.

Note: Noise compliance monitoring is not proposed for any receptor locations where background noise monitoring has not already been conducted. If operational noise compliance monitoring is required to be undertaken at a location where background noise monitoring has not previously been undertaken, it may be necessary to measure background noise levels at that location, or background noise levels measured at a representative location may be adopted.

### 11.5 Identification of Tonality and Annoying Characteristics

A subjective assessment of the wind farm noise at each noise monitoring location, will be performed at the beginning and end of each fortnight of noise monitoring to assist in identifying if there may be tonality or other 'annoying characteristics' (as defined in SA Guidelines 2003) which require a penalty adjustment to the measured sound pressure levels.

For each subjective assessment:

- An acoustic engineer will listen to the sound at the noise monitoring location for a period of 10 minutes (as far as practical, the listening position would be the same as the noise logger position used for measurement of the 'A'-weighted sound pressure levels).
- The sounds at the monitoring location will be noted, including any sound from the wind farm and any tonality or annoying characteristics due to the wind farm.
- The sound pressure levels during the subjective assessment will be measured using a Bruel and Kjaer 2250 Class 1 Sound Level Meter, or equivalent, and the sound itself will be recorded to wave file by the Sound

Level Meter, to provide an audio record of the period, and to enable subsequent objective analysis if required.

- The local wind conditions at the monitoring locations during the assessment period will be noted subjectively.
- The wind conditions at the Wind Farm will be determined (after the assessment) from the met mast data corresponding to the same time period as the assessment.

The record sheet template that will be used on site to document each subjective assessment is presented in Appendix G.

This approach will provide:

- Nominally four subjective assessments at each noise monitoring location during the operational noise compliance monitoring period
- Subjective assessments distributed over a total period of 4 to 8 weeks, allowing opportunity for different wind and atmospheric conditions to occur;
- Subjective assessments covering a range of different times of day;

In total, for 17 monitoring locations this approach will provide approximately 68 subjective assessments, covering a cumulative period of approximately 11 hours. With this number of subjective assessments spread over the monitoring period and across different locations, it is likely that a large range of atmospheric conditions will be covered including upwind, downwind and crosswind conditions, and a range of wind speeds.

If tonality or 'annoying characteristics' are not noted during any of the subjective assessments, then it is considered that no further assessment of these characteristics would be necessary.

If it appears likely that a tone or other 'annoying characteristic' may be present based on the subjective assessments, a formal objective assessment would be undertaken in accordance with Section 11.6.

## 11.6 Objective Assessment of Tonality and Annoying Characteristics

Where objective assessment of tonality is required to confirm the presence of a potential tone, this would be conducted at the receptor using the tone assessment methodology prescribed by the latest version of IEC 61400-11 (Edition 3.0 November 2012) as required by Condition 2.19 of the Project Approval.

If objective assessment of tonality confirms that tonality is present and is a "repeated characteristic" of the Wind Farm noise, then a +5 dB(A) penalty adjustment shall be applied to the measured wind farm noise levels.

A "repeated characteristic" shall be defined in accordance with the draft *NSW Wind Farm Noise Guidelines, December 2011*, as a characteristics which occurs in more than 10% of the measurement intervals during an assessment period (i.e. daytime 7am to 10pm or night-time 10pm to 7am).

As the Project Approval and SA Guidelines 2003 do not prescribe methods for objective assessment of other 'annoying characteristics' if objective assessment of other annoying characteristics is required, it shall be undertaken in accordance with the guidance provided in the draft *NSW Wind Farm Noise Guidelines, December 2011*, or using another suitable method, to be agreed between the Wind Farm Owner and the Director-General.

## 11.7 Noise Monitoring Schedule

The noise compliance monitoring will commence within one month of the Wind Farm being commissioned.

It is anticipated that the noise compliance monitoring will be divided into two rounds, comprising nominally 8 or 9 simultaneous monitoring locations in each round. Each round of noise monitoring will be nominally 4 weeks in duration, or sufficient length to achieve the minimum number of data points required in accordance with the SA Guidelines.

Reporting will be completed on completion of the noise monitoring in accordance with Section 13.3 of this Plan.

If due to the prevailing meteorological conditions the noise monitoring cannot be completed within three months of the last wind turbine being commissioned, an extension shall be sought from the Director-General.

## 11.8 Ongoing Noise Monitoring

After verifying the operational noise compliance on completion of the Wind Farm, monitoring to verify continued compliance with the noise criteria will be undertaken in the following circumstances:

- 1) In accordance with a request from the Director-General or EPA;
- 2) At the discretion of the Wind Farm Owner following any modifications to the wind turbines or the operation of the Wind Farm which may adversely affect noise emissions from the Wind Farm;
- 3) At the discretion of the Wind Farm Owner in response to a noise complaint from the public;
- 4) For any other circumstances deemed appropriate by the Wind Farm Owner.

Any ongoing noise monitoring for the purpose of verifying compliance will be undertaken in accordance with the Noise Compliance Monitoring Procedures presented in Sections 11.1 to 11.7.

## 12.0 Results Analysis and Assessment Procedure

### 12.1 General

The results analysis and assessment procedure shall be in accordance with the requirements of the SA Guidelines 2003, with the exception that the wind speeds shall be the hub-height wind speeds rather than wind speed at 10m above ground level, in accordance with Project Approval Condition 2.21.

In broad terms this will involve a regression analysis of the 10-minute wind speed versus  $L_{A90}^3$  sound pressure level data pairs to determine the Wind Farm noise level at each integer wind speed.

The resulting Wind Farm noise levels will be assessed in relation to the noise limits established in Condition 2.15 of the Project Approval including any penalty adjustments that may be applicable for tonality or other 'annoying characteristics'.

A comparative assessment in relation to the predicted noise levels from the Wind Farm will also be undertaken, with reference to the Revised Noise Assessment (*Gullen Range Wind Farm Revised Noise Impact Assessment, Report No. Rp 002 R03 2012154SY, dated 25 September 2013 - See Appendix D*) prepared in accordance with Condition 2.16 of the project approval.

### 12.2 Meteorological Data

#### 12.2.1 Wind Speed and Direction Data

Wind data (in 10-minute intervals) for the purpose of all noise monitoring analysis would be taken from the two permanent meteorological masts (met masts) at the wind farm.

The data used will be from a combination of the two permanent met masts, as each mast may be affected by the wake of the Wind Farm for certain wind directions.

As it is necessary to compare the operational noise data with wind speeds measured at the same met mast position as used to establish the criteria, the permanent met mast data will be transformed to the equivalent wind speed at the temporary met mast locations (now decommissioned), which were used for the background noise assessment. This will be done using a correlation between the permanent met mast and the temporary met mast wind speeds, established based on data from a period where both the temporary and the permanent met masts were operating at the site.

#### 12.2.2 Rainfall Data

Periods of rainfall are required to be excluded from analysis of the noise monitoring data. As the permanent met masts do not gather rainfall data, and the closest Bureau of Meteorology weather station (with the required data) is more than 30 km away, local weather stations will be installed at selected noise monitoring locations during the monitoring to capture representative rainfall data.

This equipment would also measure a range of other parameters at the monitoring location including local wind speed and direction, atmospheric pressure, and temperature.

### 12.3 Turbine Operation Data

A log of any turbine shutdowns for maintenance will be kept for the duration of the noise monitoring period.

Periods for which wind turbines are shut down will be excluded from the analysis of the noise monitoring data if the non-operational turbine(s) would result in 0.5 dB(A) or greater difference to the overall Wind Farm noise levels at the receptor (based on modelling predictions for the wind direction which results in the greatest change to the noise levels at the receptor due to the non-operational turbines). At a minimum, the noise levels for each of the main compass points at 45 degree intervals should be modelled (i.e. N, NE, E, SE, S, SW, W, NW).

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<sup>3</sup> Note: In accordance with the SA Guidelines 2003,  $L_{A90}$  sound pressure levels are used to represent the  $L_{Aeq}$  wind farm noise levels due to the challenges associated with measuring  $L_{Aeq}$  sound pressure levels directly in windy conditions.  
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Revision 3 – 04-Oct-2013  
Prepared for – Goldwind Australia Pty Ltd – ABN: 32 140 108 390

## 13.0 Documentation of Noise Compliance Monitoring

### 13.1 Noise Monitoring Quality Assurance Records

For each noise monitoring location the following records will be kept for quality assurance purposes and will be provided to the Director-General and EPA if requested:

- Photographs of the noise monitor installed at the measurement location, with one in each direction as a minimum.
- A noise logger installation record. An example form is presented in Appendix E. The intent of this form is to ensure that all necessary location-specific data that is required to be documented in the report is captured.
- A noise logger configuration and maintenance checklist, completed for each visit to the noise logger. An example form is included in Appendix F, however, the exact checks required to be performed will be specific to the type of equipment used. The intent of using this form is to minimise the risk of data loss due to human error or equipment faults.
- An instrumentation record, if applicable, noting the reasons for any instrumentation changes in the event that the instrument used for the measurements needs to be changed during the measurement period due to a fault or other reason.
- A subjective assessment record, as per the template in Appendix G.
- Any additional notes based on site observations or noise-related comments from residents received at the time of noise monitoring site visits.

### 13.2 Raw Noise Data

All raw noise data in the format native to the noise logging equipment will be retained and will be provided to the Director-General if requested.

### 13.3 Reports to the Director-General and EPA

#### 13.3.1 Operational Noise Compliance Monitoring

A report on the operational noise compliance monitoring conducted following completion of the Wind Farm will be provided to the Director-General and EPA. The results of the monitoring for all locations will be presented in a single report. The structure and content of the report will align with the requirements specified by the SA Guidelines 2003.

#### 13.3.2 Schedule for Provision of Reports

All reports will be provided to the Director-General and EPA within one month of the date of completion of the noise monitoring being reported on.

## Appendix A

# Summary of Project Approval Conditions addressed in this Plan

## Appendix A Summary of Project Approval Conditions addressed in this Plan

The following table presents a list of the sections in this report where items addressing specific requirements of the Project Approval conditions can be found:

**Table 2 Summary of Project Approval Conditions addressed in this Plan**

Condition	Condition Requirement	Operational Noise Management and Noise Compliance Plan Reference
2.17	<i>Where the noise predictions are found to exceed the limits specified in condition 2.15 the Proponent shall develop and implement a Noise Operating Strategy...</i>	Section 5.0
2.17	<i>...that identifies specific methods of noise reductions to restore the levels back to the limits in Condition 2.15 at any receiver location for all wind directions including worst case scenarios.</i>	Section 5.2 and 5.3
2.17	<i>The strategy shall including noise modelling verification that demonstrates the predicted noise reductions can be achieved.</i>	Appendix D
2.18	<i>Noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 20 metres of the dwelling, where the dwelling is more than 20 metres from the boundary, to determine compliance with the noise level limits in conditions 2.15 and 2.16. Under this Condition "dwelling" means one in existence or the subject of a valid development consent at the date of this approval.</i>	Section 11.2
2.19	<i>For the purposes of conditions 2.15 and 2.16 of this approval, 5 dB(A) shall be applied to the measured noise level where tonality is present. The presence of tonality shall be determined using the methodology detailed in Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques IEC 61400-11:2002 or its latest edition.</i>	Section 11.5 and 11.6
2.21a	<i>The Noise Compliance Plan shall include, but not be limited to:</i> a) <i>an assessment of the performance of the project against the noise predictions contained in conditions 2.15 and 2.16;</i>	See Note 1 at end of this table.
2.21b	b) <i>a commitment to operate the Project in accordance with any Noise Operating Strategy that is implemented in accordance with condition 2.17;</i>	Section 4.0 and 10.0
2.21c	c) <i>a commitment that noise monitoring will be undertaken within three months of the commissioning of the wind turbines. If prevailing meteorological conditions do not allow the required monitoring to be undertaken in this period, the Director-General shall be notified and an extension of time may be sought; and</i>	Section 11.7
2.21d	d) <i>a requirement that all noise compliance monitoring results are submitted to the Director-General within one month of completion of the monitoring. The Director-General may request that additional noise monitoring be undertaken and completed within a specified timeframe.</i>	Section 13.3.2

Condition	Condition Requirement	Operational Noise Management and Noise Compliance Plan Reference
2.21	<i>The Noise Compliance Assessment shall be undertaken generally in accordance with the procedures presented in SA Guidelines 2003, except that all sounds [sic] power levels and wind speeds shall be referenced to hub-height.</i>	Section 11.0 and 12.0
2.22	<i>In the event that the Noise Compliance Plan indicates that noise from the wind turbines exceeds the noise limits specified under conditions 2.15 and 2.16, as relevant, the Proponent shall investigate and propose mitigation and management measures to achieve compliance with the noise limits. Details of the remedial measures and a timetable for implementation must be submitted to the Director-General for approval within such period as the Director-General may require. Remedial measures shall include, in the first instance, all reasonable and feasible measures to reduce noise from the project, including but not necessarily limited to reduced operation of wind turbines. Once all reasonable and feasible source controls are exhausted, remedial measures may include offering building acoustics treatments and/or noise screening to affected residences, but may only be used to address noise limit exceedances at the absolute discretion of the relevant landowner. The Proponent shall also demonstrate that the relevant landowner / resident has been made fully aware of the noise and other implications of making any agreement.</i>  <i>If there is no such agreement with the relevant landowner, then the turbine(s) causing the exceedance(s) must be turned off until the turbine(s) can be operated in accordance with this approval.</i>	Section 8.0
2.24	<i>The Proponent shall bear the costs of any additional at-receiver mitigation measures implemented at an affect landowner or property.</i>	Item 10) of Section 8.0
3.2	<i>Noise compliance monitoring shall be conducted in accordance with the Noise Management Plan under condition 7.3a) and 7.5a), or as directed by the Director-General in response to noise complaints.</i>	Section 6.0, 9.2 and Part B
7.5a i)	<i>As part of the Operation Environmental Management Plan required under condition 7.4, the Proponent shall prepare and implement, but is not limited to the following Management Plans:</i>  a) <i>a Noise Management Plan to outline measures to minimise noise emissions from the operation of the project. The Plan must include, but not necessarily be limited to:</i>  i) <i>details of procedures to ensure ongoing compliance with the operational noise limits specified in condition 2.14 [sic]<sup>4</sup> as they apply to identified receptors. This should include identification of monitoring requirements.</i>	All sections.
7.5a ii)	ii) <i>identification and implementation of best practice management techniques for minimisation of noise emissions where reasonable and feasible;</i>	Section 4.0
7.5a iii)	iii) <i>measures to be undertaken to rectify annoying characteristics resulting from the operation of the project, such as, but not limited to, infrasound or adverse mechanical noise from component failure; and</i>	Section 7.0

<sup>4</sup> Condition 7.5a i) refers to the noise limits specified in Condition 2.14. It is believed that this is meant to refer to Condition 2.15, as Condition 2.14 relates to notification of blasting during construction.

Condition	Condition Requirement	Operational Noise Management and Noise Compliance Plan Reference
7.5a iv)	iv) <i>procedures and corrective actions to be taken if non-compliance is detected.</i>	Section 8.0

Note 1:

The Noise Compliance Plan presented in Part B of this document prescribes the methodology for completing an assessment to satisfy Condition 2.21a. Such an assessment cannot be completed until the wind turbines are commissioned; however in accordance with Condition 2.21 the Noise Compliance Plan is required to be submitted prior to commissioning of the wind turbines. Sections 12.1 and 13.3 of the Noise Compliance Plan prescribe details of the assessment and reporting that will be completed to satisfy Condition 2.21a.

Appendix B

# Glossary of Acoustic Terms

## Appendix B Glossary of Acoustic Terms

A-weighting	The A-weighting scale is used to adjust the sound pressure levels measured in decibels to more accurately reflect the subjective response of the human ear to sound. The human ear is less sensitive to low frequency (pitch) sounds than sounds of middle to high frequency. That is, low frequency sounds of the same decibel level are not heard as loud as high frequency sounds. A sound level meter replicates the human response of the ear by using an electronic filter which is called the A-weighting filter. A sound level measured with this filter switched on is denoted as dB(A).
dB(A)	The unit of A-weighted sound pressure level.
$L_{Aeq,T}$	The 'A'-weighted equivalent continuous sound pressure level over time period 'T'. It is the sound level that, if it was continuous across the measurement period, would contain the same amount of sound energy as the actual fluctuating noise level.
$L_{A90(T)}$	The A-weighted sound pressure level exceeded for 90% of a measurement period of duration 'T'. This descriptor is used to represent the background noise levels and the $L_{Aeq}$ wind farm noise levels in accordance with the SA Guidelines 2003.
Sound Pressure Level	A measure of the magnitude of a sound wave. Mathematically, it is twenty times the logarithm to the base ten of the ratio of the root mean square sound pressure at a point in a sound field, to the reference sound pressure; where sound pressure is defined as the alternating component of the pressure (Pa) at the point, and the reference sound pressure is $2 \times 10^{-5}$ Pa. [Unit: Decibels]

Appendix C

# Planning Approval S07/00846

# Project Approval

## Section 75J of the *Environmental Planning and Assessment Act 1979*

I, the Minister for Planning, approve the project referred to in Schedule 1, subject to the conditions in Schedule 2.

These conditions are required to:

- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the ongoing environmental management of the project.



The Hon Kristina Keneally MP  
Minister for Planning

Sydney

2009

File No: S07/00846

### SCHEDULE 1

<b>Application No:</b>	07_0118
<b>Proponent:</b>	Gullen Range Wind Farm Pty Ltd
<b>Approval Authority:</b>	Minister for Planning
<b>Land:</b>	Land to which Major Project Application 07_0118 applies
<b>Project:</b>	Construction and operation of a wind farm with generation capacity of up to 278 megawatt including: 84 turbines; substation; transmission connection; control room; facilities building; access tracks; and minor road upgrades on the Gullen Range (Southern Tablelands Region NSW): Kialla, Bannister, Pomeroy and Gurrundah sites
<b>Major Project:</b>	The project was declared a Major Project under section 75B(1)(a) of the <i>Environmental Planning and Assessment Act 1979</i> , because it is development of a kind described in clause 24 of Schedule 1 of <i>State Environmental Planning Policy (Major Projects) 2005</i> .

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## SCHEDULE 2

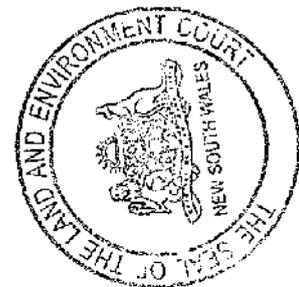
<b>Associated property</b>	A property comprising one or more lots, that is owned, leased or otherwise lawfully used by the Proponent or where there is a written agreement between the owner of the property and the Proponent (but only during the currency of the agreement) that part of the property in relation to which the agreement is established.
<b>Associated residence</b>	A residence within a property, comprising one or more lots, that is owned, leased or otherwise lawfully used by the Proponent or where there is a written agreement between the owner of the property and the Proponent (but only during the currency of the agreement) that part of the property in relation to which the agreement is established.
<b>Council</b>	Refers to both Upper Lachlan Shire Council and Goulburn Mulwaree Council unless otherwise stated
<b>DECC</b>	Department of Environment and Climate Change
<b>Department, the</b>	Department of Planning
<b>Director-General, the</b>	Director-General of the Department of Planning (or delegate).
<b>Director-General's Approval or the agreement or satisfaction of the Director-General</b>	A written approval from the Director-General (or delegate). Where the Director-General's Approval is required under a condition the Director-General will endeavour to provide a response within one month of receiving an approval request. The Director-General may ask for additional information if the approval request is considered incomplete. When further information is requested the time taken for the Proponent to respond in writing will be added to the one month period.
<b>Dust EA</b>	Any solid material that may become suspended in air or deposited <i>Proposed Development of the Gullen Range Wind Farm, Southern Tablelands, New South Wales Part 3A Environmental Assessment (Project Application 07_0118)</i> , prepared by Epuron Pty Ltd and dated July 2008.
<b>EPA</b>	Environment Protection Authority as part of the Department of Environment and Climate Change
<b>Minister, the</b>	Minister for Planning
<b>Month</b>	Thirty (30) days
<b>Operation</b>	The point at which turbines approved or at which all turbines of the project constructed in any stage (pursuant to condition 1.8) are practically complete and ready for operation for the purpose of generating electricity.
<b>Proponent</b>	Gullen Range Wind Farm Pty Ltd
<b>Reasonable and feasible</b>	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. <b>Feasible</b> relates to engineering considerations and what is practical to build. <b>Reasonable</b> relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements.
<b>RFS</b>	The New South Wales Rural Fire Service
<b>RTA</b>	The Roads and Traffic Authority
<b>Site</b>	Land to which Major Projects Application 07_0118 applies.
<b>Statement of Commitments</b>	<i>Proposed Development of the Gullen Range Wind Farm, Southern Tablelands, New South Wales Final Statement of</i>



**Submission Report**

*Commitments*, prepared by Epuron Pty Ltd and dated November 2008.

*Proposed Development of the Gullen Range Wind Farm, Southern Tablelands, New South Wales Response to Submissions to the Environmental Assessment*, prepared by Epuron Pty Ltd and dated November 2008



## 1. ADMINISTRATIVE CONDITIONS

### Terms of Approval

- 1.1 The Proponent shall carry out the project generally in accordance with:
- Major Project Application 07\_0118;
  - Proposed Development of the Gullen Range Wind Farm, Southern Tablelands, New South Wales Part 3A Environmental Assessment (Project Application 07\_0118)*, prepared by Epuron Pty Ltd and dated July 2008;
  - Proposed Development of the Gullen Range Wind Farm, Southern Tablelands, New South Wales Response to Submissions to the Environmental Assessment*, prepared by Epuron Pty Ltd and dated November 2008;
  - Proposed Development of the Gullen Range Wind Farm, Southern Tablelands, New South Wales Final Statement of Commitments*, prepared by Epuron Pty Ltd and dated November 2008; and
  - the conditions of this approval.
- 1.2 In the event of an inconsistency between:
- the conditions of this approval and any document listed from condition 1.1 a) and 1.1 d) inclusive, the conditions of this approval shall prevail to the extent of the inconsistency; and
  - any document listed from condition 1.1 a) and 1.1 d) inclusive, and any other document listed from condition 1.1 a) and 1.1 d) inclusive, the most recent document shall prevail to the extent of the inconsistency.
- 1.3 The Proponent shall comply with any reasonable requirement(s) of the Director-General arising from the Department's assessment of:
- any reports, plans or correspondence that are submitted in accordance with this approval; and
  - the implementation of any actions or measures contained in these reports, plans or correspondence.



### Modifications to the Scope of the Project

- 1.4 Pursuant to section 75J(4) of the *Environmental Planning and Assessment Act 1979* the project is modified to delete the following turbines from the scope of the project: KIA\_03, KIA\_04, KIA\_05, KIA\_06, KIA\_07, KIA\_08, KIA\_09, KIA\_10, KIA\_11, KIA\_12 and KIA\_14. This approval does not authorise construction of these turbines.

Note: the turbines referred to under condition 1.4 have been removed from the project based on a precautionary approach with respect to potential aviation hazards associated with the project, and for potential users of the Crookwell Airstrip. Turbines have been selected for deletion from the project based on the Inner Horizontal and Conical Surfaces identified for a Code 2, Non-instrument runway under *Manual of Standards Part 139 – Aerodromes (Version 1.4)* (Civil Aviation Safety Authority, April 2008).

- 1.5 Pursuant to section 75J(4) of the *Environmental Planning and Assessment Act 1979* the project is modified to remove the ability of the Proponent to relocate turbines from the locations indicated in the document referred to under condition 1.1b) by up to 250 metres, without further assessment and approval in accordance with the requirements of the *Environmental Planning and Assessment Act 1979*.

### Limits of Approval

- 1.6 This approval shall lapse five years after the date on which it is granted unless the Proponent has confirmed to the satisfaction of the Director-General that orders have been placed for wind turbines, or demonstrated that work subject of this approval has been completed on the site before that time.

## Statutory Requirements

- 1.7 The Proponent shall ensure that all licences, permits and approvals are obtained and maintained as required throughout the life of the project. No condition of this approval removes the obligation for the Proponent to obtain, renew or comply with such licences, permits or approvals. The Proponent shall ensure that a copy of this approval and all relevant environmental approvals are available on the site at all times during the project.
- 1.8 The Proponent may elect to construct the project in stages. In this case, these conditions of approval may be complied with separately for each stage, as relevant.

## Decommissioning

- 1.9 Within one year of decommissioning, the site shall be returned, as far as practicable, to its condition prior to the commencement of construction. All wind turbines and associated above ground structures (i.e. not including turbine foundations) including but not necessarily limited to, the substation, the control and facilities building and electrical infrastructure shall be removed from the site unless otherwise agreed by the Director-General, except where the substation, control room or overhead electricity lines are transferred to or in the control of the local electricity network operator. All other elements associated with the project, including site roads, shall be removed unless otherwise agreed to by relevant the landowner(s).
- 1.10 If any wind turbine is not used for the generation of electricity for a continuous period of 12 months, it shall be decommissioned by the Proponent, unless otherwise agreed by the Director-General. The Proponent shall keep independently-verified annual records of the use of wind turbines for electricity generation. Copies of these records shall be provided to the Director-General upon request. The relevant wind turbine and any associated infrastructure is to be dismantled and removed from the site by the Proponent within 24 months from the date that the wind turbine was last used to generate electricity.
- 1.11 Prior to the commencement of construction, the Proponent shall provide written evidence to the satisfaction of the Director-General that the lease agreements with the site landowners have adequate provisions to require that decommissioning occurs in accordance with this approval.

## 2. SPECIFIC ENVIRONMENTAL CONDITIONS

### Visual Amenity

#### *Landscaping Requirements*

- 2.1 Prior to the commencement of Operation, the Proponent shall consult with Council and the RTA in relation to the need to provide landscaping screening measures along public road reserves such as but not limited to Range Road, Storriers Lane, Bannister Lane and Grabben Gullen Road and shall report to the Director-General on the outcomes of this consultation. The Proponent shall implement landscaping screening measures in accordance with the Director-General's requirements.
- 2.2 Not more than six months prior to the commencement of Operation, the Proponent shall notify in writing:
  - (a) all owners of existing or approved residential dwellings that are located within three kilometres of the project;
  - (b) all owners of approved subdivision allotments where there is an approved dwelling entitlement, where such subdivision allotments were approved by the date of approval of the project that are located within three kilometres of the project;
  - (c) the owners of Lot 55 of DP 754115;
  - (d) but excluding the owners of Lot 118 of DP 1116333 and Lot 121 of DP 754115 and the owners of Lots 143 and 303 of DP 754115, Lot 2 of DP 541500 and Lot 2 of DP 541499

that they may be eligible to have landscaping treatment on their property in order to minimise the visual impact of the project on their property.



2.3 Any such owner (or their successors) who may potentially be eligible to have landscaping treatment (as they have views or likely views of a turbine(s) on their property pursuant to clause 2.2 may, no later than six months after the commencement of operation, advise the Proponent whether access to their property for landscaping assessment is granted and request the Proponent to investigate such ways of minimising the visual impact of the project on their property. The Proponent shall:

- a) within fourteen (14) days of receiving the request, commission a suitably qualified person approved by the Director-General, to:
  - i. inspect the relevant property and determine whether the property is eligible to have landscaping treatment under condition 2.2; and
  - ii. investigate reasonable and feasible measures to minimise the visual impacts of the project on the landowner's property using landscape treatments, if that qualified person determines the property is eligible to have landscaping treatment;
- b) ensure that the qualified person provides a landscaping plan detailing the matters investigated and consequential recommendations within twelve (12) weeks of receiving such request; and
- c) provide the landowner with a copy of the landscaping plan, including suggested landscape treatment measures, within fourteen (14) days of receiving the plan.

Should the parties be unable to reach agreement within one month of receiving the request referred to at a) above whether the property is eligible to have landscaping treatment pursuant to condition 2.2, then either party may refer the matter to the Director-General for resolution. The Director-General's decision on such a referral shall be final and binding on the parties.

Landscaping treatments shall be agreed within one month of the landowner receiving a copy of the visual impact mitigation report. The Proponent shall implement the agreed measures with all landscaping being completed within three months (where practical). The Proponent shall maintain these measures, at their cost, for a period of two years. Access and notification arrangements are to be negotiated between the parties.

Landscape treatments shall include, but not be limited to, site preparation, stock and rabbit-proof fencing, selection and planting of appropriate species decided by both parties, watering, weed control and the replacement of failed plants.;

Should the parties be unable to reach agreement, within three months of an eligible landowner receiving a copy of a landscaping plan in accordance with condition 2.3(c) above, on the scope of and/or timing of implementation of landscaping treatments, then either party may refer the matter to the Director-General for resolution. The Director-General's decision on such a referral shall be final and binding on the parties.



### ***Turbine External Design***

- 2.4 Wind turbine generators shall be painted matte off-white/grey. The blades shall be finished with a surface treatment that minimises any potential for glare or reflection.
- 2.5 No advertising signs or logos shall be mounted on the turbines, except where required for safety purposes. A corporate logo may be placed on the turbines provided it is not distinguishable by the naked eye from any publicly accessible location, or from any properties not being an associated property.

### ***Lighting***

- 2.6 No external lighting other than low intensity security night lighting of infrastructure associated with the project, including wind turbine generators is permitted; unless otherwise agreed or directed by the Director-General.

### ***Shadow-flicker***

- 2.7 Shadow flicker arising from the operation of the project shall not exceed 30 hours/annum at any residence not being an associated residence..

## **Noise Impacts**

### ***Construction Noise***

- 2.8 The Proponent shall only undertake construction activities associated with the project that would generate an audible noise at any residential premises during the following hours:
- 7:00 am to 6:00 pm, Mondays to Fridays, inclusive;
  - 8:00 am to 1:00 pm on Saturdays; and
  - at no time on Sundays or public holidays.

This condition does not apply in the event of a direction from police or other relevant authority for safety reasons, or emergency work to avoid the loss of lives, property and/or to prevent environmental harm.

- 2.9 The hours of construction activities specified under condition 2.8 of this approval may be varied with the prior written approval of the Director-General. Any request to alter the hours of construction specified under condition 2.8 shall be:
- considered on a case-by-case basis; and
  - accompanied by details of the nature and need for activities to be conducted during the varied construction hours and any other information necessary to reasonably determine that activities undertaken during the varied construction hours will not adversely impact on the acoustic amenity of receptors in the vicinity of the site; and
  - affected residential receivers being informed of the timing and duration of work approved under this condition at least 48 hours before that work commences.
- 2.10 During construction, the Proponent shall minimise noise emissions from plant and equipment operated on the site by installing and maintaining, wherever practicable, efficient silencers, low-noise mufflers (residential standard) and replacement of reversing alarms on vehicles with alternative silent measures, such as flashing lights

### ***Construction Blasting***

- 2.11 Blasting associated with the construction of the project shall only be undertaken during the following hours:
- 9:00 am to 5:00 pm, Mondays to Fridays, inclusive;
  - 9:00 am to 1:00 pm on Saturdays; and
  - at no time on Sundays or public holidays.
- 2.12 The Proponent shall ensure that air blast overpressure generated by blasting associated with the project does not exceed the criteria specified in Table 1 when measured at the most-affected residential or sensitive receiver.



**Table 1 – Airblast Overpressure Criteria**

Air blast Overpressure (dB(Lin Peak))	Allowable Exceedance
115	5% of total number of blasts over a 12 month period
120	Never

2.13 The Proponent shall ensure that the ground vibration generated by blasting associated with the project does not exceed the criteria specified in Table 2 when measured at the most-affected residential or sensitive receiver.

**Table 2 – Peak Particle Velocity Criteria**

Peak Particle Velocity Criteria (mms <sup>-1</sup> )	Allowable Exceedance
5	5% of total number of blasts over a 12 month period
10	Never



2.14 Prior to each blasting event, the Proponent shall notify the relevant local council and potentially-affected landowners, including details of time and location of the blasting event and providing a contact point for inquiries and complaints.

**Operational Noise Criteria**

2.15 Subject to conditions 2.15 to 2.20 the Proponent shall design, operate and maintain the project to ensure that the equivalent noise level ( $L_{Aeq(10\text{-minute})}$ ) from the project does not exceed at each of the residential receiver locations identified in Section 5 of the Noise Impact Assessment prepared by Marshall Day Acoustics, dated 5 June 2008 (Section 3.2 of EA Attachments), or any other relevant receiver in existence or the subject of a valid development consent at the date of this approval:

- a) 35 dB(A); or
- b) the existing background noise level ( $L_{A90(10\text{-minute})}$ ) correlated to the integer wind speed at hub height at the wind farm site by more than 5 dB(A).

whichever is the greater, for each integer wind speed (measured at hub height) from cut-in to rated power of the wind turbine generator, when determined in accordance with the methodology provided in the *Wind Farms: Environmental Noise Guidelines* (SA EPA, 2003) ('SA Guidelines 2003').

2.16 The Proponent shall prepare a revised Noise Assessment for the final turbine model and turbine layout selected, which shall be submitted to the Director-General prior to commissioning of the wind turbines. The assessment shall demonstrate consistency with the EA and the ability of the final turbine model and layout to meet the requirements of condition 2.15. The revised Noise Assessment shall include the following:

- a) noise predictions of the final turbine model and layout selected at each of the receiver locations;
- b) method and modelling inputs employed to carry out the noise level predictions according to the SA Guidelines 2003 except that all sounds power levels and wind speeds shall be referenced to hub height;
- c) an assessment of the suitability of background noise level data to cover the range of wind speeds and directions generally expected at the site; and
- d) noise predictions shall be conducted by an acoustic engineer defined for the purposes of this condition as an engineer who is eligible for membership of both the Australian Acoustical Society and the Institution of Engineers Australia.

2.17 Where noise predictions are found to exceed the limits specified in condition 2.15 the Proponent shall develop and implement a Noise Operating Strategy that identifies specific methods of noise reductions to restore the levels back to the limits in Condition 2.15 at any receiver location for all wind directions including worst case-scenarios. The strategy shall

include noise modelling verification that demonstrates the predicted noise reductions can be achieved.

- 2.18 Noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 20 metres of the dwelling, where the dwelling is more than 20 metres from the boundary, to determine compliance with the noise level limits in conditions 2.15 and 2.16. Under this Condition "dwelling" means one in existence or the subject of a valid development consent at the date of this approval.
- 2.19 For the purposes of conditions 2.15 and 2.16 of this approval, 5 dB(A) shall be applied to measured noise levels where tonality is present. The presence of tonality shall be determined using the methodology detailed in *Wind Turbine Generator Systems- Part 11: Acoustic Noise Measurement Techniques IEC 61400-11:2002* or its latest edition.
- 2.20 Notwithstanding conditions 2.15 and 2.16 of this approval, the noise limits specified under those conditions do not apply to any residence where a noise agreement is in place between the Proponent and the respective owner(s) of those residences in relation to noise impacts and/or noise limits. For this condition to take effect, the noise agreements shall satisfy the requirements of *Guidelines for Community Noise (WHO, 1999)* and Section 2.3 of the SA Guidelines 2003.

#### **Verification of Operational Noise Performance**

- 2.21 The Proponent shall prepare a Noise Compliance Plan which shall be submitted to the Director-General prior to commissioning of the wind turbines. The Noise Compliance Plan shall include, but not be limited to:
- a) an assessment of the performance of the project against the noise predictions contained in conditions 2.15 and 2.16;
  - b) a commitment to operate the Project in accordance with any Noise Operating Strategy that is implemented in accordance with condition 2.17;
  - c) a commitment that noise compliance monitoring will be undertaken within three months of the commissioning of the wind turbines. If prevailing meteorological conditions do not allow the required monitoring to be undertaken in this period, the Director-General shall be notified and an extension of time may be sought; and
  - d) a requirement that all noise compliance monitoring results are submitted to the Director-General within one month of completion of the monitoring. The Director-General may request that additional noise compliance monitoring be undertaken and completed within a specified timeframe.

The Noise Compliance Assessment shall be undertaken generally in accordance with the procedures presented in SA Guidelines 2003, except that all sound power levels and wind speeds shall be referenced to hub height

- 2.22 In the event that the Noise Compliance Plan indicates that noise from the wind turbines exceeds the noise limits specified under conditions 2.15 and 2.16, as relevant, the Proponent shall investigate and propose mitigation and management measures to achieve compliance with the noise limits. Details of the remedial measures and a timetable for implementation must be submitted to the Director-General for approval within such period as the Director-General may require. Remedial measures shall include, in the first instance, all reasonable and feasible measures to reduce noise from the project, including but not necessarily limited to reduced operation of wind turbines. Once all reasonable and feasible source controls are exhausted, remedial measures may include offering building acoustic treatments and/or noise screening to affected residences, but may only be used to address noise limit exceedances at the absolute discretion of the relevant landowner. The Proponent shall also demonstrate that the relevant landowner/resident has been made fully aware of the noise and other implications of making any agreement.

If there is no such agreement with the relevant landowner, then the turbine(s) causing the exceedance(s) of the noise limits must be turned off until the turbine(s) can be operated in accordance with this approval.

2.23 The Proponent shall provide written notice to all landowners that are entitled to rights under condition 2.22 within 21 days of determining the landholdings to which these rights apply. For the purpose of condition 2.22, this condition only applies where operational noise levels have been confirmed in accordance with the conditions 2.15 and 2.16.

2.24 The Proponent shall bear the costs of any additional at-receiver mitigation measures implemented at an affected landowner or property.

**Land Acquisition and Criteria**

2.25 Should the Proponent determine to proceed with any or all of the turbines listed in Table 3, the Proponent shall notify in writing the owner of each of the Lots listed in the corresponding row of the specific turbine(s) it intends to proceed with and that it is initiating the acquisition process.



**Table 3 – Turbines to be deleted or landholdings to be acquired**

<b>Turbines to be deleted</b>	<b>or</b>	<b>Property to be acquired</b>	<b>Relevant Lot and DP numbers</b>
BAN 20, BAN 21, BAN 22		B33	1/568887
BAN 22, BAN 23, BAN 24		Daniel Hewitt	55/754115
BAN 14, BAN 15		G&S Price Jones	111/750042
POM_01		Johnson	53/750043 44/750043 103/750043
POM_12, POM_13, POM_14, POM_15, POM_16, POM_19, POM_20		Kings' Lot 6	<i>See note below</i>
POM_12, POM_13, POM_14, POM_15, POM_16, POM_19, POM_20		Kings' Lot 7	<i>See note below</i>
POM_12, POM_13, POM_14, POM_15, POM_16, POM_19, POM_20		Kings' Lot 8	<i>See note below</i>
POM 19, POM 20, POM 21		Kings' Lot 9	<i>See note below</i>
POM 19, POM 20, POM 21		Kings' Lot 10	<i>See note below</i>
POM 19, POM 20, POM 21		Kings' Lot 11	<i>See note below</i>
BAN 24		Montgomery (B121a)	1/783347
BAN 29		Montgomery (B122a)	54/754115
BAN 22, BAN 25, BAN 26		Picker-Wales	1/810446

Note: on 24 July 2008, Upper Lachlan Shire Council granted development consent (230/07) for the creation of a 20-lot subdivision and dwelling entitlements on the following land: Lots 1 and 2 DP57829, Lots 1 and 2 DP937271, Lot 3 DP974080, Lot 101 DP1096412, Lot 1 DP111454, Lot 104 DP750043, Lots 1 and 2 DP547768, Lot 1 DP64411, Lots 29, 37, 42, 46, 55, 65, 165 and 204 DP750019

Note: The lots listed in Table 3 include any unmade Crown roads adjoining the lots which are purchased by the current or future landowners, including but not limited to unmade Crown roads adjoining the Kings' lots 6 to 8 which the Kings are in the process of purchasing.

- 2.26 At the request in writing of the owner(s) of any of the Lots notified under condition 2.25 if such a request is made within three months of the date of service of the notification required under condition 2.25 and provided that this approval or/and (in relation to any Kings' Lots referred to in Table 3 of condition 2.25) development consent 230/07 has not lapsed or been surrendered within that time, the Proponent shall proceed to acquire the relevant landholdings referred to in the owner(s)' request under this condition.
- 2.27 Within three months of receiving a written request from a landowner with acquisition rights under condition 2.26 of this approval, the Proponent shall make a binding written offer to purchase the land specified in the request to the landowner, with such offer to remain open for a period of three months after receipt and shall not be reduced, based on:
- a) the current market value of the landowner's interest in the land at the date of the written request, as if the land was unaffected by the project, having regard to the:
    - i) existing and permissible use of the land, in accordance with applicable planning instruments at the date of the written request; and
    - ii) presence of improvements on the land and/or any approved building or structure which has been physically commenced at the date of the landowner's written request, and is due to be completed subsequent to that date;
  - b) the reasonable costs associated with obtaining legal advice and expert advice for determining the acquisition price of the land, and the terms upon which it is acquired; and
  - c) reasonable compensation for any disturbance caused by the land acquisition process.

If after three months of receipt of the Proponent's offer above the Proponent and landowner cannot agree on the acquisition price of the land, including costs and compensation under b) and c) above, and/or the terms upon which the land is to be acquired, then either party may refer the matter to the Director-General for resolution.

Upon receiving such a request, the Director-General shall request the President of the New South Wales Division of the Australian Property Institute to appoint a suitably qualified and experienced independent valuer, being a Fellow of the Institute, to consider submissions from both parties, and determine a fair and reasonable acquisition price for the land, including the reasonable compensation for disturbance caused by the land acquisition process associated with c) above, and/or terms upon which the land is to be acquired. This process is to be completed within three months of Director-General receiving any such request.

Within 14 days of receiving the independent valuer's determination, the Proponent shall make a binding written offer (including as to the reasonable costs and compensation under b) and c) above), which shall remain open for a period of three months after receipt and shall not be reduced, to purchase the land at a price not less than the independent valuer's determination and otherwise on the terms specified in the determination.

If the landowner refuses to accept this offer within three months of the date of receipt of the Proponent's offer, the Proponent's obligations to acquire the land concerned shall cease.

If the landowner accepts either of the offers above and thereafter the Proponent fails to acquire the land on terms consistent with the relevant offer within three months of acceptance, the relevant turbines are to be deleted.

- 2.28 The Proponent shall bear the reasonable costs of any valuation or survey assessment requested by the independent valuer or the Director-General and the costs of determination referred to under condition 2.27.
- 2.29 If the Proponent and landowner agree that only part of that landowner's property shall be acquired, then the Proponent shall pay all reasonable costs associated with obtaining Council approval for any plan of subdivision (where permissible), and registration of the plan at the Office of the Registrar-General.



- 2.30 If the Proponent has not initiated the acquisition process referred to in condition 2.25 for any Lot specified in any request under condition 2.26 by 26 June 2013 or prior to the commencement of any construction activities in the relevant sector of the project, whichever occurs earliest, the relevant nominated turbine(s) relating to that Lot identified in condition 2.25 are to be deleted from the project.
- 2.31 If the Proponent has initiated the acquisition process referred to in condition 2.25 by the earlier of the dates determined in accordance with condition 2.30 and the owners of the relevant Lot to be acquired notify the Proponent in writing that they do not consent to their Lot being acquired, or fail to provide a written request to the Proponent for all or part of their land to be acquired in accordance with condition 2.26, then the requirement either to acquire that land under condition 2.25, or to delete the nominated relevantly applicable turbine from the project under condition 2.30 lapses.
- 2.32 Conditions 2.25-2.30 of this approval are to apply to the landowners of Lots 105, 106, 112, 113, 195, 227 and 253 of DP 7540042 and Lots 247, 304, 355 and 366 of DP 7541115, if:
- turbines BAN\_14 and BAN\_15 are not deleted by 26 June 2013; and
  - aviation hazard lighting is required to be installed on any turbines in the project.



### Flora and Fauna Impacts

- 2.33 The Proponent shall not operate wind turbines POM\_03, POM\_04, POM\_06, and POM\_07 between one hour before sunset and one after sunrise during the period 30 November to 31 March, unless the Proponent demonstrates to the satisfaction of the Director-General that operation during these periods will not adversely impact on Powerful Owl juvenile dispersion. In undertaking such a demonstration, the Proponent shall undertake the following:
- monitoring of the dispersion Powerful Owl juveniles in and around the site, to be conducted by an independent specialist approved by the Director-General;
  - preparation of a report to be submitted to the Director General presenting the outcomes of monitoring and impacts to the Powerful Owl juvenile dispersion in and around the site; and
  - conclusively demonstrating to the satisfaction of the Director-General that the dispersion of Powerful Owl juveniles in and around the site will not be adversely impacted by the project.
- 2.34 The Proponent shall ensure that during the construction of wind turbine BAN\_14, including construction and/ or installation of any ancillary facilities and any site access arrangements, the following requirements are met:
- vegetation defined as all or part of an Endangered Ecological Community shall not be cleared, modified or otherwise directly impacted as a result of the works;
  - access to the construction site shall be clearly demarcated to minimise the potential for impacts on local vegetation;
  - disturbed areas shall be stabilised and rehabilitated following the conclusion of construction works; and
  - an independent qualified ecologist shall attend all site works to advise on mitigation, management and monitoring measures that shall be applied to comply with this condition of approval.
- 2.35 Prior to the commencement of construction of the project, the Proponent shall in consultation with the DECC, finalise (and following approval implement) a compensatory habitat package to offset in perpetuity the value of habitat lost as a result of the project, to the satisfaction of the Director-General. Unless otherwise agreed to by the Director-General, the package shall comprise:
- a minimum of 2:1 'like for like' offset of the vegetation communities to be removed or otherwise disturbed on site utilising a "Worst Case Scenario" impact assessment; or
  - the implementation of in kind management measures or funding for such measures as agreed to by DECC; or a combination of the measures specified in a) and b).

- 2.36 The Proponent shall make a financial contribution of \$1500.00 to the NSW Wildlife Information and Rescue Service for each death of a Powerful Owl that has reasonably been attributed to the carrying out of the project. The financial contribution must be paid by the Proponent within one month of the Proponent becoming aware of the death. The contribution must be adjusted to take account of any increase in the Consumer Price Index (All Groups Index for Sydney) over time, commencing at the September 2010 quarter.
- 2.37 The Proponent shall make a financial contribution of \$1500.00 to the NSW Wildlife Information and Rescue Service for each death of the Wedge-tailed Eagle that has reasonably been attributed to the carrying out of the project. The financial contribution must be paid by the Proponent within one month of the Proponent becoming aware of the death. The contribution must be adjusted to take account of any increase in the Consumer Price Index (All Groups Index for Sydney) over time, commencing at the September 2010 quarter.
- 2.38 In order to avoid the Endangered Ecological Community of vegetation in the southern portion of the Pomeroy site, proposed cabling Option 2 shall be utilised.
- 2.39 Gurrundah Creek shall be surveyed by a suitably qualified ecologist for the presence of Platypus. Subject to identification of the species, any construction works in the vicinity of the creek shall be conducted in accordance with the Flora and Fauna Management Plan contained in condition 7.3 such that negative impacts to the species are mitigated.
- 2.40 Prior to the commencement of construction, clearly defined work areas (including access trails) must be established using a combination of posts, fencing or markers, and suitably marked up maps as appropriate. All on-site construction movements are to be restricted to these areas, to prevent uncontrolled or inadvertent access by vehicles or construction personnel to vegetation and fauna habitat to be protected under this approval.

#### **Aviation**

- 2.41 Prior to the commencement of operation, the following information shall be provided by the Proponent to the Civil Aviation Safety Authority, Commonwealth Department of Defence and Airservices Australia to inform these agencies of the wind farms location:
- "as constructed" coordinates in latitude and longitude of each wind turbine generator;
  - final height of each wind turbine generator in Australian Height Datum; and
  - ground level at the base of each wind turbine generator in Australian Height Datum.
- 2.42 The Proponent shall notify all known users of the Crookwell, Ashwei and Kings' Airstrips of the location of the wind turbines and any changes to operational procedures.

#### **Bushfire Risk**

- 2.43 Throughout the life of the project, the Proponent shall regularly consult with the local RFS to ensure its familiarity with the project, including the construction timetable and the final location of all infrastructure on the site. The Proponent shall comply with any reasonable request of the local RFS to reduce the risk of bushfire and to enable fast access in emergencies.
- 2.44 The Proponent shall:
- ensure there is appropriate fire-fighting equipment held on site to respond to any fires that may occur at the site during construction and operation of the project; and
  - assist the RFS and emergency services as much as possible if there is a fire on-site during the project.
- 2.45 The Proponent shall prepare, in consultation with the local RFS, a **Bushfire Risk Management Plan** based on the guidelines *Planning for Bushfire Protection* (RFS, 2001 or its latest edition). The Plan shall include, but not necessarily be limited to:
- details of the bushfire hazards and risks associated with the project;
  - mitigation measures including contingency plans;
  - procedures and programs for liaison and regular drills with the local RFS; and

- d) procedures for regular fire prevention inspections by the local RFS and implementation of any recommendations

#### ***Bunding and Spill Management***

- 2.46 The Proponent shall store and handle all dangerous goods (as defined by the Australian Dangerous Goods Code) and combustible liquids, strictly in accordance with:
- a) all relevant Australian Standards;
  - b) a minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund; and
  - c) the EPA's Environment Protection Manual Technical Bulletin *Bunding and Spill Management*

In the event of an inconsistency between requirements listed from a) to c) above, the most stringent requirement shall prevail to the extent of the inconsistency.



#### ***Safety Management System***

- 2.47 At least two months prior to the commencement of commissioning, the Proponent shall prepare a report outlining a comprehensive Safety Management System, covering all on-site systems related to ensuring the safe operation of the project. The report must clearly specify all safety related procedures, responsibilities and policies, along with details of mechanisms for ensuring adherence to the procedures. Records must be kept at the Site and must be available for inspection by the Department upon request. The Safety Management System must be developed in accordance with the Department's *Hazardous Industry Planning Advisory Paper No. 9, 'Safety Management'*, and should include:
- a) procedures and programs for the maintenance and testing of the safety related equipment to ensure its integrity over the life of the project; and
  - b) an outline of a documented procedure for the management of change.

#### ***Traffic and Transport Impacts***

- 2.48 The Proponent shall apply for a Road Occupancy Licence from the RTA Traffic Operations Unit prior to commencing work within the classified road reserve or within 100 metres of traffic signals. The application shall be accompanied by a Traffic Control Plan to be prepared by a person who is certified to prepare Traffic Control Plans.
- 2.49 Upon determining the haulage route(s) for the construction, the Proponent shall:
- a) commission a qualified person to undertake a Road Dilapidation Report of all roads proposed to be used for construction activities in consultation with relevant road authorities. The Report shall assess the current condition of the relevant roads.
  - b) following completion of construction a subsequent Road Dilapidation Report shall be prepared to assess any damage that may have resulted due to traffic and transport related to the construction and ongoing operation of the project.

The Proponent shall commit to restore the relevant roads to a state, described in the original Road Dilapidation report. The cost of any restorative work described in the subsequent Report or recommended by the relevant road authorities after review of the subsequent Report, shall be funded by the Proponent. Such work shall be undertaken at a time as agreed upon between the Proponent and the relevant road authorities. In the event of a dispute between the parties with respect to the extent of restorative work that may be required under this condition, any party may refer the matter to the Director-General for resolution. The Director-General's determination of any such dispute shall be final and binding on the parties.

- 2.50 Heavy vehicle access to Ross Bridge will not be permitted for approximately 12 months from the 23 September 2008 as the bridge is undergoing maintenance.
- 2.51 Prior to the commencement of any works that are part of or extending from Prices Lane, the Proponent is required to obtain the consent of the Surveyor General and a licence under the *Crown Lands Act 1989*.

- 2.52 Grabben Gullen Road, Gurrundah Road and Range Road junctions shall be designed and constructed in consultation with Upper Lachlan Shire Council.
- 2.53 Prior to the commencement of construction, the Proponent shall upgrade all site access roads for temporary use by heavy vehicles to a standard endorsed by the Council to the reasonable and feasible requirements of the Council.

### **Electromagnetic Interference**

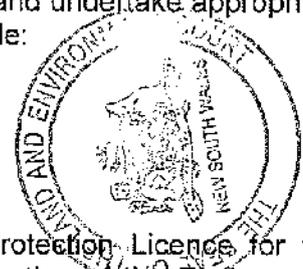
#### ***Television and Radio Interference***

- 2.54 Prior to the commencement of commissioning of the project, the Proponent shall undertake an assessment of the existing quality of the television/radio transmission available at a representative sample of residential dwellings located within 5 kilometres of any wind turbine.
- 2.55 The Proponent shall undertake reasonable and feasible mitigation to rectify any television/radio transmission problems reasonably attributable to the project at any residential dwelling located within five kilometres of a wind turbine. Such measures may include:
- a) modification to or replacement of receiving antenna;
  - b) installation and maintenance of a parasitic antenna system;
  - c) provision of a land line between the affected receiver and an antenna located in an area of favourable reception; or
  - d) other feasible measures.
  - e) if interference cannot be overcome by the measures outlined in a) to d), the Proponent shall negotiate with the impacted landowner about installing and maintaining a satellite receiving antenna.

Any requested works shall be completed within three months of the completion of the relevant television and/or radio reception assessment, unless otherwise agreed by the landowner. The Proponent shall be responsible for all reasonable costs associated with undertaking any mitigation measures.

#### ***Radio Communication***

- 2.56 In the event that any issue with radio communication service links (installed before construction of the project) arise as a result of the project (such as obstruction of transmission paths), the Proponent shall consult with the operator and undertake appropriate remedial measures to rectify any issue. Such measures may include:
- a) modification to or relocation of the existing antennae;
  - b) installation of a directional antennae; and/ or
  - c) installation of an amplifier to boost the signal strength.



### **Soil and Water Quality Impacts**

- 2.57 Except as may be expressively provided by an Environment Protection Licence for the project, the Proponent shall comply with section 120 of the *Protection of the Environment Operations Act 1997* which prohibits the pollution of waters.
- 2.58 Prior to the commencement of construction the Proponent must indicate to the Director-General in consultation with the Department of Water and Energy; The details of which water sources are to be used, from which property, for which purpose and the volume and time period required to utilise the water.
- 2.59 Soil disturbing activities of any nature are not permitted in the classified Crown Road reserve between Gurrundah Creek and ten metres upslope from the northern end of the abandoned sheep dip site located on the "Hillview" property, being Lot 206 DP750043, other than any soil sampling activities being carried out by a suitably qualified person to identify whether any soil contamination is present.

### **Heritage Impacts**

- 2.60 If during the course of construction the Proponent becomes aware of any previously unidentified Aboriginal object(s), all work likely to affect the object(s) must cease immediately and the DECC informed in accordance with the *National Parks and Wildlife Act 1974*. Works must not recommence until written authorisation from DECC is received by the Proponent.
- 2.61 If during the course of construction the Proponent becomes aware of any unexpected historical relic(s), all work likely to affect the relic(s) must cease immediately and the Heritage Office notified in accordance with the *Heritage Act 1977*. Works shall not recommence until the Proponent receives written authorisation from the Heritage Office.

### **Waste Generation and Management**

- 2.62 The Proponent shall not cause, permit or allow any waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing, or disposal or any waste generated on site to be disposed of at the site, except as expressly permitted by a licence under the *Protection of the Environment Operations Act 1997*, if such a licence is required in relation to that waste.
- 2.63 The Proponent shall ensure that all liquid and / or non-liquid waste generated and / or stored on the site is assessed and classified in accordance with *Waste Classification Guidelines Part 1: Classifying Waste* (DECC, 2008), or any future guideline that may supersede that document.

## **3. ENVIRONMENTAL MONITORING AND AUDITING**

### **Bird and Bat Monitoring**

- 3.1 Prior to the commencement of construction, the Proponent must prepare and submit for the approval of the Director-General a **Bird and Bat Adaptive Management Program**, which takes account of bird/ bat monitoring methods identified in the current editions of *AusWEA Best Practice Guidelines for the Implementation of Wind Energy Projects in Australia* and *Wind Farm and Birds: Interim Standards for Risk Assessment*. The Program shall be implemented by a suitably qualified expert, approved by the Director-General. The Program shall incorporate Monitoring, and a Decision Matrix that clearly sets out how the Proponent will respond to the outcomes of monitoring. It must:
- incorporate an ongoing role for the suitably qualified expert;
  - set out monitoring requirements in order to assess the impact of the project on bird and bat populations, including details on survey locations, parameters to be measured, frequency of surveys and analyses and reporting. The monitoring program must be capable of detecting any changes to the population of birds and/ or bats that can reasonably be attributed to the operation of the project, that is, data may be required to be collected prior to the commencement of construction. The requirements must also account for natural and human changes to the surrounding environment that might influence bird and/ or bat behaviour such as changes in land use practices, and significant changes in water levels in nearby water bodies;
  - incorporate a decision making framework that sets out specific actions and when they may be required to be implemented to reduce any impacts on bird and bat populations that have been identified as a result of the monitoring;
  - identify 'at risk' bird and bat groups such as the Powerful Owl, the Common Bent-wing Bat, the Large-footed Myotis and the Eastern False Pipistrelle and include monthly mortality assessments and periodic local population censuses and bird utilisation surveys;
  - identify potential mitigation measures and implementation strategies in order to reduce impacts on birds and bats such as minimising the availability of raptor perches, swift carcass removal, pest control including rabbits, use of deterrents, and sector management including switching off turbines that are predicted to or have had an unacceptable impact on bird/ bat mortality at certain times; and
  - identify matters to be addressed in periodic reports in relation to the outcomes of monitoring, the application of the decision making framework, the need for mitigation measures, progress with implementation of such measures, and their success.

The Reports referred to under part f) shall be submitted to the Director-General on an annual basis, from the commencement of operation, and shall be prepared within two months of the end of the reporting period. The Director-General may vary the reporting requirement or period by notice in writing to the Proponent.

The Proponent is required to implement reasonable and feasible mitigation measures as identified under part e) where the need for further action is identified through the Bird and Bat Adaptive Management Program, or as otherwise agreed with the Director-General.

### **Noise Monitoring – Operation**

3.2 Noise compliance monitoring shall be conducted in accordance with the Noise Management Plan under condition 7.3a) and 7.5a), or as directed by the Director-General in response to noise complaints.

### **Independent Environmental Auditing**

3.3 Within two years of the commencement of Operation of the project, and then as may be directed by the Director-General, the Proponent shall commission an independent person or team to undertake an **Environmental Audit** of the project. The independent person or team shall be approved by the Director-General prior to the commencement of the Audit. The Audit must:

- a) be carried out in accordance with ISO 19011:2002 - Guidelines for Quality and or Environmental Management Systems Auditing;
- b) assess compliance with the requirements of this approval, and other licences and approvals that apply to the project;
- c) assess the environmental performance of the project against the predictions made and conclusions drawn in the documents referred to under condition 1.1 of this approval;
- d) review the effectiveness of the environmental management of the project, including any environmental impact mitigation works; and
- e) review the adequacy of the Proponent's response to any complaints made about the project through the Complaints Register required under condition 14.3

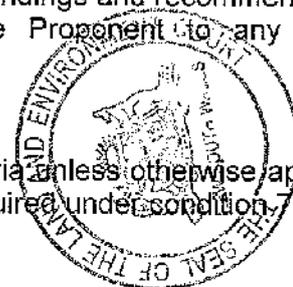
An **Environmental Audit Report** must be submitted for comment to the Director-General within two months of the completion of the Audit, detailing the findings and recommendations of the Audit and including a detailed response from the Proponent to any of the recommendations contained in the Report.

## **4. ANCILLARY FACILITIES**

4.1 The sites for Ancillary Facilities must satisfy the following criteria unless otherwise approved through the Construction Environmental Management Plan required under condition 7.2:

- a) be located within the site;
- b) have ready access to the road network;
- c) be located to minimise the need for heavy vehicles to travel through residential areas;
- d) be sited on relatively level land;
- e) be separated from nearest residences by at least 200 m (or at least 250 m for a temporary batch plant);
- f) be located above the 20 ARI flood level unless a contingency plan to manage flooding is prepared and implemented;
- g) not require vegetation clearing beyond that already required for the project; and
- h) not affect the land use of adjacent properties.

The location of the Ancillary Facilities must be identified in the CEMP and must include an analysis against the above criteria. Where these criteria cannot be met, the CEMP must demonstrate there will be no adverse impacts from the Ancillary Facility's construction or operation.



The Director-General may, having considered the Report, require the Proponent to undertake works to address the findings or recommendations presented in the Report. Any such works must be completed within such time as the Director-General may require.

## 5. COMMUNITY INFORMATION, CONSULTATION AND INVOLVEMENT

5.1 Subject to confidentiality, the Proponent shall make all documents required under this approval available for public inspection on request.

### Provision of Electronic Information

5.2 Prior to the commencement of construction of the project, the Proponent shall establish a dedicated website or maintain dedicated pages within its existing website for the provision of electronic information associated with the project subject to confidentiality. The Proponent shall publish and maintain up-to-date information on this website or dedicated pages including, but not necessarily limited to:

- a) information on the statutory context of project (including on any existing approvals obtained under the *Environmental Planning and Assessment Act 1979*) and the current implementation status of the project;
- b) a copy of this approval and any future modification to this approval;
- c) a copy of each relevant environmental approval, licence or permit required and obtained in relation to the project;
- d) a copy of each plan or report required under this approval; and
- e) details of the outcomes of compliance reviews and audits of the project.



### Community Information Plan

5.3 Prior to the commencement of construction of the project, the Proponent shall prepare and implement a **Community Information Plan** which sets out the community communications and consultation processes to be undertaken during construction and operation of the project. The Plan must include but not be limited to:

- a) procedures to inform the local community of planned investigations and Construction activities, including blasting works;
- b) procedures to inform the relevant community of Construction traffic routes and any potential disruptions to traffic flows and amenity impacts;
- c) procedures to consult with local landowners with regard to Construction traffic to ensure the safety of livestock and to limit disruption to livestock movements;
- d) procedures to inform the community where work has been approved to be undertaken outside the normal Construction hours, in particular noisy activities;
- e) procedures to inform and consult with those landowners who are eligible for landscaping on their property as determined under condition 2.2 of this approval; and
- f) procedures to notify relevant landowners of the process available to review potential impacts on radio and television transmission.

### Complaints Procedure

5.4 Prior to the commencement of construction of the project, the Proponent shall ensure that the following are available for community complaints for the life of the project (including construction and operation):

- a) a 24-hour telephone number on which complaints about construction and operational activities at the site may be registered;
- b) a postal address to which written complaints may be sent; and
- c) an email address to which electronic complaints may be transmitted.

The telephone number, the postal address and the e-mail address must be advertised in a newspaper circulating in the locality on at least one occasion prior to the commencement of construction and at six-monthly intervals thereafter. These details must also be provided on the Proponent's internet site. The telephone number, the postal address and the email address shall be displayed on a sign near the entrance to the site, in a position that is clearly visible to the public.

- 5.5 The Proponent shall record details of all complaints received through the means listed under condition 5.4 of this approval in an up-to-date Complaints Register. The Register shall record, but not necessarily be limited to:
- a) the date and time, where relevant, of the complaint;
  - b) the means by which the complaint was made (telephone, mail or email);
  - c) any personal details of the complainant that were provided, or if no details were provided, a note to that effect;
  - d) the nature of the complaint;
  - e) any action(s) taken by the Proponent in relation to the complaint, including any follow-up contact with the complainant; and
  - f) if no action was taken by the Proponent in relation to the complaint, the reason(s) why no action was taken.

The Complaints Register shall be made available for inspection by the Director-General upon request.

### Community Enhancement Program

- 5.6 Prior to the commencement of construction of the project, the Proponent shall prepare and submit for the approval of the Director-General, a **Community Enhancement Program**, (as generally described in the Environmental Assessment referred to in condition 1.1b) of this approval, in so far as it is consistent with the terms contained in this condition) with the aim of funding community enhancement measures to the benefit of the local community that consists of the following components:
1. a Clean Energy Program to support the installation of residential clean energy improvements, (as generally described in the Environmental Assessment referred to in condition 1.1b) of this approval, in so far as it is consistent with the terms contained in this condition); and
  2. a Community Fund, to provide funds to undertake initiatives which provide a direct benefit to the local community.

The Community Enhancement Program shall be developed in consultation with the Upper Lachlan Shire Council, the Goulburn Mulwaree Council and the local community and provide details of:

- (a) the process by which the program's funds would be administered, including mechanisms for accounting and reporting;
- (b) how measures and initiatives to be funded by the program would be identified, assessed, prioritised and implemented over the life of the project; and
- (c) any other terms agreed to by the parties.

The Proponent shall each year contribute the sum of \$1666 per constructed turbine to the Community Enhancement Program, commencing upon commissioning of the project until the end of its life. The contribution shall be adjusted to take account of any increase in the Consumer Price Index (All Groups Index for Sydney) over time, commencing at the September 2010 quarter.

The Community Enhancement Program shall not require any financial contribution from any recipient of the scheme nor shall the program be conditional on the extent of government subsidies or rebates available for measures to be funded by the program.

### 6. COMPLIANCE TRACKING PROGRAM

- 6.1 Prior to the commencement of construction, the Proponent shall develop and implement a **Compliance Tracking Program** for the project, to track compliance with the requirements of this approval during the construction and operation of the project and shall include, but not necessarily limited to:
- a) provisions for an Annual Environmental Management Report (AEMR) that is to be prepared and submitted to the Director-General throughout the operational life of the project. The AEMR must review the performance of the project against the Operational

Environmental management Plan, the conditions of this approval and other licences and approvals relating to the project.

- b) provisions for periodic reporting of the compliance status to the Director-General including at least prior to the commencement of construction of the project and prior to the commencement of operation of the project;
- c) a program for independent environmental auditing in accordance with *AS/NZ ISO 19011:2003 - Guidelines for Quality and/or Environmental Management Systems Auditing*;
- d) procedures for rectifying any non-compliance identified during environmental auditing or review of compliance;
- e) mechanisms for recording environmental incidents and actions taken in response to those incidents;
- f) provisions for reporting environmental incidents to the Director-General during construction and operation; and
- g) provisions for ensuring all employees, contractors and sub-contractors are aware of, and comply with, the conditions of this approval relevant to their respective activities.

## 7. ENVIRONMENTAL MANAGEMENT

### Environmental Representative

7.1 Prior to the commencement of any construction or operational activities, or as otherwise agreed by the Director-General, the Proponent shall nominate for the approval of the Director-General a suitably qualified and experienced Environmental Representative(s) independent of the design, construction and operation personnel. The Proponent shall engage the Environmental Representative(s) during any construction activities, and throughout the life of the project, or as otherwise agreed by the Director-General. The Environmental Representative(s) shall be the Proponent's principal point of advice in relation to the environmental performance of the project and shall have responsibility for:

- a) overseeing the implementation of all environmental management plans and monitoring programs required under this approval, and advise the Proponent upon the achievement of these plans/programs;
- b) considering and advising the Proponent on its compliance obligations against all matters specified in the conditions of this approval and the Statement of Commitments as referred to under condition of this approval, permits and licences; and
- c) having the authority and independence to recommend to the Proponent reasonable steps to be taken to avoid or minimise unintended or adverse environmental impacts, and, failing the effectiveness of such steps, to recommend to the Proponent that relevant activities are to be ceased as soon as reasonably practicable if there is a significant risk that an adverse impact on the environment will be likely to occur.

### Construction Environmental Management Plan (CEMP)

7.2 The Proponent shall prepare and implement a **Construction Environmental Management Plan** in accordance with the *Guideline for the Preparation of Environmental Management Plans* (DUAP 2004) or its latest revision. The plan must include but not be necessarily be limited to:

- a) a description of all activities to be undertaken on the site during construction including an indication of stages of construction, where relevant;
- b) statutory and other obligations that the Proponent is required to fulfil during construction including all approvals, consultations and agreements required from authorities and other stakeholders, and key legislation and policies;
- c) details of how the environmental performance of the construction works will be monitored, and what actions will be taken to address identified adverse environmental impacts. In particular, the following environmental performance issues shall be addressed in the Plan;
- d) details of how the environmental performance of the construction works will be monitored, and what actions will be taken to address identified adverse environmental impacts. In particular, the following environmental performance issues shall be addressed in the Plan:

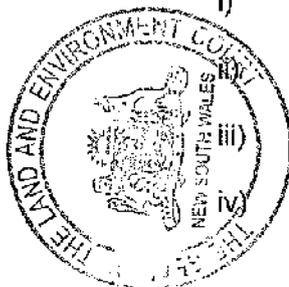


- i) measures to monitor and minimise soil erosion and the discharge of sediment and other pollutants to lands and/ or waters during construction activities, particularly during any construction works at or near drainage lines; and
- ii) measures to monitor and manage dust emissions.
- e) a description of the roles and responsibilities for all relevant employees involved in the construction of the project; and
- f) complaints handling procedures during construction.
- g) the Management Plans listed under condition 7.3 of this approval.

The Plan shall be submitted for the approval of the Director-General no later than one month prior to the commencement of any construction works associated with the project, or within such period otherwise agreed by the Director-General. Construction works shall not commence until written approval has been received from the Director-General. Upon receipt of the Director-General's approval, the Proponent must make the Plan Publicly available as soon as practicable.

7.3 As part of the Construction Environmental Management Plan required under condition 7.2 of this approval, the Proponent must prepare and implement, but is not limited to, the following Management Plans:

- a) a **Noise Management Plan** to detail measures to minimise noise emissions associated with the construction of the project. The Plan must include, but not necessarily be limited to:
  - i) identification of all major sources of noise that may be emitted as a result of the Construction of the project;
  - ii) specification of the noise criteria as it applies to a particular activity;
  - iii) identification and implementation of best practice management techniques for minimisation of noise and vibration emissions;
  - iv) procedures for the monitoring of noise emissions; and
  - v) description of the procedures to be undertaken if any non-compliance is detected.
- b) a **Traffic Management Plan** to outline measures for the management and coordination of road works required under this approval and to minimise potential conflicts between different user groups. The Plan must be prepared in consultation with the RTA and Council and must include, but not necessarily be limited to:
  - i) details of measures to minimise interactions between the project and other users of the roads such as the use of fencing, lights, barriers, traffic diversions etc;
  - ii) procedures for informing the public where any road access will be restricted as a result of the project;
  - iii) procedures to inform vehicle drivers and Crookwell Road business owners of the traffic routes to be used by heavy vehicles associated with the project;
  - iv) procedures to manage construction traffic to ensure the safety of livestock and to minimise disruption to livestock, and school children and limit disruption to school bus timetables;
  - v) speed limits to be observed along routes to and from the site and within the site;
  - vi) minimum requirements for vehicle maintenance to address noise and exhaust emissions, particularly along roads in close proximity to residences;
  - vii) precautionary measures such as signage to warn users of the Bicentennial National Trail about the construction activities for the project;
  - viii) details of the expected behavioural requirements for vehicle drivers travelling to and from the site and within the site; and
  - ix) prohibition of heavy vehicle access to Ross Bridge.
- c) a **Flora and Fauna Management Plan** to outline measures to protect and minimise loss of native vegetation and native fauna habitat as a result of construction of the project. The Plan must include, but not necessarily be limited to:
  - i) plans showing terrestrial vegetation communities; important flora and fauna habitat areas;
  - ii) locations where threatened species, populations or ecological communities have been recorded or are likely to occur; and areas to be cleared. The plans must



- also identify vegetation adjoining the site where this contains important habitat areas and/or threatened species, populations or ecological communities;
- iii) methods to manage impacts on flora and fauna species (terrestrial and aquatic) and their habitat which may be directly or indirectly affected by the project, such as location of fencing, procedures for clearing of vegetation or soil and procedures for re-locating hollows or installing nesting boxes.
- iv) rehabilitation details, such as use of locally native species in rehabilitation and landscaping works and methods to re-use topsoil and cleared vegetation;
- v) the impact avoidance and mitigation measures outlined in section 4 of the EA;
- vi) a Weed Management Strategy; and
- vii) a program for reporting on the effectiveness of terrestrial flora and fauna management measures. Management methods must be reviewed where found to be ineffective.

### Operation Environmental Management Plan (OEMP)

7.4 The Proponent shall prepare and implement an **Operation Environmental Management Plan** in accordance with the Department's publication entitled *Guideline for the Preparation of Environmental Management Plans* (2004) or its latest revision. The Plan shall include, but not necessarily be limited to:

- a) identification of all statutory and other obligations that the Proponent is required to fulfil in relation to the operation of the development, including all consents, licences, approvals and consultations;
- b) a management organisational chart identifying the roles and responsibilities for all relevant employees involved in the operation of the project;
- c) overall environmental policies and principles to be applied to the operation of the project;
- d) standards and performance measures to be applied to the project, and means by which environmental performance can be periodically reviewed and improved, where appropriate;
- e) management policies to ensure that environmental performance goals are met and to comply with the conditions of this approval;
- f) the Management Plans listed under condition 7.5 of this approval; and
- g) the environmental monitoring requirements outlined under this approval.

The Plan shall be submitted for the approval of the Director-General no later than one month prior to the commencement of Operation of the project or within such period as otherwise agreed by the Director-General. Operation must not commence until written approval has been received from the Director-General. Upon receipt of the Director-General's approval, the Proponent shall make the Plan publicly available as soon as practicable.

7.5 As part of the Operation Environmental Management Plan required under condition 7.4, the Proponent shall prepare and implement, but is not limited to the following Management Plans:

- a) a **Noise Management Plan** to outline measures to minimise noise emissions from the operation of the project. The Plan must include, but not necessarily be limited to:
  - i) details of procedures to ensure ongoing compliance with the operational noise limits specified in condition 2.14 as they apply to identified receptors. This should include identification of monitoring requirements;
  - ii) identification and implementation of best practice management techniques for minimisation of noise emissions where reasonable and feasible;
  - iii) measures to be undertaken to rectify annoying characteristics resulting from the operation of the project such as, but not limited to, infrasound or adverse mechanical noise from component failure; and
  - iv) procedures and corrective actions to be undertaken if non-compliance is detected.
- b) a **Landscape Management Plan** to outline measures to ensure appropriate development and maintenance of landscaping on the site to address the visual impacts arising from the project including, turbines, site access roads, substation and control and facilities building, as far as is reasonable and feasible. The Plan must be prepared

by a qualified landscape architect and meet the requirements of Council, should there be any. The Plan must include, but not necessarily be limited to:

- i) measures associated with the biodiversity offset package required under condition 2.26 and any remnant vegetation onsite;
- ii) details of landscaping to be undertaken at the site including locations for planting;
- iii) maximisation of use of flora species that are native to the locality and with low maintenance requirements;
- iv) a program for the removal of weeds introduced or spread as a result of the development at the site; and
- v) a program for maintenance of all landscaped areas on the site to ensure these areas are kept in a tidy, healthy state.

7.6 Within three years of the commencement of operation of the project, and at least every three years thereafter, the Proponent shall undertake a formal review of the Operation Environmental Management Plan. The review shall ensure that the Plan is up-to-date and all changes to procedures and practices since the previous review have been fully incorporated into the Plan. The Proponent must notify the Director-General of the completion of each review, and must supply a copy of the updated Plan on request.

## 8. ENVIRONMENTAL REPORTING

### Incident Reporting

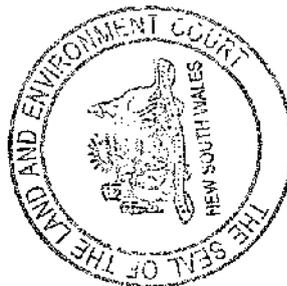
- 8.1 The Proponent shall notify the Director-General and any relevant Government authority of any incident with actual or potential significant off-site impacts on people or the biophysical environment as soon as practicable after the occurrence of the incident ("initial notification"). The Proponent must provide written details ("written report") of the incident to the Director-General and any relevant Government authority within seven days of the date on which the incident occurred.
- 8.2 The Proponent shall meet the requirements of the Director-General to address the cause or impact of any incident, as it relates to this approval, reported in accordance with condition 8.1 of this approval, within such period as the Director-General may require.



**Tim Moore**  
Senior Commissioner



**Judy Fakes**  
Commissioner of the Court



# APPENDIX K1 – REVISED NOISE ASSESSMENT

**GULLEN RANGE WIND FARM**  
**Revised Noise Impact Assessment**  
**Rp 002 R06 2012154SY**

**18 December 2014**



Project: **GULLEN RANGE WIND FARM**

Prepared for: **Goldwind  
Suite 2, Level 23  
201 Elizabeth Street  
Sydney NSW 2000**

Attention: **Tom Nielsen**

Report No.: **Rp 002 R06 2012154SY**

Cross reference: **Rp 002 R06 2012154SY Appendices A to G**

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#### Document control

Status:	Rev:	Comments	Date:	Author:	Reviewer:
Final	-		23 July 2013	BM	DG & JA
Revised	01	-	29 August 2013	BM	DG
Revised	02	-	5 September 2013	BM	
Revised	03	-	25 September 2013	BM	
Revised	04	Additional receivers & background information	26 October 2014	JA	DG
Revised	05	Removal of curtailment	3 December	JA	DG
Revised	06	EPL related data and other supplementary information. Receptor location status changes.	18 December	JA	DG

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*(for appendices see document Rp002 R06 2012154SY Appendices A to G)*

## 1.0 INTRODUCTION

The Gullen Range Wind Farm (the *wind farm*) received planning approval in 2010 and is being developed by Goldwind Australia Pty Ltd (Goldwind). Marshall Day Acoustics Pty Ltd (MDA) prepared a noise impact assessment report 2007265SY 001 R02 (MDA 2008 Report) for the wind farm in June 2008 which was included in the planning application.

The wind farm's Project Approval, reference S07/00846, includes a number of noise related conditions. The purpose of this report is to address the requirements of Condition 2.16 which states:

*The Proponent shall prepare a revised Noise Assessment for the final turbine model and turbine layout selected, which shall be submitted to the Director-General prior to commissioning of the wind turbines. The assessment shall demonstrate consistency with the EA and the ability of the final turbine model and layout to meet the requirements of condition 2.15. The revised Noise Assessment shall include the following:*

- a) noise predictions of the final turbine model and layout selected at each of the receiver locations;*
- b) method and modelling inputs employed to carry out the noise level predictions according to the SA Guidelines 2003 except that all sounds power levels and wind speeds shall be referenced to hub height;*
- c) an assessment of suitability of the background noise level data to cover the range of wind speeds and directions generally expected at the site; and*
- d) noise predictions shall be conducted by an acoustic engineer defined for the purposes of this condition as an engineer who is eligible for membership of both the Australian Acoustical Society and the Institution of Engineers Australia*

This report commissioned by Goldwind Australia Pty Ltd details the results of a revised assessment of noise associated with the operation of the Gullen Range Wind Farm. Specifically, this report addresses the Project Approval requirements detailed above, accounting for:

- the turbines selected for the wind farm;
- the Final Design Layout of the wind farm; and
- updated receiver location data including coordinate information supplied by the Department of Planning and three (3) additional receiver locations (B31a, G37a and G52) identified during the development of the wind farm
- changes to the assessment status of a number of neighbouring residences to reflect their association with the project.

The assessment has been carried out in general agreement with the South Australian Environmental Protection Authority (EPA) *Environmental Noise Guidelines: Wind Farms* (2003) (The SA Guidelines 2003).

Acoustic terminology used throughout this report is presented in Appendix A.

The appendices to this report are provided in a separate document (reference *Rp002 R06 2012154SY Gullen Range Wind Farm Revised Noise Impact Assessment (Appendices A to G)*).

In addition to the requirements of the Project Approval, Environment Protection License (EPL) 20365 for the project also stipulates noise assessment reporting requirements. Specifically, Condition U1 states that the licensee must provide a noise assessment report to the EPA that includes but is not limited to the following:

- (a) Background noise levels for each of the proposed compliance locations for the New Gullen Range wind farm. The background noise level data must be collected in accordance with the requirements and recommendations of 'Section 3.1 Background Noise' of the document Wind Farms Environmental Noise Guidelines (South Australia EPA, 2003) or as otherwise agreed with the EPA.*
- (b) Address and GPS location of all non-associated relevant receivers.*
- (c) Wind speed measurements for at least each integer wind speed from cut-in speed to the speed up to the rated power of the wind turbine generators in accordance with the requirements of Section 3.2 of the document Wind Farms Environmental Noise Guidelines (South Australia EPA, 2003).*
- (d) Predicted noise levels at all relevant receiver locations that are not associated with the New Gullen Range wind farm for each integer wind speed from cut-in speed to the speed of the rated power in accordance with the document Wind Farms Environmental Noise Guidelines (South Australia EPA, 2003).*

*Note: The noise assessment report must include all the documentation required by Section 5.1 of the document Wind Farms Environmental Noise Guidelines (South Australia EPA, 2003)*

*Note: The background noise level assessment must include all the documentation required by Section 5.2 of the document Wind Farms Environmental Noise Guidelines (South Australia EPA, 2003)*

The information contained in this report and the appendices also addresses the information requirements of Condition U1 of EPL 20365. Specifically, with the exception of address point data (to supplement easting and northing data), all data required by PL 20365 is provided in this report and appendices.

## 2.0 SITE DESCRIPTION

The Gullen Range Wind Farm site is located approximately 20km west of Goulburn in New South Wales, northeast of Canberra.

The project comprises 73 turbines. The coordinates of wind turbines for the Final Design Layout of the wind farm, Layout 6a, are provided in Appendix B1.

### 2.1 Wind turbines

Two turbine models have been selected for the project; the Goldwind GW82 and GW100 turbines. A total of seventeen (17) GW82 turbines and fifty-six (56) GW100 turbines are proposed for the site. Details for the two turbine models are provided in Table 1.

**Table 1: Turbine manufacturer specifications**

	GW82	GW100
Manufacturer	Goldwind Science & Technology	Goldwind Science & Technology
Model	GW82/1500	GW100/2500
Rotor Diameter (m)	82.3	100
Hub Height (m)	85	80
Orientation	Upwind	Upwind
Rotor speed (rpm)	10.0 to 17.3	6.5 to 14.5
Cut-in Wind Speed (hub height, m/s)	3 <sup>#</sup>	3 <sup>#</sup>
Rated Wind Speed (hub height, m/s)	10.3 <sup>#</sup>	12.5 <sup>#</sup>
Cut-out Wind Speed (hub height, m/s)	22 <sup>#</sup>	25 <sup>#</sup>
Sound Power $L_{WA}$ at 9 m/s (hub height, dB, based on measured plus uncertainty values)	103.9	104.0
Tonality audibility ( $\Delta L_{a,k}$ )	No* ( $\Delta L_{a,k} \leq -3$ )	No* ( $\Delta L_{a,k} \leq -6.11$ )

# Values obtained from thewindturbine.net, wind speeds are understood to be referenced to hub height

\* Refer to Section 2.2.4 and Section 5.0 for details.

## 2.2 Sound power level data

### 2.2.1 Data sources

Test data and sound power level information for the GW82 and GW100 turbines has been obtained from the following documents.

**Table 2: Turbine sound power level test documents**

Item	Date of issue	Document name
GW100 Sound power data including spectral noise data	29 May 2012	GL Garrad Hassan test document <i>Summary of results of the noise emission measurement, in accordance with IEC 61400-11, of a WTGS of the type Goldwin GW100/2500</i> (extract from GLGH-4286 12 08977 258-A-0001-A) for a 100m hub-height turbine
GW82 Sound power data including spectral noise data	9 November 2011	DEWI test document <i>Acoustic Noise Emission Goldwind 82/1500 Guazhou City</i> (document reference DEWI-GER-AM10-00026-04.02) for a 65m hub-height turbine

The test reports provide sound power level information for standardised<sup>1</sup> wind speeds referenced to 10m above ground level (AGL). Consistent with Planning Approval Condition 2.16(b), available sound power levels have been re-referenced to hub height wind speeds using equation (7) of IEC 61400-11:2006<sup>2</sup>. The re-referenced data covers the range of hub height wind speeds 8m/s to 12m/s.

The SA Guidelines 2003 require an assessment of wind farm noise from the turbine cut-in wind speed, nominally 3m/s, up until the wind speed of rated power, nominally 12m/s. The re-referenced, measured sound power level data, including a tolerance for measurement uncertainty, is used herein for the available range of hub height wind speeds from 8m/s to 12m/s. For wind speeds below 8m/s, where measured sound power level data is not available, guaranteed sound power levels have been used. These levels have been provided by Goldwind, as detailed in their email dated 21 September 2012.

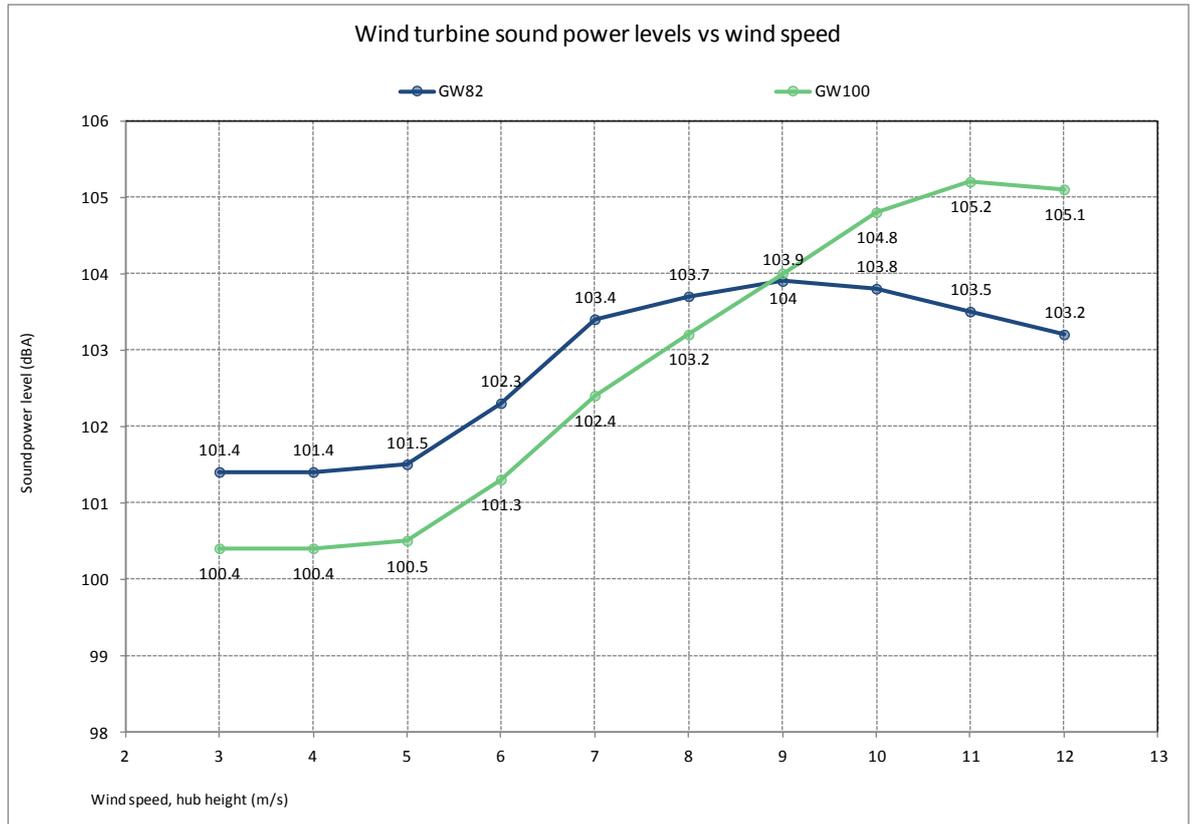
Sound power level data used for this assessment is detailed below.

<sup>1</sup> In accordance with IEC61400-11, standardised wind speeds (m/s) are referenced to 10m AGL, derived from hub height measured wind speeds with a reference roughness length  $z_0$  of 0.05m.

<sup>2</sup> International Standard *IEC 61400-11 Wind turbine generator systems – Part 11: Acoustic noise measurement techniques Version 2.1* (IEC 61400-11:2006), dated November 2006

### 2.2.2 Sound power level data vs wind speed

Sound power level data referenced to hub height wind speeds for the GW82 and GW100 turbines is presented in Figure 1, comprising guaranteed data for hub height wind speeds less than 8m/s and measured sound power level data + test uncertainty for hub height wind speeds of 8m/s and greater.



**Figure 1: Sound power levels vs wind speed for GW82 and GW100**

Tabular values are presented in Table 3.

**Table 3: Sound power levels for GW82 and GW100 turbines**

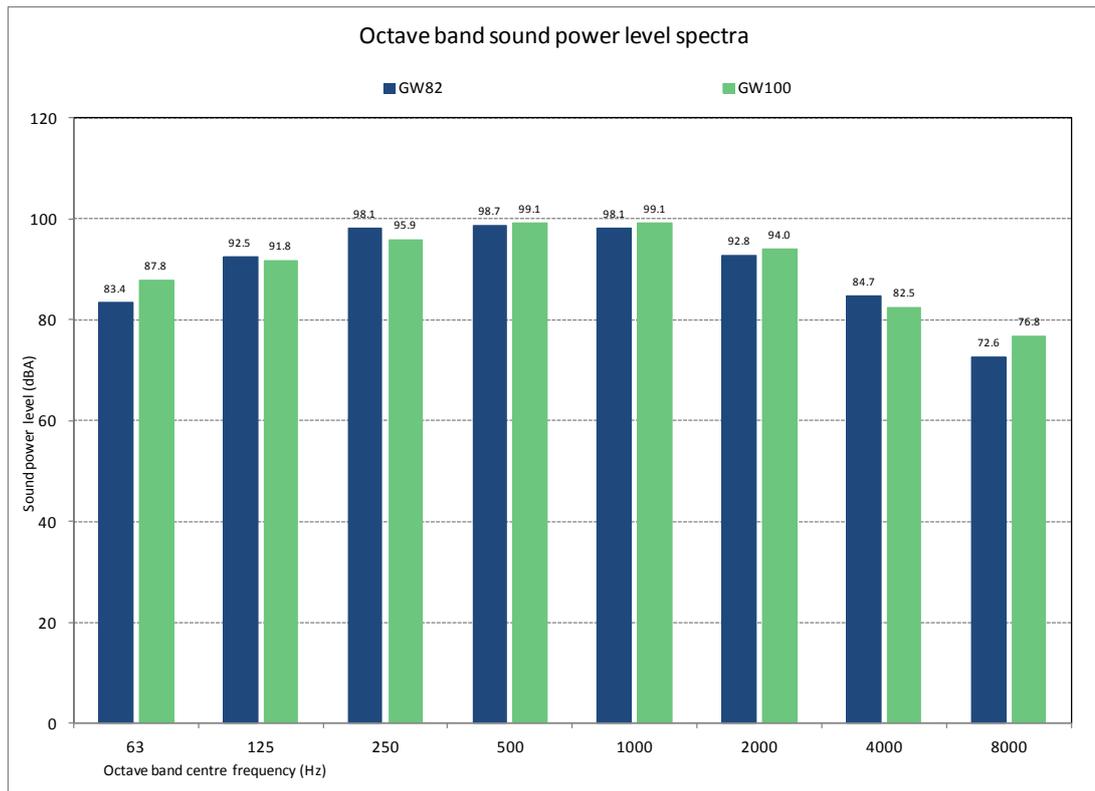
L <sub>WA</sub> (dB)	Hub height wind speed (m/s)									
	3*	4*	5*	6*	7*	8 <sup>#</sup>	9 <sup>#</sup>	10 <sup>#</sup>	11 <sup>#</sup>	12 <sup>#</sup>
GW82	101.4	101.4	101.5	102.3	103.4	103.7	103.9	103.8	103.5	103.2
GW100	100.4	100.4	100.5	101.3	102.4	103.2	104.0	104.8	105.2	105.1

\* Based on guaranteed sound power levels provided by Goldwind

# Based on measured + uncertainty data from test reports

### 2.2.3 Spectral data

Predicted noise levels must be calculated for the range of wind speeds using octave band data. Figure 2 provides octave band sound power level spectra for the GW82 and GW100 turbines referenced to the hub height wind speed of 9m/s.



**Figure 2: Reference A-weighted octave band sound power level spectra for GW82 and GW100 turbines adjusted to 9m/s hub height wind speeds**

Tabular spectral data is presented in Table 4.

**Table 4: Reference A-weighted octave band sound power level spectra for the GW82 and GW100 turbines at 9m/s hub height sound power levels**

Source		Octave Band Centre Frequency (Hz)								Total
		63	125	250	500	1000	2000	4000	8000	
L <sub>WA</sub> (dB)	GW82	83.4	92.5	98.1	98.7	98.1	92.8	84.7	72.6	103.9
	GW100	87.8	91.8	95.9	99.1	99.1	94.0	82.5	76.8	104.0

For assessment across the required SA Guidelines 2003 wind speed range, the spectra presented in Table 4 have been scaled to match the sound power levels of each integer wind speed detailed in Table 3 above.

In addition to the octave band data provided in Figure 2 and in Table 4, examples of the corresponding one-third octave band spectra are provided in Figure 3.

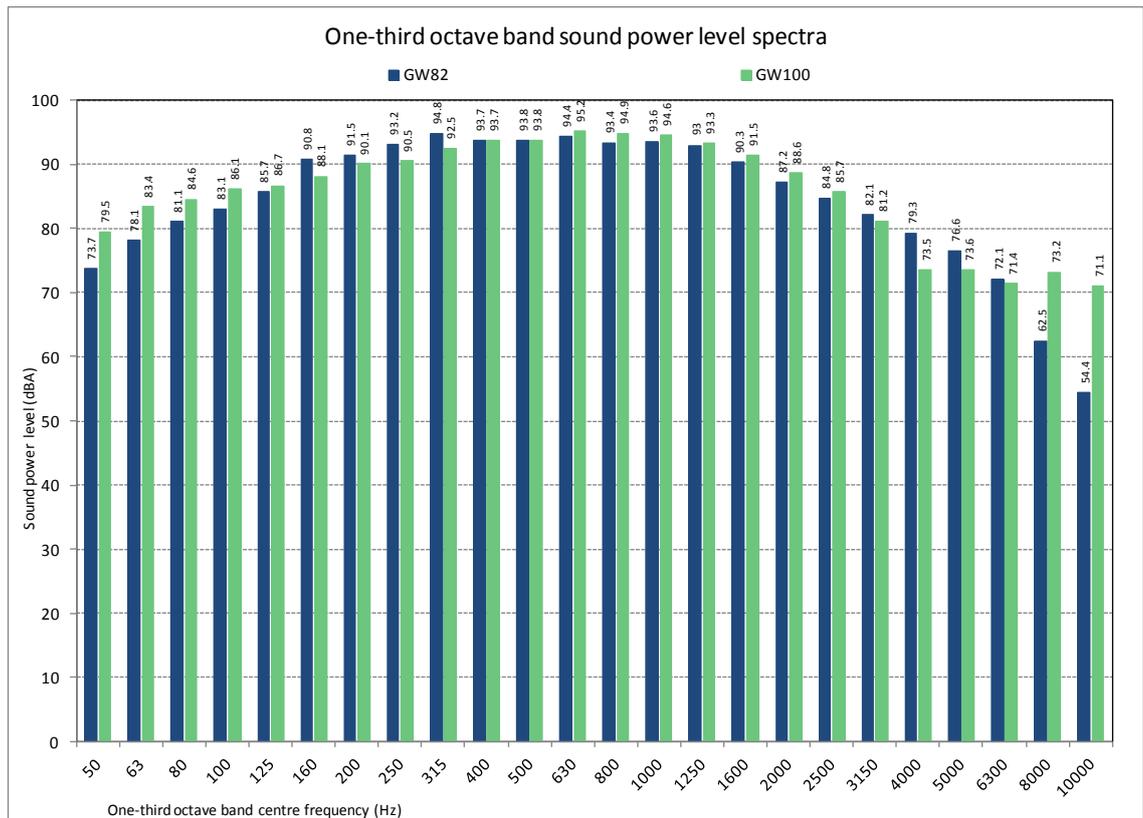


Figure 3: Reference A-weighted one-third octave band sound power level spectra for GW82 and GW100 turbines adjusted to 9m/s hub height wind speeds

### 2.2.4 Tonality

The results of tonality assessments carried out in accordance with IEC61400-11 *Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques* (IEC61400-11) are detailed in the respective sound power level test documents for the GW82 and G100 turbines.

The GW82 test report states<sup>3</sup> the tonal audibility ( $\Delta L_{a,k}$ ) is less than -3dB for the integer wind speed range 7-10m/s at 10m AGL.

The GW100 test report provides tonal audibility ( $\Delta L_{a,k}$ ) for the most prevalent tone at each integer wind speed in the range 6-10 m/s at 10m AGL. The largest reported tonal audibility value,  $\Delta L_{a,k}$ , is -6.11 dB at 9m/s.

### 2.3 Receiver locations

A total of two-hundred and fifty-six (256) receiver locations in the vicinity of the proposed site have been considered in this assessment. Coordinate details for these locations were supplied by Goldwind, and included supplementary information supplied by the Department of Planning and Environment concerning revised coordinates and an additional three (3) receiver locations (B31a, G37a and G52).

<sup>3</sup> The tonal audibility values presented in the test report for the GW82 turbine are stated as  $\Delta L_a$  levels. We understand that this is a typographical error and values should be stated as  $\Delta L_{a,k}$

A complete list of the receivers considered in this assessment is provided in Appendix B<sup>4</sup> including details of the nearest turbine, the separation distance from the nearest turbine and the highest predicted level of wind farm noise<sup>5</sup>.

All receiver locations presented in the original noise impact assessment have been referenced in this assessment, with the exception of receivers B121a, B122a and B4.

Receivers B121a and B122a were included in the original noise impact assessment at the request of Epuron (the developer of the site at the time of the noise impact assessment) as reference locations for potential future development. Since this time, we understand that the subdivision for these locations has been approved, but no residences have been built or are under construction. Further, a noise agreement has been established with the landowner.

We understand B4 has been confirmed as a derelict shed, and there is no planning application or existing approval for a residential dwelling at this location.

On this basis, we do not consider locations B121a, B122a and B4 to be relevant receivers for the purpose of the assessment. This matter is subject to the interpretation of the condition and relevant legal advice.

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<sup>4</sup> for appendices see document Rp002 R06 2012154SY Appendices A to G

<sup>5</sup> Refer to Section 5.0 for details of the prediction methodology

### 3.0 NOISE ASSESSMENT GUIDELINES

#### 3.1 Project approval requirements

The Project Approval document for the wind farm sets out the key noise assessment criteria for the development. In relation to wind farm noise levels, condition 2.15 of the Project approval notes that the equivalent noise level ( $L_{Aeq,10\text{ minute}}$ ) must not exceed the following levels:

- 35 [dB  $L_{Aeq,10\text{ minute}}$ ]; or
- the existing background noise level [ $L_{A90,10\text{ minute}}$ ] correlated to the integer wind speed at hub height at the wind farm site by more than 5 [dB]

*whichever is the greater, for each integer wind speed (measured at hub height) from cut-in to rated power of the wind turbine generator, when determined in accordance with the methodology provided in the Wind Farms: Environmental Guidelines (SA EPA 2003)[...]*

Regarding tonality, condition 2.19 of the Project Approval notes that “...5[dB] shall be applied to measured noise levels where tonality is present.”

The Project Approval also notes at Section 2.20 that the noise limits detailed in Section 2.15 do not apply to receivers with a noise agreement with the proponent. Under the definitions detailed in Schedule 2 of the Project Approval, receiver locations with a written agreement between the owner of the property and the proponent of the wind farm (including, but not limited to, noise agreements) are referred to as associated properties or associated residences.

Accordingly, for consistency with the Project Approval, the receiver locations where noise agreements are in place are subsequently referred to as *associated receivers* throughout this report. Further details of the limits that apply at associated receivers are provided subsequently in Section **Error! Reference source not found.** of this report.

#### 3.2 SA EPA Environmental Noise Guidelines: Wind Farms (2003)

Condition 2.16(b) of the Project Approval requires that the revised noise assessment be carried out according to the SA Guidelines 2003 with the exception that all sound power levels and wind speeds shall be referenced to hub height. The SA Guidelines 2003 state that its objective is:

*...to balance the advantage of developing wind energy projects in this State with protecting the amenity of the surrounding community from adverse noise impacts.*

The SA Guidelines 2003 criteria apply to noise levels occurring under free-field conditions, which are not significantly influenced by reflections from vertical structures. These noise limits apply to the 24-hour period, seven days per week and do not differentiate between day, evening and night-time periods.

The SA Guidelines 2003 were developed in recognition of the inherent noise characteristics of a correctly functioning modern wind farm which are described as including aerodynamic noise from passing blades, referred to as “swish” and infrequent braking noise. In instances where a wind farm emits atypical noise characteristics, Section 4.5 of the SA Guidelines 2003 requires that these be rectified.

The 2003 SA Guidelines propose a 5dB penalty for characteristics of turbine operation that may be deemed as annoying, such as tonality.

### 3.3 Associated receiver noise limit

In relation to receiver locations where a noise agreement is in place between the owner of a residence and the proponent of the wind farm, Section 2.20 of the Project Approval notes:

*[...]the noise limits specified [...]do not apply to any residence where a noise agreement is in place between the Proponent and the respective owner(s) of those residences in relation to noise impacts and/or noise limits. For this condition to take effect, the noise agreements shall satisfy the requirements of Guidelines for Community Noise (WHO, 1999) and Section 2.3 of the SA Guidelines 2003.*

Regarding associated receivers, Section 2.3 of the SA Guidelines 2003 states:

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

The SA Guidelines 2003 note that developers cannot absolve themselves of their obligations to protect the environment by entering into an agreement with a landowner. With this obligation in mind, associated receivers were included in the original noise impact assessment report. Noise limits for associated receivers were nominated on the basis of the UK wind farm guideline document, ETSU-R-97<sup>6</sup>, which recommends:

*[...]that both day- and night-time lower fixed limits can be increased to 45 [dB] and that consideration should be given to increasing the permissible margin above background where the occupier of the property has some financial involvement in the wind farm.*

The ETSU-R-97 limit of 45dB is consistent with the WHO criterion for the protection of amenity and avoidance of sleep disturbance, as published in the document *Guidelines for Community Noise* (1999).

For this noise assessment, a minimum guideline noise limit of 45dB is adopted for stakeholder properties. In combination with the background noise level dependent limits stipulated in the SA Guidelines 2003, the guideline criterion for associated receivers is as follows:

- 45dB or background  $L_{A90} + 5\text{dB}$ ; whichever is the greater; for each integer wind speed from cut-in to rated power of the wind farm.

Importantly, this approach means that noise limits for both associated and non-associated receivers have the same dependence on background noise levels. The primary point of difference for stakeholder noise limits is the alternative base noise limit.

A total of eighteen (18) of the two-hundred and fifty-three assessable receiver locations are designated as associated receivers. This includes six (6) receiver locations that have become associated receivers since the Revised Noise Assessment (RNA) dated 25 September 2013 (MDA reference Rp 002 r03 2012154SY), and receiver location G37a which is one of the three (3) receiver locations identified during the development of the wind farm.

All of the associated receivers are listed in Table 5.

<sup>6</sup> ETSU-R-97 UK Department of Trade and Industry 1996, *The assessment and rating of noise from wind farms*

**Table 5: Schedule of all associated receivers**

Associated Receivers		
B1	B12 <sup>1</sup>	B33
B2	B12a	B53
B3	B17 <sup>1</sup>	G37 <sup>1</sup>
B6	B18a	G37a <sup>2</sup>
B7 <sup>1</sup>	B27	PW7
B9	B29 <sup>1</sup>	PW34 <sup>1</sup>

1 Receiver locations which have become associated receivers since the RNA dated 25 September 2013

2 Receiver location not identified in the RNA dated 25 September 2013

## 4.0 NOISE CRITERIA

This section of the report provides details of the noise criteria applicable to the operation of the Gullen Range Wind Farm, based on the requirements of the Project Approval and the guidance contained in the SA Guidelines 2003.

The dwellings to be assessed in accordance with the SA Guidelines 2003 are referred to as receivers and are categorised as follows:

- Non-associated receivers: receivers that do not have an agreement with the proponent of the wind farm
- Associated receivers: dwellings where the landowners have entered into a noise agreement with the proponent of the wind farm.
- Relevant receivers: receiver locations (non-associated or associated) where the noise levels as a result of operation of the wind farm are predicted to be higher than 35dB and a representation of pre-development background noise levels is required to define the noise criteria. According to the SA Guidelines 2003, this representation can be determined by direct measurement of background noise levels or, alternatively, by measurement at a nearby proxy location (for example, “...a house located among a group of nearby houses within a residential zone”).

### 4.1 Background noise monitoring

Background noise monitoring was carried out at locations around the proposed Gullen Range Wind Farm as part of the works for the original noise assessment. Specifically, unattended background noise monitoring was conducted by MDA at seventeen (17) locations between July and November 2007. This monitoring data was documented in the original MDA 2008 Report which was considered as part of the Land & Environment Court approval for the site.

We understand that the continued use of the existing background noise data was confirmed by Goldwind and the Department of Planning and Environment (DPE) in consultations dated 21 March 2013.

The noise criteria presented in this report have therefore been derived on the basis of the background noise levels measured in 2007. Accordingly, no further background noise measurements have been carried out as part of this revised noise assessment. However, to address the requirements of Project Approval condition 2.16, the existing background noise data has been reanalysed with wind speed data referenced to the turbine hub-heights of the Final Design Layout.

The original seventeen (17) locations selected for background noise monitoring in 2007 were determined on the basis of a preliminary noise model of the wind farm layout and turbine selections that were proposed at that time. The process of identifying locations suitable for monitoring was documented in the MDA 2008 Report, which stated:

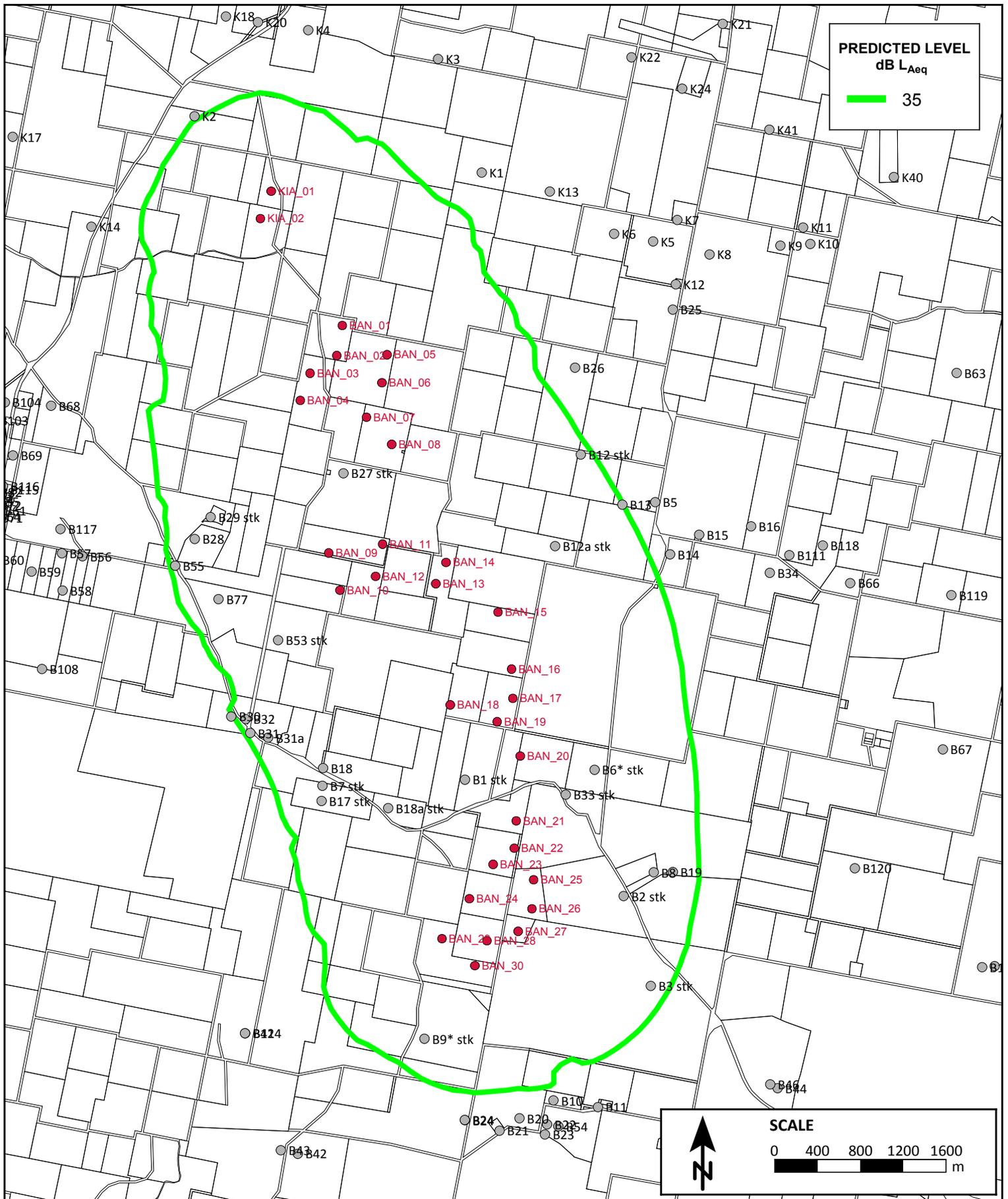
*A detailed evaluation was made for all receiver locations where the initial prediction model indicated a potential sensitivity to the acceptable noise criteria. Dwellings with a predicted noise level of 32dB  $L_{Aeq}$  or greater were included for further assessment. From this shortlist, relevant receiver locations were selected.*

*Where a cluster of receiver locations occurred, a worst-case determination was made that involved selecting a single dwelling as being representative of the cluster. Factors that were used in this determination included: elevation, foliage coverage, topography of surrounding land, proximity to the nearest WTG and of course, overall predicted  $L_{Aeq}$  level.*

While the selection of background monitoring locations included consideration of preliminary noise modelling carried out prior to the survey, predicted noise contour maps for the final design layout and selected turbines have been prepared to provide context to the originally selected monitoring locations.

The noise contour maps are shown subsequently in Figure 4 and Figure 5 of the following pages and depict the extent of the predicted 35dB contour associated with operation of the wind farm, overlaid on top of cadastral map data. The same data is also illustrated overlaid on top of topographical elevation data in Figure 6 and Figure 7.

Section 5.0 provides further detailed information about the predicted noise levels, including the calculation method and noise levels across a range of integer wind speeds. However for reference here, the contour is presented for a hub-height wind speed of 11m/s which equates to the highest predicted noise levels for the majority of locations around the site, calculated on the basis of every location being simultaneously downwind of all turbines.



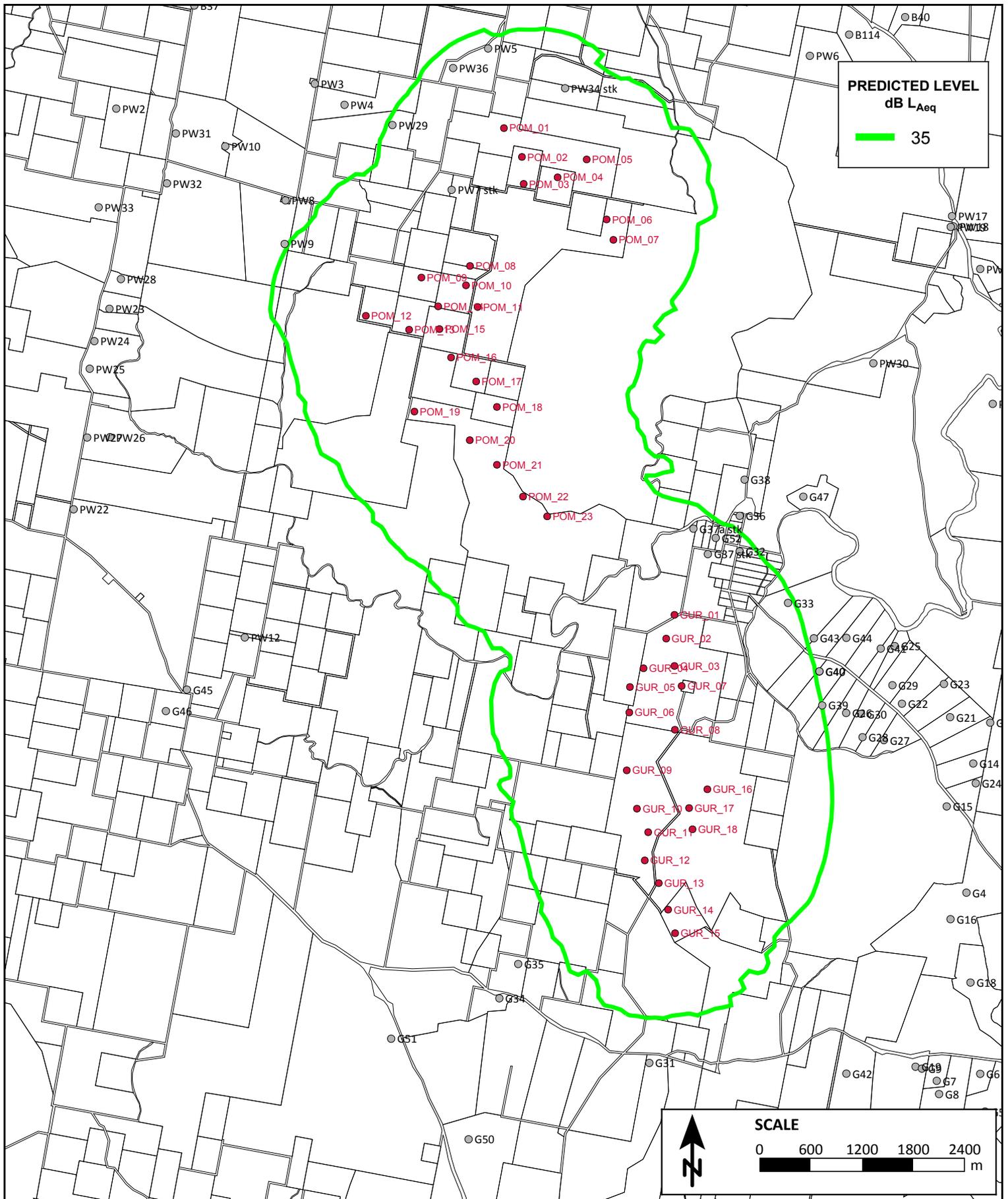
**LEGEND**

- Receiver
- Turbine

Project: Gullen Windfarm  
 Project number: 2012154  
 Client name: Goldwind  
 Version: SoundPLAN 7.3  
 Prediction method: ISO9613-2:1996  
 Model number: 16  
 Run number: 200  
 File: Gullen 35dB contour\_north section-cadastre for R0  
 Prediction Height: 1.5 m

**35dB LAeq contour at 11m/s (hub-height)**

North Section



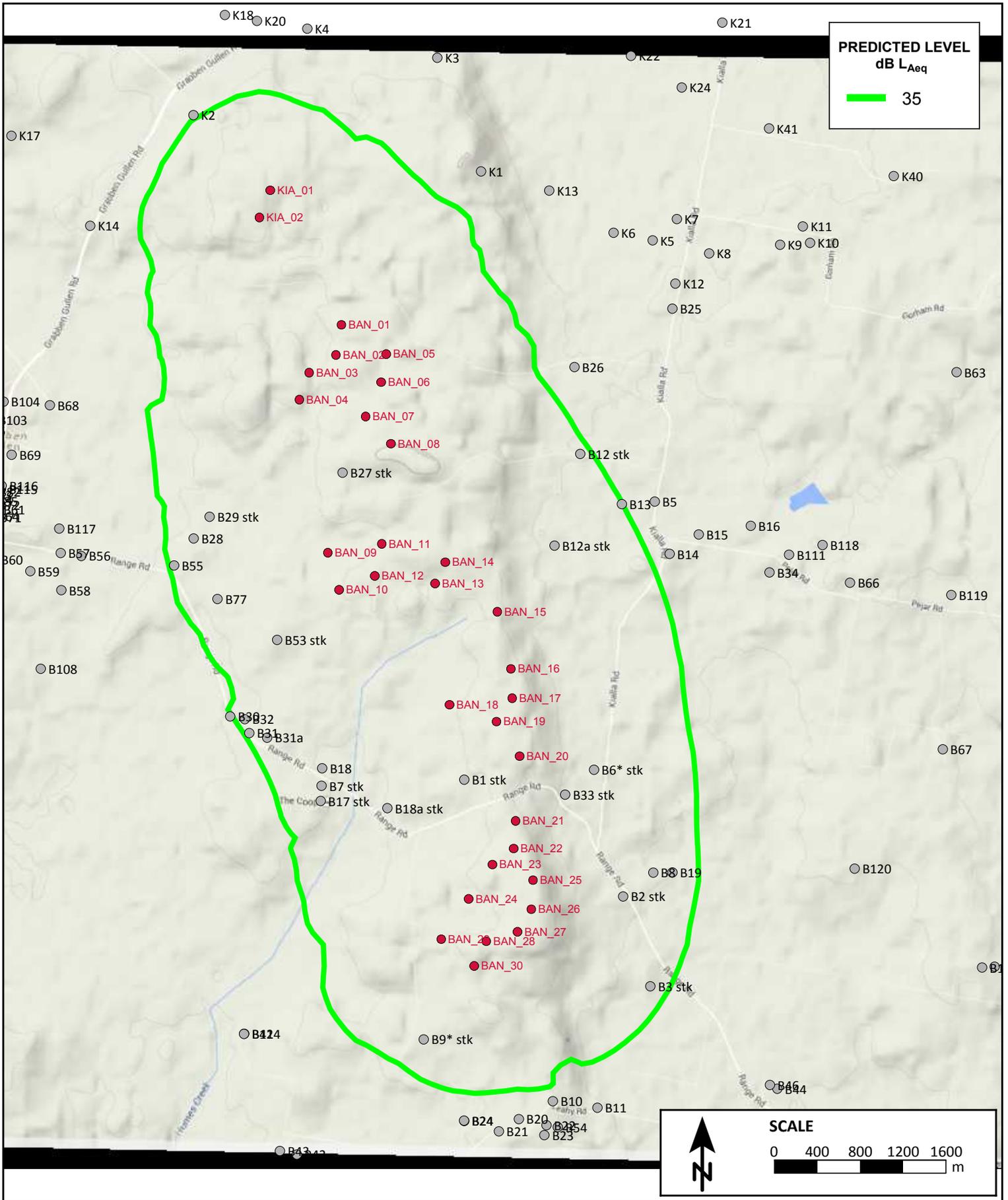
**LEGEND**

- Receiver
- Turbine

Project: Gullen Windfarm  
 Project number: 2012154  
 Client name: Goldwind  
 Version: SoundPLAN 7.3  
 Prediction method: ISO9613-2:1996  
 Model number: 16  
 Run number: 200  
 File: Gullen 35dB contour\_south section-cadastre for RC  
 Prediction Height: 1.5 m

**35dB LAeq contour at 11m/s (hub-height)**

South Section



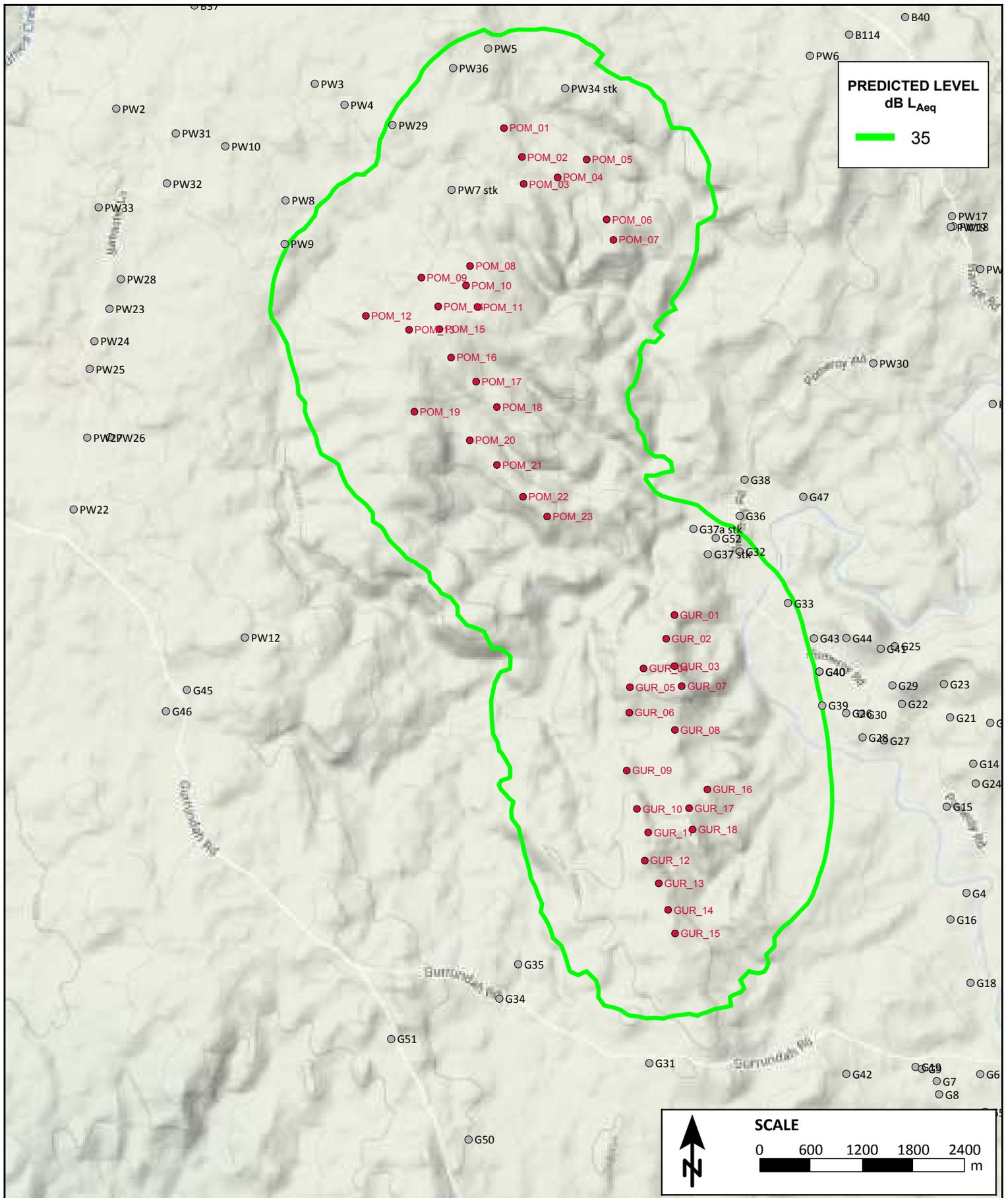
**LEGEND**

- Receiver
- Turbine

Project: Gullen Windfarm  
 Project number: 2012154  
 Client name: Goldwind  
 Version: SoundPLAN 7.3  
 Prediction method: ISO9613-2:1996  
 Model number: 16  
 Run number: 200  
 File: Gullen 35dB contour north section-topographical f  
 Prediction Height: 1.5 m

**35dB LAeq contour at 11m/s (hub-height)**

North Section (Topographical)



**LEGEND**

- Receiver
- Turbine

Project: Gullen Windfarm  
 Project number: 2012154  
 Client name: Goldwind  
 Version: SoundPLAN 7.3  
 Prediction method: ISO9613-2:1996  
 Model number: 16  
 Run number: 200  
 File: Gullen 35dB contour\_south section-topographical.f  
 Prediction Height: 1.5 m

**35dB LAeq contour at 11m/s (hub-height)**

South Section (Topographical)

Based on the results presented in Figure 4 and Figure 5, and the detailed results presented in Section 5.0, this revised noise assessment has identified thirty-five (35) of the two-hundred and fifty-four (254) receiver locations with predicted noise levels equal to or greater than 35dB  $L_{Aeq}$ .

For this set of thirty-five (35) receivers, eleven (11) of the seventeen (17) original background noise monitoring locations can be considered relevant receivers.

Details of all seventeen (17) monitoring locations are provided in Table 6 below, including:

- identification of the eleven (11) current relevant receivers
- identification of those receivers referencing a monitoring location for the purposes of establishing the background noise dependent component of noise limits.

Further details of the background noise monitoring campaigns are provided in Appendix C. Background noise versus wind speed charts, and the applicable noise limit charts, are presented in Appendix D and Appendix E respectively.

**Table 6: Background noise monitoring locations**

Monitoring Location	Easting (m) <sup>#</sup>	Northing (m) <sup>#</sup>	Monitoring period	Relevant receiver?	Receivers represented by monitoring locations
B8	725764	6171873	26/07/07 to 09/08/07	✓	B2*, B3*, B19
B11	725247	6169678	23/08/07 to 07/09/07		B9*
B12a*	724847	6174932	23/08/07 to 07/09/07	✓	-
B13	725472	6175320	10/08/07 to 24/08/07	✓	-
B18	722690	6172850	26/07/07 to 09/08/07	✓	B1*, B7*, B17*, B18a*, B31, B31a, B32
B26	725030	6176599	09/08/07 to 23/08/07		B12*
B27*	722879	6175614	02/11/07 to 17/11/07	✓	-
B29*	721644	6175203	09/08/07 to 23/08/07	✓	B28, B55
B33*	724946	6172602	12/07/07 to 09/08/07	✓	B6*
B53*	722272	6174050	12/07/07 to 26/07/07	✓	B77
G31	727534	6155924	02/11/07 to 16/11/07		-
G37*	728219	6161915	26/07/07 to 09/08/07	✓	G32, G33, G37a*, G52
G39	729557	6160137	09/08/07 to 23/08/07	✓	-
K1	724164	6178435	26/07/07 to 09/08/07		-
K2	721492	6178960	26/07/07 to 09/08/07		-
PW7*	725225	6166206	12/07/07 to 26/07/07	✓	PW5, PW29, PW34*, PW36
PW9	723273	6165570	10/08/07 to 08/09/07		-

<sup>#</sup> MGA94 Zone 55 datum

\* Associated Receiver

During the time period between the issue of the MDA 2008 Report and the preparation of the current document, the stakeholder status of three (3) of the background noise monitoring locations has changed. Specifically, locations B12a, B29 and PW7 are now associated receivers.

Consistent with the discussions in Section 3.3 above, this means that these three (3) locations are assessed herein using a combination of background dependent limits and an elevated base noise limit of 45dB. The background noise data at B29 and PW7 remains applicable for deriving limits at the five (5) non-associated receivers that refer to B29 and PW7. However the limits for these five (5) locations must be established using the B29 (for non-associated receivers B28 and B55) and PW7 (for non-associated receivers PW5, PW29 and PW36) background dependent limits in combination with the lower base limit of 35dB, as originally applied to both B29 and PW7.

Note that B12a is not used to represent any other associated receivers.

## 4.2 Noise limits

The MDA 2008 Report presents noise limits that were established using the results of the background noise monitoring surveys, with wind speeds referenced to 10m AGL. For this revised noise impact assessment, noise limits have been re-established using wind speeds referenced to the turbine hub height. The method for determining hub height wind speed data applicable to the 2007 monitoring campaign is detailed in Appendix C.2.

A summary of the assessed background noise levels and subsequent applicable noise limits, for both associated and non-associated properties, is presented in Table 7 through Table 23 below<sup>7</sup>. Charts presenting the revised noise limits are detailed in Appendix E.

**Table 7: Background noise levels and applicable noise limits, B8**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	28.0	29.3	30.8	32.3	33.9	35.5	37.2	38.9	40.6	42.3
Applicable limit (non-associated) $L_{Aeq}$ dB	35.0	35.0	35.8	37.3	38.9	40.5	42.2	43.9	45.6	47.3
Applicable limit (associated) $L_{Aeq}$ dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.6	47.3

**Table 8: Background noise levels and applicable noise limits, B11**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	26.6	26.4	26.6	27.1	27.9	28.9	30.3	31.9	33.7	35.8
Applicable limit (non-associated) $L_{Aeq}$ dB	35.0	35.0	35.0	35.0	35.0	35.0	35.3	36.9	38.7	40.8
Applicable limit (associated) $L_{Aeq}$ dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0

<sup>7</sup> Sound levels in environmental assessment work are typically reported to the nearest integer to reflect the practical use of measurement and prediction data. In the case of wind farm layout design however, significant layout modifications may only give rise to fractional changes in the predicted noise level. This is a result of the relatively large number of sources influencing the total predicted noise level, as well as the typical separating distances between the turbine locations and surrounding assessment positions. It is therefore necessary to consider the predicted noise levels at a finer resolution than can be perceived or measured in practice. It is for this reason that relevant levels presented in Section 4 and Section 5 of this document are reported to one decimal place.

**Table 9: Background noise levels and applicable noise limits, B12a**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	28.4	29.4	30.6	31.9	33.3	34.7	36.2	37.7	39.2	40.7
Applicable limit (non-associated) $L_{Aeq}$ dB	35.0	35.0	35.6	36.9	38.3	39.7	41.2	42.7	44.2	45.7
Applicable limit (associated) $L_{Aeq}$ dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.7

**Table 10: Background noise levels and applicable noise limits, B13**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	30.3	30.4	30.8	31.4	32.2	33.2	34.4	35.6	36.9	38.3
Applicable limit (non-associated) $L_{Aeq}$ dB	35.3	35.4	35.8	36.4	37.2	38.2	39.4	40.6	41.9	43.3

**Table 11: Background noise levels and applicable noise limits, B18**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	26.7	27.4	28.3	29.4	30.6	31.8	33.2	34.7	36.2	37.8
Applicable limit (non-associated) $L_{Aeq}$ dB	35.0	35.0	35.0	35.0	35.6	36.8	38.2	39.7	41.2	42.8
Applicable limit (associated) $L_{Aeq}$ dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0

**Table 12: Background noise levels and applicable noise limits, B26**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	27.1	26.9	27.1	27.5	28.1	28.8	29.8	30.9	32.1	33.3
Applicable limit (non-associated) $L_{Aeq}$ dB	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.9	37.1	38.3
Applicable limit (associated) $L_{Aeq}$ dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0

**Table 13: Background noise levels and applicable noise limits, B27**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	29.0	30.0	31.1	32.2	33.4	34.7	36.1	37.5	39.0	40.6
Applicable limit (non-associated) $L_{Aeq}$ dB	35.0	35.0	36.1	37.2	38.4	39.7	41.1	42.5	44.0	45.6
Applicable limit (associated) $L_{Aeq}$ dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.6

**Table 14: Background noise levels and applicable noise limits, B29**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	32.3	33.4	34.5	35.7	37.0	38.3	39.6	41.0	42.3	43.6
Applicable limit (non-associated) $L_{Aeq}$ dB	37.3	38.4	39.5	40.7	42.0	43.3	44.6	46.0	47.3	48.6
Applicable limit (associated) $L_{Aeq}$ dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	46.0	47.3	48.6

**Table 15: Background noise levels and applicable noise limits, B33**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	28.5	28.7	29.1	29.7	30.5	31.5	32.6	33.8	35.1	36.6
Applicable limit (non-associated) $L_{Aeq}$ dB	35.0	35.0	35.0	35.0	35.5	36.5	37.6	38.8	40.1	41.6
Applicable limit (associated) $L_{Aeq}$ dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0

**Table 16: Background noise levels and applicable noise limits, B53**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	29.0	29.2	29.6	30.2	31.0	32.0	33.2	34.6	36.2	38.0
Applicable limit (non-associated) $L_{Aeq}$ dB	35.0	35.0	35.0	35.2	36.0	37.0	38.2	39.6	41.2	43.0
Applicable limit (associated) $L_{Aeq}$ dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0

**Table 17: Background noise levels and applicable noise limits, G31**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	31.9	32.8	33.7	34.5	35.4	36.2	37.0	37.9	38.8	39.8
Applicable limit (non-associated) $L_{Aeq}$ dB	36.9	37.8	38.7	39.5	40.4	41.2	42.0	42.9	43.8	44.8

**Table 18: Background noise levels and applicable noise limits, G37**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	27.4	28.7	29.9	31.2	32.5	33.8	35.2	36.5	37.9	39.4
Applicable limit (non-associated) $L_{Aeq}$ dB	35.0	35.0	35.0	36.2	37.5	38.8	40.2	41.5	42.9	44.4
Applicable limit (associated) $L_{Aeq}$ dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0

**Table 19: Background noise levels and applicable noise limits, G39**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	31.4	31.2	31.3	31.7	32.3	33.0	34.0	35.0	36.2	37.6
Applicable limit (non-associated) $L_{Aeq}$ dB	36.2	36.2	36.3	36.7	37.3	38.0	39.0	40.0	41.2	42.6

**Table 20: Background noise levels and applicable noise limits, K1**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	23.9	24.3	25.2	26.5	28.1	30.0	32.1	34.4	36.6	38.8
Applicable limit (non-associated) $L_{Aeq}$ dB	35.0	35.0	35.0	35.0	35.0	35.0	37.1	39.4	41.6	43.8

**Table 21: Background noise levels and applicable noise limits, K2**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	27.7	27.1	27.2	27.9	29.1	30.8	32.7	34.8	37.1	39.4
Applicable limit (non-associated) $L_{Aeq}$ dB	35.0	35.0	35.0	35.0	35.0	35.8	37.7	39.8	42.1	44.4

**Table 22: Background noise levels and applicable noise limits, PW7**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	29.3	29.4	29.9	30.7	31.9	33.3	35.0	36.8	38.8	40.9
Applicable limit (non-associated) $L_{Aeq}$ dB	35.0	35.0	35.0	35.7	36.9	38.3	40.0	41.8	43.8	45.9
Applicable limit (associated) $L_{Aeq}$ dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9

**Table 23: Background noise levels and applicable noise limits, PW9**

Description	Hub height wind speeds (m/s)									
	3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB	30.5	30.3	30.5	31.1	31.9	33.1	34.5	36.1	37.8	39.6
Applicable limit (non-associated) $L_{Aeq}$ dB	35.3	35.3	35.5	36.1	36.9	38.1	39.5	41.1	42.8	44.6

## 5.0 PREDICTED WIND FARM NOISE LEVELS

Operational wind farm noise levels have been predicted using a three-dimensional computer noise model generated in SoundPLAN® version 7.2. Specifically, predictions have been carried out using the SoundPLAN implementation of ISO 9613-2: 1996<sup>8</sup> to calculate noise propagation from the wind farm to each receiver location. ISO 9613-2:1996 is recognised as an appropriate method for use in calculating wind farm noise by several Australasian guidance documents<sup>9</sup>. Further discussion of ISO 9613-2 and its application to this assessment is provided in Appendix D.

For both turbine types the respective tonality assessments indicate that all tones are less than the minimum reportable IEC61400-11 tonal audibility level,  $\Delta L_{a,k} \geq -3\text{dB}$ . On this basis, it is considered that tonal corrections are not applicable to predicted wind farm noise levels for this noise assessment.

A summary of the assessment of predicted wind farm noise compliance is presented below in Table 24 through Table 48. These tables present the following information for each noise monitoring location identified in Section 4.0 above:

- Relevant associated and non-associated receiver noise limits
- Predicted wind farm noise levels<sup>10</sup> across the range of assessable hub height wind speeds for non-associated relevant receivers and background noise monitoring locations, including the compliance margin between the predicted noise level and noise limit at each wind speed
- Predicted wind farm noise levels<sup>3</sup> across the range of assessable hub height wind speeds for associated relevant receivers and background noise monitoring locations, including the compliance margin between the predicted noise level and noise limit at each wind speed

Further details of predicted wind farm noise levels are provided in Appendix B2. It can be seen from the summary tables and information in Appendix G that compliance with the applicable SA Guidelines 2003 noise limits is achieved at all non-associated locations detailed for assessed hub height wind speeds from cut-in, 3m/s, to the nominal rated power, 12m/s. For associated receivers and the same range of hub height wind speeds, predicted wind farm noise levels satisfy the noise limit criteria detailed in Section 3.3 and Appendix E.

At all other identified receivers (refer to Appendix B), noise levels are predicted to be less than 35 dB  $L_{Aeq}$  across the entire range of assessed wind speeds, therefore also satisfying the requirements of the SA Guidelines 2003 and Project Approval Condition 2.15.

<sup>8</sup> ISO 9613-2: 1996 *Acoustics – Attenuation of sound during propagation outdoors Part 2: General method of calculation (ISO9613-2)*

<sup>9</sup> SA EPA *Wind farms environmental noise guidelines* (July 2009)  
AS4959:2010 *Acoustics – Measurement, prediction and assessment of noise from wind turbine generators*  
NZS6808:2010 *Acoustics – Wind farm noise*

<sup>10</sup> The predicted wind farm noise levels presented below include adjustment for an anomaly in a previous version of this report (Rp 002 R03 2012154SY dated 25 September 2013) regarding spectral data for the GW82 turbine at the hub height wind speed of 9m/s. The anomaly increased the predicted noise levels presented in report Rp 002 R03 2012154SY at some locations by up to approximately one decibel at the hub height wind speed of 9m/s.

**Table 24: Compliance summary for non-associated receivers represented by monitoring location B8**

Description		Hub height wind speeds (m/s)									
		3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB		28.0	29.3	30.8	32.3	33.9	35.5	37.2	38.9	40.6	42.3
Applicable limit $L_{Aeq}$ dB		35.0	35.0	35.8	37.3	38.9	40.5	42.2	43.9	45.6	47.3
Receiver B8 $L_{Aeq}$ dB	predicted level	33.9	33.9	34.0	34.8	35.9	36.5	37.0	37.4	37.6	37.4
	compliance margin	1.1	1.1	1.8	2.5	3.0	4.0	5.2	6.4	8.0	9.9
Receiver B19 $L_{Aeq}$ dB	predicted level	32.7	32.7	32.8	33.6	34.7	35.3	35.8	36.2	36.4	36.2
	compliance margin	2.3	2.3	3.0	3.7	4.2	5.2	6.4	7.6	9.2	11.1

**Table 25: Compliance summary for associated receivers represented by monitoring location B8**

Description		Hub height wind speeds (m/s)									
		3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB		28.0	29.3	30.8	32.3	33.9	35.5	37.2	38.9	40.6	42.3
Applicable limit $L_{Aeq}$ dB		45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.6	47.3
Receiver B2 $L_{Aeq}$ dB	predicted level	35.9	35.9	36.0	36.8	37.9	38.5	39.0	39.5	39.7	39.5
	compliance margin	9.1	9.1	9.0	8.2	7.1	6.5	6.0	5.5	5.9	7.8
Receiver B3 $L_{Aeq}$ dB	predicted level	32.2	32.2	32.3	33.1	34.2	34.8	35.3	35.8	36.0	35.8
	compliance margin	12.8	12.8	12.7	11.9	10.8	10.2	9.7	9.2	9.6	11.5

**Table 26: Compliance summary for non-associated receivers represented by monitoring location B11**

Description		Hub height wind speeds (m/s)									
		3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB		26.6	26.4	26.6	27.1	27.9	28.9	30.3	31.9	33.7	35.8
Applicable limit $L_{Aeq}$ dB		35.0	35.0	35.0	35.0	35.0	35.0	35.3	36.9	38.7	40.8
Receiver B11 $L_{Aeq}$ dB	predicted level	29.4	29.4	29.5	30.3	31.4	31.9	32.5	32.9	33.1	32.9
	compliance margin	5.6	5.6	5.5	4.7	3.6	3.1	2.8	4.0	5.7	7.9

**Table 27: Compliance summary for associated receivers represented by monitoring location B11**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	26.6	26.4	26.6	27.1	27.9	28.9	30.3	31.9	33.7	35.8	
Applicable limit $L_{Aeq}$ dB	45	45	45	45	45	45	45	45	45	45	
Receiver B9 $L_{Aeq}$ dB	predicted level	34.9	34.9	35.0	35.8	36.9	37.4	37.8	38.1	38.1	37.9
		compliance margin	10.1	10.1	10.0	9.2	8.1	7.6	7.2	6.9	6.9

**Table 28: Compliance summary for associated receivers represented by monitoring location B12a**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	28.4	29.4	30.6	31.9	33.3	34.7	36.2	37.7	39.2	40.7	
Applicable limit $L_{Aeq}$ dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.7	
Receiver B12a $L_{Aeq}$ dB	predicted level	34.8	34.8	34.9	35.7	36.8	37.5	38.3	39.0	39.3	39.2
		compliance margin	10.2	10.2	10.1	9.3	8.2	7.5	6.7	6.0	5.7

**Table 29: Compliance summary for non-associated receivers represented by monitoring location B13**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	30.3	30.4	30.8	31.4	32.2	33.2	34.4	35.6	36.9	38.3	
Applicable limit $L_{Aeq}$ dB	35.3	35.4	35.8	36.4	37.2	38.2	39.4	40.6	41.9	43.3	
Receiver B13 $L_{Aeq}$ dB	predicted level	30.5	30.5	30.6	31.4	32.5	33.3	34.0	34.6	35.0	34.9
		compliance margin	4.7	4.9	5.2	5.0	4.7	5.0	5.4	6.0	7.0

**Table 30: Compliance summary for non-associated receivers represented by monitoring location B18**

Description		Hub height wind speeds (m/s)									
		3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB		26.7	27.4	28.3	29.4	30.6	31.8	33.2	34.7	36.2	37.8
Applicable limit $L_{Aeq}$ dB		35.0	35.0	35.0	35.0	35.6	36.8	38.2	39.7	41.2	42.8
Receiver B18 $L_{Aeq}$ dB	predicted level	33.2	33.2	33.3	34.1	35.2	35.8	36.4	36.8	37.0	36.9
	compliance margin	1.8	1.8	1.7	0.9	0.4	1.1	1.8	2.9	4.2	5.9
Receiver B31 $L_{Aeq}$ dB	predicted level	31.0	31.0	31.1	31.9	33.0	33.7	34.3	35.0	35.2	35.1
	compliance margin	4.0	4.0	3.9	3.1	2.5	3.2	3.9	4.7	6.0	7.7
Receiver B31a $L_{Aeq}$ dB	predicted level	31.5	31.5	31.6	32.4	33.5	34.2	34.9	35.4	35.7	35.6
	compliance margin	3.5	3.5	3.4	2.6	2.0	2.7	3.3	4.3	5.5	7.2
Receiver B32 $L_{Aeq}$ dB	predicted level	31.1	31.1	31.2	32.0	33.1	33.8	34.5	35.1	35.3	35.2
	compliance margin	3.9	3.9	3.8	3.0	2.5	3.1	3.7	4.6	5.9	7.6

**Table 31: Compliance summary for associated receivers represented by monitoring location B18**

Description		Hub height wind speeds (m/s)									
		3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB		26.7	27.4	28.3	29.4	30.6	31.8	33.2	34.7	36.2	37.8
Applicable limit $L_{Aeq}$ dB		45	45	45	45	45	45	45	45	45	45
Receiver B1 $L_{Aeq}$ dB	predicted level	40.7	40.7	40.8	41.6	42.7	43.2	43.6	43.8	43.8	43.6
	compliance margin	4.3	4.3	4.2	3.4	2.3	1.8	1.4	1.2	1.2	1.4
Receiver B7 $L_{Aeq}$ dB	predicted level	33.0	33.0	33.1	33.9	35.0	35.6	36.2	36.6	36.8	36.6
	compliance margin	12.0	12.0	11.9	11.1	10.0	9.4	8.8	8.4	8.2	8.4
Receiver B17 $L_{Aeq}$ dB	predicted level	32.9	32.9	33.0	33.8	34.9	35.5	36.0	36.4	36.6	36.4
	compliance margin	12.1	12.1	12.0	11.2	10.1	9.5	9.0	8.6	8.4	8.6
Receiver B18a $L_{Aeq}$ dB	predicted level	35.9	35.9	36.0	36.8	37.9	38.4	38.9	39.2	39.3	39.1
	compliance margin	9.1	9.1	9.0	8.2	7.1	6.6	6.1	5.8	5.7	5.9

**Table 32: Compliance summary for non-associated receivers represented by monitoring location B26**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	27.1	26.9	27.1	27.5	28.1	28.8	29.8	30.9	32.1	33.3	
Applicable limit $L_{Aeq}$ dB	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.9	37.1	38.3	
Receiver B26 $L_{Aeq}$ dB	predicted level	29.0	29.0	29.1	29.9	31.0	31.8	32.6	33.3	33.7	33.6
	compliance margin	6.0	6.0	5.9	5.1	4.0	3.2	2.4	2.6	3.4	4.8

**Table 33: Compliance summary for associated receivers represented by monitoring location B26**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	27.1	26.9	27.1	27.5	28.1	28.8	29.8	30.9	32.1	33.3	
Applicable limit $L_{Aeq}$ dB	45	45	45	45	45	45	45	45	45	45	
Receiver B12 $L_{Aeq}$ dB	predicted level	30.9	30.9	31.0	31.8	32.9	33.6	34.3	35.1	35.4	35.3
	compliance margin	14.1	14.1	14.0	13.2	12.1	11.4	10.7	9.9	9.6	9.7

**Table 34: Compliance summary for associated receivers represented by monitoring location B27**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	29.0	30.0	31.1	32.2	33.4	34.7	36.1	37.5	39.0	40.6	
Applicable limit $L_{Aeq}$ dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.6	
Receiver B27 $L_{Aeq}$ dB	predicted level	39.8	39.8	39.9	40.7	41.8	42.6	43.4	44.1	44.5	44.4
	compliance margin	5.2	5.2	5.1	4.3	3.2	2.4	1.6	0.9	0.5	1.1

**Table 35: Compliance summary for non-associated receivers represented by monitoring location B29**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	32.3	33.4	34.5	35.7	37.0	38.3	39.6	41.0	42.3	43.6	
Applicable limit $L_{Aeq}$ dB	37.3	38.4	39.5	40.7	42.0	43.3	44.6	46.0	47.3	48.6	
Receiver B28 $L_{Aeq}$ dB	predicted level	31.5	31.5	31.6	32.4	33.5	34.3	35.1	35.9	36.2	36.1
	compliance margin	5.7	6.8	7.9	8.3	8.5	9.0	9.5	10.1	11.1	12.5
Receiver B55 $L_{Aeq}$ dB	predicted level	30.6	30.6	30.7	31.5	32.6	33.3	34.1	34.8	35.2	35.1
	compliance margin	6.7	7.8	8.9	9.3	9.5	10.0	10.5	11.1	12.1	13.5

**Table 36: Compliance summary for associated receivers represented by monitoring location B29**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	32.3	33.4	34.5	35.7	37.0	38.3	39.6	41.0	42.3	43.6	
Applicable limit $L_{Aeq}$ dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	46.0	47.3	48.6	
Receiver B29 $L_{Aeq}$ dB	predicted level	32.6	32.6	32.7	33.5	34.6	35.4	36.1	36.9	37.3	37.2
	compliance margin	12.4	12.4	12.3	11.5	10.4	9.6	8.9	9.0	10.0	11.4

**Table 37: Compliance summary for associated receivers represented by monitoring location B33**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	28.5	28.7	29.1	29.7	30.5	31.5	32.6	33.8	35.1	36.6	
Applicable limit $L_{Aeq}$ dB	45	45	45	45	45	45	45	45	45	45	
Receiver B6 $L_{Aeq}$ dB	predicted level	37.4	37.4	37.5	38.3	39.4	39.8	40.3	40.5	40.6	40.4
	compliance margin	7.6	7.6	7.5	6.7	5.6	5.2	4.7	4.5	4.4	4.6
Receiver B33 $L_{Aeq}$ dB	predicted level	40.0	40.0	40.1	40.9	42.0	42.5	42.8	43.0	42.9	42.7
	compliance margin	5.0	5.0	4.9	4.1	3.0	2.5	2.2	2.0	2.1	2.3

**Table 38: Compliance summary for non-associated receivers represented by monitoring location B53**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	29.0	29.2	29.6	30.2	31.0	32.0	33.2	34.6	36.2	38.0	
Applicable limit $L_{Aeq}$ dB	35.0	35.0	35.0	35.2	36.0	37.0	38.2	39.6	41.2	43.0	
Receiver B77 $L_{Aeq}$ dB	predicted level	32.1	32.1	32.2	33.0	34.1	34.8	35.6	36.3	36.7	36.6
	compliance margin	2.9	2.9	2.8	2.2	1.9	2.2	2.6	3.3	4.5	6.4

**Table 39: Compliance summary for associated receivers represented by monitoring location B53**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	29.0	29.2	29.6	30.2	31.0	32.0	33.2	34.6	36.2	38.0	
Applicable limit $L_{Aeq}$ dB	45	45	45	45	45	45	45	45	45	45	
Receiver B53 $L_{Aeq}$ dB	predicted level	35.1	35.1	35.2	36.0	37.1	37.9	38.6	39.4	39.7	39.6
	compliance margin	9.9	9.9	9.8	9.0	7.9	7.1	6.4	5.6	5.3	5.4

**Table 40: Compliance summary for non-associated receivers represented by monitoring location G31**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	31.9	32.8	33.7	34.5	35.4	36.2	37.0	37.9	38.8	39.8	
Applicable limit $L_{Aeq}$ dB	36.9	37.8	38.7	39.5	40.4	41.2	42.0	42.9	43.8	44.8	
Receiver G31 $L_{Aeq}$ dB	predicted level	27.0	27.0	27.1	27.9	29.0	29.7	30.5	31.3	31.6	31.5
	compliance margin	9.9	10.9	11.6	11.7	11.4	11.4	11.5	11.6	12.2	13.3

**Table 41: Compliance summary for non-associated receivers represented by monitoring location G37**

Description		Hub height wind speeds (m/s)									
		3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB		27.4	28.7	29.9	31.2	32.5	33.8	35.2	36.5	37.9	39.4
Applicable limit $L_{Aeq}$ dB		35.0	35.0	35.0	36.2	37.5	38.8	40.2	41.5	42.9	44.4
Receiver G32 $L_{Aeq}$ dB	predicted level	31.7	31.7	31.8	32.6	33.7	34.4	35.0	35.5	35.8	35.6
	compliance margin	3.3	3.3	3.2	3.6	3.8	4.5	5.2	6.0	7.2	8.7
Receiver G33 $L_{Aeq}$ dB	predicted level	31.5	31.5	31.6	32.4	33.5	34.1	34.6	35.2	35.4	35.2
	compliance margin	3.5	3.5	3.4	3.8	4.0	4.7	5.6	6.4	7.6	9.2
Receiver G52 $L_{Aeq}$ dB	predicted level	32.0	32.0	32.1	32.9	34.0	34.6	35.2	35.8	36.1	36.0
	compliance margin	3.0	3.0	2.9	3.3	3.5	4.2	5.0	5.7	6.8	8.4

**Table 42: Compliance summary for associated receivers represented by monitoring location G37**

Description		Hub height wind speeds (m/s)									
		3	4	5	6	7	8	9	10	11	12
Background noise $L_{A90}$ dB		27.4	28.7	29.9	31.2	32.5	33.8	35.2	36.5	37.9	39.4
Applicable limit $L_{Aeq}$ dB		45	45	45	45	45	45	45	45	45	45
Receiver G37 $L_{Aeq}$ dB	predicted level	33.3	33.3	33.4	34.2	35.3	36.0	36.6	37.2	37.5	37.3
	compliance margin	11.7	11.7	11.6	10.8	9.7	9.0	8.4	7.8	7.5	7.7
Receiver G37a $L_{Aeq}$ dB	predicted level	31.8	31.8	31.9	32.7	33.8	34.5	35.2	35.7	36.0	35.9
	compliance margin	13.2	13.2	13.1	12.3	11.2	10.5	9.8	9.3	9.0	9.1

**Table 43: Compliance summary for non-associated receivers represented by monitoring location G39**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	31.4	31.2	31.3	31.7	32.3	33.0	34.0	35.0	36.2	37.6	
Applicable limit $L_{Aeq}$ dB	36.2	36.2	36.3	36.7	37.3	38.0	39.0	40.0	41.2	42.6	
Receiver G39 $L_{Aeq}$ dB	predicted level	30.9	30.9	31.0	31.8	32.9	33.5	34.1	34.7	35.0	34.9
	compliance margin	5.3	5.3	5.3	4.9	4.4	4.5	4.9	5.3	6.3	7.7

**Table 44: Compliance summary for non-associated receivers represented by monitoring location K1**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	23.9	24.3	25.2	26.5	28.1	30.0	32.1	34.4	36.6	38.8	
Applicable limit $L_{Aeq}$ dB	35.0	35.0	35.0	35.0	35.0	35.0	37.1	39.4	41.6	43.8	
Receiver K1 $L_{Aeq}$ dB	predicted level	26.8	26.8	26.9	27.7	28.8	29.6	30.3	31.1	31.5	31.4
	compliance margin	8.2	8.2	8.1	7.3	6.2	5.5	6.8	8.2	10.1	12.4

**Table 45: Compliance summary for non-associated receivers represented by monitoring location K2**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	27.7	27.1	27.2	27.9	29.1	30.8	32.7	34.8	37.1	39.4	
Applicable limit $L_{Aeq}$ dB	35.0	35.0	35.0	35.0	35.0	35.8	37.7	39.8	42.1	44.4	
Receiver K2 $L_{Aeq}$ dB	predicted level	29.9	29.9	30.0	30.8	31.9	32.6	33.5	34.2	34.6	34.5
	compliance margin	5.1	5.1	5.0	4.2	3.1	3.1	4.2	5.6	7.5	9.8

**Table 46: Compliance summary for non-associated receivers represented by monitoring location PW7**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	29.3	29.4	29.9	30.7	31.9	33.3	35.0	36.8	38.8	40.9	
Applicable limit $L_{Aeq}$ dB	35.0	35.0	35.0	35.7	36.9	38.3	40.0	41.8	43.8	45.9	
Receiver PW5 $L_{Aeq}$ dB	predicted level	31.9	31.9	32.0	32.8	33.9	34.7	35.3	36.1	36.4	36.3
	compliance margin	3.1	3.1	3.0	2.9	3.0	3.7	4.7	5.8	7.4	9.6
Receiver PW29 $L_{Aeq}$ dB	predicted level	31.4	31.4	31.5	32.3	33.4	34.0	34.6	35.2	35.4	35.3
	compliance margin	3.6	3.6	3.5	3.4	3.5	4.3	5.4	6.6	8.4	10.7
Receiver PW36 $L_{Aeq}$ dB	predicted level	32.1	32.1	32.2	33.0	34.1	34.9	35.6	36.2	36.6	36.5
	compliance margin	2.9	2.9	2.8	2.7	2.8	3.5	4.4	5.6	7.3	9.5

**Table 47: Compliance summary for associated receivers represented by monitoring location PW7**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	29.3	29.4	29.9	30.7	31.9	33.3	35.0	36.8	38.8	40.9	
Applicable limit $L_{Aeq}$ dB	45	45	45	45	45	45	45	45	45	45.9	
Receiver PW5 $L_{Aeq}$ dB	predicted level	31.9	31.9	32.0	32.8	33.9	34.7	35.3	36.1	36.4	36.3
	compliance margin	13.1	13.1	13.0	12.2	11.1	10.3	9.7	8.9	8.6	9.6
Receiver PW34 $L_{Aeq}$ dB	predicted level	35.0	35.0	35.1	35.9	37.0	37.7	38.5	39.2	39.6	39.5
	compliance margin	10.0	10.0	9.9	9.1	8.0	7.3	6.5	5.8	5.4	6.4

**Table 48: Compliance summary for non-associated receivers represented by monitoring location PW9**

Description	Hub height wind speeds (m/s)										
	3	4	5	6	7	8	9	10	11	12	
Background noise $L_{A90}$ dB	30.5	30.3	30.5	31.1	31.9	33.1	34.5	36.1	37.8	39.6	
Applicable limit $L_{Aeq}$ dB	35.3	35.3	35.5	36.1	36.9	38.1	39.5	41.1	42.8	44.6	
Receiver PW9 $L_{Aeq}$ dB	predicted level	30.8	30.8	30.9	31.7	32.8	33.4	34.0	34.5	34.7	34.6
	compliance margin	4.5	4.5	4.6	4.4	4.1	4.7	5.5	6.6	8.1	10.1

## 6.0 VERIFICATION OF OPERATIONAL NOISE PERFORMANCE

### 6.1 Overview

Conditions 2.21 through 2.24 of the Project Approval provide requirements concerning the verification of operational noise from the wind farm once it begins operation.

Goldwind have had a Noise Compliance Plan (ref 60276905-RPAC-001\_Gullen Range Operational Noise Management and Noise Compliance Plan\_R3 dated 4 October 2013) prepared by AECOM Pty Ltd to address these Project Approval requirements, particularly Condition 2.21.

Verifying operating noise performance typically involves measuring and analysing post-construction noise levels in accordance with relevant guidance documents, in this case the SA Guidelines 2003, and comparing levels with applicable noise limits to evaluate compliance. Compliance monitoring is typically based on measuring at representative relevant receivers and using these results to inform compliance outcomes for other surrounding associated receiver locations. The relevant receiver where compliance monitoring is carried out is usually selected on the basis of factors including the availability of background data at the proposed measurement location and the location where noise levels associated with the wind farm are expected to be highest.

For the Gullen Range Wind farm, in all cases, the noise limits relevant to assessing compliance are detailed in Section 4.2 and Appendix E.

### 6.2 Operational Requirements

Previous versions of the RNA included modelling of the effect of a Noise Operating Strategy that had been developed to maintain compliance at location B12 which was previously a non-associated residence.

The status of B12 has changed to an associated receiver and, as a result, the Noise Operating Strategy is no longer required.

### 6.3 Monitoring locations revised to associated receivers

Additional comments are provided here concerning the proposed compliance assessment methodology for monitoring locations B12a, B29 and PW7, whose status in the project has changed from non-associated to associated since the issue of the MDA 2008 Report. Other receiver locations are noted to have changed status to associated receivers (see Section 3.3), but were not monitoring locations and are therefore not considered further in this section.

#### 6.3.1 Associated receiver and monitoring location B12a

For location B12a, there are no receivers that depend on B12a for a representation of background noise levels for the derivation of noise limits. Wind farm noise compliance at this location can therefore be assessed using the noise limits tabulated in Section 4.2, also graphically illustrated in Appendix E, and measured post-construction noise levels determined with reference to relevant Project Approval conditions and the Noise Compliance Plan.

### 6.3.2 Associated receiver and monitoring location PW7

The background noise data at location PW7 has been used to determine non-associated and associated receiver noise limits for a total of four (4) other receivers which rely on PW7 for a representation of background noise levels. The locations include the associated receiver location PW34 and the non-associated receivers PW5, PW29 & PW36.

Wind farm noise compliance at PW7 is to be assessed using the noise limits tabulated in Section 4.2 and graphically illustrated in Appendix E. Specifically, measured post-construction noise levels at PW7, assessed in accordance relevant Project Approval conditions and the Noise Compliance Plan, can be used for a direct evaluation of compliance at PW7. These results are also likely to be suitable for informing the compliance outcome at the associated, associated receiver PW34.

Wind farm noise compliance at the three (3) non-associated receivers is also to be assessed using the noise limits detailed in Appendix E, specifically based on the combination of PW7 background noise data and the applicable non-associated receiver base limit of 35dB. In terms of compliance measurements for these locations, PW7 is the only location where an indication of background noise levels is available from the original 2008 survey. PW7 also represents the location within this group where noise levels are predicted to be highest. Post-construction measurement data obtained directly at PW7, in combination with other contextual information or measurements if required, can be used to inform the post-construction assessment at the other associated receivers. This process is described as follows:

- In the first case, measurements at PW7 could be directly compared to the non-associated receiver limit that applies to PW5, PW29 & PW36. If measurements at PW7 analysed in accordance with the SA Guidelines 2003 and the Noise Compliance Plan were able to demonstrate compliance with noise limits at the three (3) non-associated receivers, no additional assessment works would be required. If compliance is not able to be demonstrated, further consideration may need to be given to potential background noise corrections to the measurement data, in combination with other contextual information concerning the extent to which the wind farm noise levels at the non-associated receivers would be expected to differ from PW7. In this respect, it should be noted that predicted wind farm noise levels at PW7 are approximately 4-5dB greater than the predicted wind farm noise levels at the non-associated receivers. Measurements at PW7 would therefore be expected to overstate the operational wind farm noise levels at the non-associated receivers that reference PW7 for a representation of background noise conditions.
- Pending the outcomes of the preceding investigations, if measurements at PW7 were not sufficient for demonstrating compliance at the non-associated receivers, further monitoring could be required either at the next nearest receiver location or at an intermediate location, or a combination of the two. The specific requirements for additional monitoring would be case dependent and would therefore best be developed once the circumstances of the monitoring results are known.

### 6.3.3 Associated receiver and monitoring location B29

The background noise data at location B29 has been used to determine non-associated receiver noise limits for a total of two (2) other receivers which rely on B29 for a representation of background noise levels. The non-associated locations are B28 and B55.

Wind farm noise compliance at B29 is to be assessed using the noise limits tabulated in Section 4.2 and graphically illustrated in Appendix E. Specifically, measured post-construction noise levels at B29, assessed in accordance relevant Project Approval conditions and the Noise Compliance Plan, can be used for a direct evaluation of compliance at B29.

The approach to assessing compliance at the two (2) non-associated receivers shall follow a similar procedure to the arrangements referred to in the preceding section. An overview of the process as specifically applied to B29 and the two (2) non-associated receivers is summarised here:

- Compliance at the two (2) non-associated receivers is to be assessed using the noise limits detailed in Appendix E, specifically based on the combination of B29 background noise data and the applicable non-associated receiver base limit of 35dB.
- B29 is the location where background noise data is directly available, and where predicted noise levels are highest (for this group of receivers comprising B28, B29, and B55)
- Post-construction measurement data obtained directly at B29, in combination with other contextual information or measurements if required, can be used to inform the post-construction assessment at B28 and B55. This process is described as follows:
  - Step 1: compare the measurement results at B29 directly with the limits that apply at B28 and B55. The levels at B29 would be expected to be higher than at B28 or B55, by a margin of approximately 1-2dB. These differences would need to be factored into the comparison
  - Step 2: pending the outcomes of step 1, further monitoring could be required either at the next nearest receiver location or at an intermediate location, or a combination of the two. The specific requirements for additional monitoring would be case dependent and would therefore best be developed once the circumstances of the monitoring results are known.

#### 6.4 Site Wind Speed Reference Data

Details of the site wind speed reference data for the background noise measurements and post-construction noise measurements are provided in Appendix C2.

The analysis of post-construction noise measurement data must be referenced to the same mast locations which have been referenced in the analysis of the background noise data. In this respect, it is noted that the mast locations have changed since the original 2008 study. Accordingly, a number of adjustments will need to be applied to the post-construction site wind speed data in order to obtain the appropriate reference values for the original mast locations. In addition, the derivation of the appropriate reference values shall also take account of the wake effects of the constructed wind farm development (e.g. selection of upwind source data for key wind sectors).

All relevant data sources and wind speed data adjustments are to be documented in detail in the noise compliance monitoring report. Further, a specific requirement that applies to the analysis of post-construction noise measurement data is to filter the results to downwind directions. Wind direction data will also be sourced from the site wind speed masts, and the noise compliance monitoring report will also specify the source of direction data for each wind sector.

## 7.0 CONCLUSION

A revised noise assessment of the proposed Gullen Range Wind Farm has been carried out in accordance with the requirements of Project Approval condition 2.16 and to address condition U1.1 of EPL 20365. In order to address the requirements of condition 2.16, the following assessment work has been carried out:

- Wind speed data referenced to the proposed turbine hub-heights, for the same period when the original background noise surveys were carried out, has been sourced by Goldwind and provided to Marshall Day Acoustics for the purposes of the revised noise assessment
- The background noise levels measured in 2007, as documented in the original 2008 MDA report, and which were considered as part of the Land & Environment Court approval for the Gullen Range Wind Farm, have been reanalysed in conjunction with wind speed data referenced to the proposed turbine hub-heights to determine noise criteria in accordance with the Project Approval requirements. The continued use of this background noise level data was confirmed by discussions between Goldwind and the Department of Planning and Environment dated 21 March 2013.
- Noise emission data for the proposed Goldwind GW82 and GW100 turbines has been provided to Marshall Day Acoustics for review and inclusion in the revised noise assessment. This data includes guaranteed and tested sound power level information, in conjunction with test results with respect to tonality. A review of this data has confirmed the information to be suitable for the purposes of the revised noise assessment. The test results indicated no reportable tonality associated with either of the proposed turbine models, and therefore tone adjustments are not applicable to this assessment
- Revised noise predictions have been carried out on the basis of the current proposed layout of 73 turbines (Goldwind reference: layout 6a) and all identified receiver and stakeholder dwelling locations confirmed by discussions with Goldwind. In accordance with requirements of Project Approval condition 2.16, the revised predictions account for wind turbine generator noise emissions referenced to hub-height wind speeds. The noise predictions have been produced on the basis of a 3 dimensional noise model of the site, accounting for the influence of environmental factors including local terrain and ground conditions.
- The revised noise predictions and noise limits, both referenced to hub-height wind speeds, have been compared. This comparison demonstrates that the revised predicted noise levels are below the revised noise limits at all relevant integer wind speeds.

Based on the above, the revised noise assessment has demonstrated that the proposed turbine models and layout of the Gullen Range wind farms is expected to comply with the requirements of Project Approval condition 2.15.

Due to B12 now being an associated receiver with the project it is no longer necessary to apply the Noise Operating Strategy that was documented in previous RNAs to demonstrate compliance with the noise criteria.

**GULLEN RANGE WIND FARM**  
**Revised Noise Impact Assessment**  
**Rp 002 R06 2012154SY**  
**Appendices A to G**

**18 December 2014**



Project: **GULLEN RANGE WIND FARM**

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Report No.: **Rp 002 R06 2012154SY Appendices A to G**

Cross reference: **Rp 002 R06 2012154SY**

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Revised	04	Additional receivers & background information	26 October 2014	JA	DG
Revised	05	Removal of curtailment	3 December	JA	DG
Revised	06	EPL related data and other supplementary information. Receptor location status changes.	18 December	JA	DG

**APPENDIX A GLOSSARY OF ACOUSTIC TERMINOLOGY**

<b>Ambient</b>	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
<b>dB</b>	Decibel. The unit of sound level.
<b>dB(A)</b>	A-weighted decibel. The A-weighting approximates the response of the human ear
<b><math>L_w</math> (or SWL)</b>	Sound Power Level. The level of total sound power radiated by a sound source.
<b><math>L_{eq}</math></b>	Continuous or semi-continuous noise levels are described in terms of the equivalent continuous sound level ( $L_{eq}$ ). This is the constant sound level over a stated time period which is equivalent in total sound energy to the time-varying sound level measured over the same time period. This is commonly referred to as the average noise level.
<b><math>L_{Aeq}</math></b>	The “A” weighted equivalent continuous sound level.
<b>Octave Band</b>	A range of frequencies where the highest frequency included is twice the lowest frequency. Octave bands are referred to by their logarithmic centre frequencies, these being 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz for the audible range of sound.
	Noise is often not steady. Traffic noise, music noise and the barking of dogs are all examples of noises that vary over time. When such noises are measured, the noise level can be expressed as an average level, or as a statistical measure, such as the level exceeded for 90% of the time.
<b><math>L_{A90}</math></b>	The noise level exceeded for 90% of the measurement period, measured in A-weighted decibels. This is commonly referred to as the background noise level.

**APPENDIX B WIND FARM DETAILS**

**B1 Turbine locations (Layout 6a)**

Wind turbine	Type	GPS Coordinates		Wind turbine	Type	GPS Coordinates	
		Easting	Northing			Easting	Northing
BAN_01	GW100-2500 (80)	722867	6177000	GUR_08	GW100-2500 (80)	727832	6159846
BAN_02	GW100-2500 (80)	722816	6176718	GUR_09	GW100-2500 (80)	727269	6159369
BAN_03	GW100-2500 (80)	722567	6176552	GUR_10	GW100-2500 (80)	727389	6158918
BAN_04	GW100-2500 (80)	722477	6176299	GUR_11	GW100-2500 (80)	727520	6158639
BAN_05	GW100-2500 (80)	723284	6176726	GUR_12	GW100-2500 (80)	727479	6158308
BAN_06	GW100-2500 (80)	723235	6176463	GUR_13	GW100-2500 (80)	727642	6158039
BAN_07	GW100-2500 (80)	723092	6176141	GUR_14	GW100-2500 (80)	727753	6157727
BAN_08	GW100-2500 (80)	723327	6175886	GUR_15	GW100-2500 (80)	727834	6157450
BAN_09	GW100-2500 (80)	722740	6174867	GUR_16	GW100-2500 (80)	728211	6159145
BAN_10	GW100-2500 (80)	722846	6174519	GUR_17	GW100-2500 (80)	727997	6158925
BAN_11	GW100-2500 (80)	723242	6174950	GUR_18	GW100-2500 (80)	728036	6158675
BAN_12	GW100-2500 (80)	723177	6174649	KIA_01	GW100-2500 (80)	722206	6178258
BAN_13	GW100-2500 (80)	723736	6174579	KIA_02	GW100-2500 (80)	722106	6178003
BAN_14	GW100-2500 (80)	723832	6174779	POM_01	GW100-2500 (80)	725833	6166934
BAN_15	GW100-2500 (80)	724314	6174314	POM_02	GW100-2500 (80)	726044	6166594
BAN_16	GW100-2500 (80)	724441	6173780	POM_03	GW100-2500 (80)	726063	6166277
BAN_17	GW100-2500 (80)	724453	6173505	POM_04	GW100-2500 (80)	726461	6166355
BAN_18	GW100-2500 (80)	723870	6173444	POM_05	GW100-2500 (80)	726800	6166565
BAN_19	GW82-1500 (85)	724307	6173286	POM_06	GW100-2500 (80)	727033	6165858
BAN_20	GW82-1500 (85)	724521	6172964	POM_07	GW100-2500 (80)	727112	6165618
BAN_21	GW82-1500 (85)	724485	6172357	POM_08	GW82-1500 (85)	725438	6165310
BAN_22	GW82-1500 (85)	724466	6172100	POM_09	GW82-1500 (85)	724870	6165173
BAN_23	GW82-1500 (85)	724269	6171949	POM_10	GW82-1500 (85)	725390	6165082
BAN_24	GW82-1500 (85)	724049	6171628	POM_11	GW82-1500 (85)	725525	6164826
BAN_25	GW100-2500 (80)	724647	6171804	POM_12	GW100-2500 (80)	724220	6164723
BAN_26	GW100-2500 (80)	724630	6171532	POM_13	GW100-2500 (80)	724725	6164560
BAN_27	GW100-2500 (80)	724502	6171321	POM_14	GW82-1500 (85)	725064	6164835
BAN_28	GW100-2500 (80)	724213	6171232	POM_15	GW100-2500 (80)	725079	6164566
BAN_29	GW82-1500 (85)	723793	6171252	POM_16	GW100-2500 (80)	725216	6164233
BAN_30	GW82-1500 (85)	724099	6171000	POM_17	GW100-2500 (80)	725509	6163949
GUR_01	GW100-2500 (80)	727827	6161200	POM_18	GW100-2500 (80)	725752	6163649
GUR_02	GW100-2500 (80)	727730	6160921	POM_19	GW100-2500 (80)	724788	6163595
GUR_03	GW82-1500 (85)	727826	6160598	POM_20	GW100-2500 (80)	725434	6163257

Wind turbine	Type	GPS Coordinates		Wind turbine	Type	GPS Coordinates	
		Easting	Northing			Easting	Northing
GUR_04	GW82-1500 (85)	727464	6160571	POM_21	GW100-2500 (80)	725752	6162969
GUR_05	GW82-1500 (85)	727307	6160350	POM_22	GW100-2500 (80)	726057	6162593
GUR_06	GW100-2500 (80)	727298	6160051	POM_23	GW100-2500 (80)	726339	6162361
GUR_07	GW82-1500 (85)	727912	6160363				

**B2 Receiver locations**

Location	Easting (m) <sup>#</sup>	Northing (m) <sup>#</sup>	Closest WTG		Highest predicted wind farm noise level* (dB L <sub>Aeq</sub> )
			Closest WTG	Distance (km)	
B5	725778	6175344	BAN_15	1790	33.8
B8	725764	6171873	BAN_25	1119	37.6
B10	724832	6169735	BAN_30	1462	34.4
B11	725245	6169673	BAN_30	1753	33.1
B13	725472	6175320	BAN_15	1534	35
B14	725916	6174855	BAN_15	1691	34.1
B15	726186	6175037	BAN_15	2007	32.8
B16	726669	6175117	BAN_15	2488	31.3
B18	722690	6172850	BAN_18	1321	37
B19	725942	6171875	BAN_25	1297	36.4
B20	724515	6169567	BAN_30	1492	33.9
B21	724330	6169452	BAN_30	1565	33.5
B22	724772	6169510	BAN_30	1635	33.5
B23	724753	6169416	BAN_30	1714	33.1
B24	724008	6169549	BAN_30	1454	33.7
B24	724006	6169552	BAN_30	1454	33.7
B25	725942	6177149	BAN_05	2691	30.1
B26	725032	6176603	BAN_05	1752	33.7
B28	721496	6174999	BAN_09	1251	36.2
B30	721836	6173334	BAN_10	1557	34.9
B31	722012	6173179	BAN_10	1578	35.2
B31a	722179	6173136	BAN_10	1535	35.7
B32	721971	6173309	BAN_10	1493	35.3
B34	726843	6174681	BAN_15	2555	31.2
B35	726008	6169394	BAN_27	2446	31.8
B36	721888	6168490	BAN_30	3345	27.8
B37	722217	6168376	BAN_30	3229	28.2
B38	728292	6168955	POM_05	2817	28.1
B39	729944	6168737	POM_05	3821	25
B40	730523	6168241	POM_05	4083	<25
B41	721964	6170364	BAN_29	2033	30.8
B42	722454	6169235	BAN_30	2413	29.7
B43	722297	6169268	BAN_29	2485	29.4
B44	726916	6169850	BAN_27	2827	30.6
B45	726941	6169421	POM_01	2723	30.6
B46	726847	6169886	BAN_27	2749	30.8
B47	727704	6169126	POM_05	2716	29.3
B48	727611	6169056	POM_05	2620	29.9
B49	728055	6169108	POM_05	2836	28.4
B54	724877	6169492	BAN_30	1697	32.9
B55	721314	6174747	BAN_09	1431	35.2
B56	720452	6174836	BAN_09	2288	31.4
B57	720261	6174863	BAN_09	2479	30.6
B58	720267	6174515	BAN_09	2498	30.5

Location	Easting (m) <sup>#</sup>	Northing (m) <sup>#</sup>	Closest WTG		Highest predicted wind farm noise level* (dB L <sub>Aeq</sub> )
			Closest WTG	Distance (km)	
B59	719979	6174693	BAN_09	2766	29.6
B60	719637	6174802	BAN_09	3104	28.2
B61	719658	6175268	BAN_04	3002	29.5
B62	719365	6177236	KIA_02	2846	28
B63	728581	6176555	BAN_15	4820	<25
B64	719605	6175208	BAN_04	3072	29.3
B66	727592	6174584	BAN_16	3252	29.3
B67	728453	6173026	BAN_20	3932	25.8
B68	720160	6176246	BAN_04	2318	31.3
B69	719806	6175782	BAN_04	2721	29.1
B70	719412	6174875	BAN_09	3328	27.6
B71	719624	6175196	BAN_04	3059	29.3
B72	719614	6175315	BAN_04	3027	29.3
B73	719360	6175420	BAN_04	3239	28.4
B74	719368	6175571	BAN_04	3193	28.1
B75	719364	6175528	BAN_04	3207	28.3
B76	719356	6175487	BAN_04	3225	28.2
B77	721717	6174433	BAN_09	1111	36.7
B78	719442	6175558	BAN_04	3124	28.4
B79	719429	6175448	BAN_04	3165	28.3
B80	719397	6175374	BAN_04	3216	28.8
B81	719477	6175418	BAN_04	3127	29
B82	719618	6175436	BAN_04	2986	29.3
B83	719541	6175405	BAN_04	3069	29.2
B84	719540	6175365	BAN_04	3082	29.2
B85	719591	6175351	BAN_04	3038	29.3
B86	719242	6175674	BAN_04	3295	28
B87	719247	6175626	BAN_04	3299	28.2
B88	719393	6175259	BAN_04	3255	28.7
B89	719053	6175490	BAN_04	3518	27
B90	719077	6175572	BAN_04	3477	27.3
B91	718821	6175761	BAN_04	3695	27
B92	718946	6175940	BAN_04	3549	26.3
B93	718966	6175833	BAN_04	3542	27.1
B94	718655	6175842	BAN_04	3849	26.6
B95	718527	6176117	BAN_04	3954	<25
B96	718197	6176642	KIA_02	4139	<25
B97	718480	6176459	KIA_02	3941	<25
B98	718635	6176399	KIA_02	3824	<25
B99	719175	6176533	KIA_02	3279	26.4
B100	719251	6176391	BAN_04	3227	26.5
B101	718949	6176335	BAN_04	3528	26.3
B102	719365	6176272	BAN_04	3112	28.5
B103	719614	6176110	BAN_04	2869	28.1
B104	719730	6176279	BAN_04	2747	29.9
B105	719410	6176010	BAN_04	3081	27.7

Location	Easting (m) <sup>#</sup>	Northing (m) <sup>#</sup>	Closest WTG		Highest predicted wind farm noise level* (dB L <sub>Aeq</sub> )
			Closest WTG	Distance (km)	
B106	718833	6173986	BAN_09	4005	27.1
B107	719305	6173614	BAN_10	3655	27.8
B108	720076	6173780	BAN_10	2867	28.8
B109	718818	6171870	BAN_10	4821	25.9
B110	718022	6175225	BAN_04	4583	25.4
B111	727025	6174847	BAN_15	2763	30.5
B112	728818	6170984	BAN_26	4224	27
B113	728935	6170993	BAN_26	4339	27.2
B114	729869	6168035	POM_05	3403	25.2
B115	719707	6175463	BAN_04	2893	28.4
B116	719713	6175493	BAN_04	2879	28
B117	720248	6175091	BAN_09	2502	31
B118	727336	6174937	BAN_15	3086	29.5
B119	728532	6174471	BAN_16	4149	25.9
B120	727635	6171911	BAN_25	2990	29.3
B124	721965	6170365	BAN_29	2032	30.8
G1	732660	6156707	GUR_15	4883	<25
G2	732724	6160520	GUR_16	4718	25.4
G3	732646	6155353	GUR_15	5249	<25
G4	731240	6157926	GUR_16	3265	28.3
G5	731457	6155348	GUR_15	4189	<25
G6	731400	6155792	GUR_15	3933	<25
G7	730893	6155710	GUR_15	3519	<25
G8	730921	6155554	GUR_15	3623	<25
G9	730720	6155854	GUR_15	3298	25.9
G10	732493	6161181	GUR_07	4653	25.1
G11	731779	6161391	GUR_01	3957	26.3
G12	731989	6161115	GUR_07	4146	<25
G13	732179	6161200	GUR_07	4348	25.6
G14	731320	6159447	GUR_16	3124	28.9
G15	731010	6158943	GUR_16	2806	29.7
G16	731055	6157614	GUR_18	3200	28.6
G17	732388	6156448	GUR_15	4663	<25
G18	731287	6156868	GUR_15	3502	27
G19	730644	6155875	GUR_15	3221	26.1
G20	731518	6159929	GUR_16	3399	28.1
G21	731050	6159993	GUR_16	2963	29.3
G22	730487	6160151	GUR_16	2488	31
G23	730976	6160386	GUR_16	3031	28.8
G24	731349	6159216	GUR_16	3139	28.5
G25	730403	6160831	GUR_07	2535	29.4
G26	729834	6160042	GUR_16	1854	33.8
G27	730276	6159723	GUR_16	2144	32.1
G28	730024	6159758	GUR_16	1914	33.1
G29	730374	6160369	GUR_07	2462	31.5
G30	730007	6160032	GUR_16	2003	33.1

Location	Easting (m) <sup>#</sup>	Northing (m) <sup>#</sup>	Closest WTG		Highest predicted wind farm noise level* (dB L <sub>Aeq</sub> )
			Closest WTG	Distance (km)	
G31	727533	6155921	GUR_15	1558	31.6
G32	728590	6161946	GUR_01	1067	35.8
G33	729155	6161340	GUR_01	1335	35.4
G34	725782	6156683	GUR_15	2191	30.8
G35	726001	6157087	GUR_14	1865	32.7
G36	728590	6162366	GUR_01	1393	34.1
G38	728646	6162791	GUR_01	1789	32.6
G39	729555	6160133	GUR_07	1659	35
G40	729522	6160532	GUR_07	1619	34.7
G40	729522	6160534	GUR_07	1619	34.7
G41	730238	6160801	GUR_07	2367	31
G42	729837	6155795	GUR_15	2598	26.4
G43	729458	6160923	GUR_07	1644	34.4
G44	729836	6160928	GUR_07	2005	33
G45	722131	6160318	POM_19	4219	<25
G46	721886	6160066	POM_19	4569	<25
G47	729333	6162591	GUR_01	2050	31.9
G48	732819	6161512	GUR_01	5002	<25
G49	730976	6154207	GUR_15	4515	<25
G50	725421	6155022	GUR_15	3423	25.8
G51	724517	6156206	GUR_15	3543	25.1
G52	728309	6162105	GUR_01	1025	36.1
K1	724165	6178433	BAN_05	1921	31.5
K2	721493	6178960	KIA_01	1001	34.6
K3	723759	6179497	KIA_01	1987	28.7
K4	722551	6179768	KIA_01	1549	30.3
K5	725758	6177788	BAN_05	2692	29.3
K6	725395	6177859	BAN_05	2396	29.7
K7	725983	6177988	BAN_05	2979	28.6
K8	726283	6177666	BAN_05	3143	28.8
K9	726942	6177747	BAN_05	3798	27.3
K10	727220	6177764	BAN_05	4071	26.5
K11	727154	6177918	BAN_05	4049	26.4
K12	725970	6177384	BAN_05	2765	29.7
K13	724798	6178254	BAN_05	2151	30.1
K14	720536	6177925	KIA_02	1572	32.4
K15	718990	6177752	KIA_02	3126	26.9
K16	718955	6178061	KIA_02	3152	26.6
K17	719803	6178767	KIA_02	2426	27.4
K18	721785	6179896	KIA_01	1691	28.9
K19	721567	6180072	KIA_01	1923	27.5
K20	722083	6179842	KIA_01	1589	29.2
K21	726406	6179826	BAN_05	4400	<25
K22	725558	6179514	KIA_01	3580	26
K24	726029	6179219	BAN_05	3708	26
K26	718696	6177815	KIA_02	3415	26.5

Location	Easting (m) <sup>#</sup>	Northing (m) <sup>#</sup>	Closest WTG		Highest predicted wind farm noise level* (dB L <sub>Aeq</sub> )
			Closest WTG	Distance (km)	
K27	717565	6178979	KIA_02	4645	<25
K28	718211	6179898	KIA_01	4319	<25
K29	717681	6179720	KIA_02	4746	<25
K30	718729	6179435	KIA_02	3668	<25
K31 odgm	719206	6181045	KIA_01	4095	<25
K32	719130	6180485	KIA_01	3798	<25
K33	719874	6180315	KIA_01	3110	<25
K34 odgm	723093	6181678	KIA_01	3533	<25
K35 odgm	723011	6181871	KIA_01	3702	<25
K36 odgm	723600	6182863	KIA_01	4811	<25
K37	725942	6180298	KIA_01	4257	<25
K38	726956	6180905	KIA_01	5438	<25
K39 odgm	726551	6181491	KIA_01	5416	<25
K40	727998	6178390	BAN_05	4999	<25
K41	726839	6178835	BAN_05	4134	25
K42	718060	6178100	KIA_02	4047	25.1
K43 odgm	722712	6183332	KIA_01	5099	<25
K44 odgm	723800	6183387	KIA_01	5371	<25
K45 odgm	724105	6183410	KIA_01	5491	<25
K46 odgm	726323	6182427	KIA_01	5859	<25
K46 odgm	726323	6182427	KIA_01	5859	<25
K47 odgm	726454	6182339	KIA_01	5891	<25
K48 odgm	726506	6182402	KIA_01	5972	<25
K49 odgm	726755	6181994	KIA_01	5887	<25
K50 odgm	726836	6181945	KIA_01	5919	<25
K51 odgm	723544	6183077	KIA_01	5001	<25
PW2	721304	6167162	POM_12	3802	27.2
PW3	723625	6167454	POM_01	2268	31.3
PW4	723971	6167207	POM_01	1882	32.6
PW5	725649	6167872	POM_01	956	36.4
PW6	729410	6167785	POM_05	2881	28.2
PW8	723284	6166082	POM_12	1650	33.5
PW9	723273	6165569	POM_12	1270	34.7
PW10	722578	6166719	POM_12	2585	29.9
PW12	722808	6160934	POM_19	3317	27.3
PW16	730279	6166886	POM_06	3405	25.8
PW17	731072	6165896	POM_07	3970	<25
PW18	731087	6165777	POM_07	3978	<25
PW19	731057	6165770	POM_07	3948	<25
PW20	731401	6165274	POM_07	4303	<25
PW21	731546	6163684	GUR_01	4472	25.5
PW22	720806	6162442	POM_12	4106	25.4
PW23	721226	6164804	POM_12	2995	26.7
PW24	721049	6164423	POM_12	3185	26.1
PW25	720995	6164098	POM_12	3285	26.1
PW26	721233	6163292	POM_12	3312	26.9

Location	Easting (m) <sup>#</sup>	Northing (m) <sup>#</sup>	Closest WTG		Highest predicted wind farm noise level* (dB L <sub>Aeq</sub> )
			Closest WTG	Distance (km)	
PW27	720966	6163287	POM_12	3557	25.1
PW28	721359	6165153	POM_12	2893	27.1
PW29	724533	6166968	POM_01	1300	35.4
PW30	730152	6164162	POM_07	3371	26.7
PW31	722002	6166870	POM_12	3087	27.3
PW32	721897	6166282	POM_12	2798	27.5
PW33	721099	6165999	POM_12	3372	26.7
PW36	725240	6167640	POM_01	922	36.6
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B1 stk	724008	6172742	BAN_20	559	43.8
B2 stk	725485	6171650	BAN_25	852	39.7
B3 stk	725737	6170809	BAN_26	1322	36
B6 stk	725214	6172835	BAN_20	705	40.6
B7 stk	722684	6172685	BAN_18	1408	36.8
B9 stk	723633	6170313	BAN_30	830	38.1
B12 stk	725086	6175790	BAN_14	1611	35.4
B12a stk	724847	6174932	BAN_15	816	39.3
B17 stk	722675	6172543	BAN_18	1497	36.6
B18 stk	723294	6172476	BAN_23	1108	39.3
B27 stk	722879	6175614	BAN_08	524	44.5
B29 stk	721644	6175203	BAN_09	1146	37.3
B33 stk	724946	6172602	BAN_21	522	43
B53 stk	722272	6174050	BAN_10	741	39.7
G37 stk	728219	6161915	GUR_01	815	37.5
G37a stk	728049	6162215	GUR_01	1039	36
PW7 stk	725225	6166206	POM_03	841	40.6
PW34 stk	726550	6167402	POM_01	856	39.6

Odgm Outside dgm shape file contours – publicly sourced spot height terrain values used in these instances

stk Associated Receiver

# MGA 94 Zone 55 datum

\* Sound levels in environmental assessment work are typically reported to the nearest integer to reflect the practical use of measurement and prediction data. In the case of wind farm layout design however, significant layout modifications may only give rise to fractional changes in the predicted noise level. This is a result of the relatively large number of sources influencing the total predicted noise level, as well as the typical separating distances between the turbine locations and surrounding assessment positions. It is therefore necessary to consider the predicted noise levels at a finer resolution than can be perceived or measured in practice. It is for this reason that relevant levels presented in this table are reported to one decimal place.

## APPENDIX C BACKGROUND NOISE MONITORING

### C1 Noise monitoring

Long-term unattended background noise monitoring was conducted by MDA at seventeen (17) locations between July and November 2007. The locations selected for monitoring were based on preliminary wind farm noise predictions for the wind farm layout and turbine types(s) that were proposed at that time.

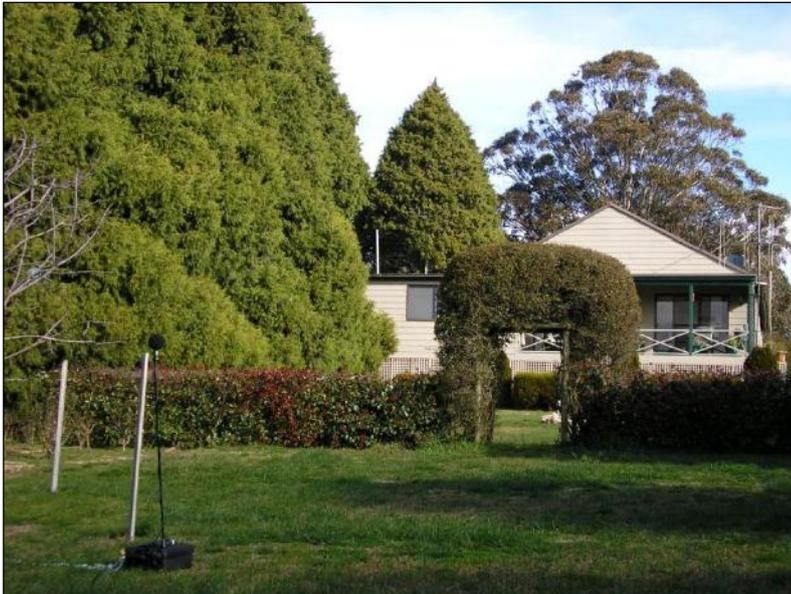
Background noise monitoring was conducted in general accordance with Section 3.1 of the SA Guidelines 2003 at identified relevant receivers.

Noise loggers were placed in accordance with the requirements of Section 3.1 of the SA Guidelines 2003 being: at least 5m from any reflective surface; within 20m of the nearest dwelling, and; in positions that were representative of the general background noise environment. Acoustic Research Laboratories (ARL) EL-316 Type 1 environmental noise loggers were used to conduct the background noise level monitoring in 10-minute statistical intervals.

**C2 Background noise monitoring location photos**



**Figure 1: B8 measurement location relative to dwelling**



**Figure 2: B11 measurement location relative to dwelling**



Figure 3: B12a measurement location



Figure 4: B13 measurement location relative to dwelling



Figure 5: B18 measurement location relative to dwelling



Figure 6: B26 measurement location relative to dwelling



**Figure 7: B27 measurement location relative to dwelling**



**Figure 8: B29 measurement location relative to dwelling**



Figure 9: B33 measurement location relative to dwelling



Figure 10: B53 measurement location relative to dwelling



Figure 11: K1 measurement location relative to dwelling



Figure 12: K2 measurement location relative to dwelling



Figure 13: G31 measurement location relative to dwelling



Figure 14: G37 measurement location relative to dwelling



Figure 15: G39 measurement location relative to dwelling



Figure 16: P07 measurement location relative to dwelling



Figure 17: PW09 measurement location relative to dwelling

**C3 Wind data**

**Pre-construction data**

Wind speed data from three met masts has been used in the assessment.

**Table 1: Reference met masts**

Mast	Easting:Northing (MGA 94 Zone 55)
Bannister	724434 : 6172019
Gurrundah	727540 : 6158661
Kialla	723729 : 6178571

Wind speed data referenced to 80m AGL has been provided to us by Goldwind for each met mast, spanning the time periods when background noise monitoring occurred in 2007. In each case, the hub height data has been determined from analysis of measured wind speeds at multiple heights between 10m AGL and 50 to 65m AGL. Specific analysis details are mast dependent, and have been provided to us by Goldwind. Extracts from wind speed analysis discussions provided by Goldwind are presented below.

**Note for 80m wind speed time series for Bannister and Gurrundah Masts**

*Wind Speed has been extrapolated to 80m hub height for the two masts based on the Logarithmic Profile as shown by the methodology below. Four heights have been used for each mast. For Gurrundah this is 65m, 63m, 40m and 10m. For Bannister this is 65m, 62m, 40m and 10m. This has been calculated at each time stamp.*

**Logarithmic Profile**

The logarithmic law (or log law) assumes that the wind speed varies logarithmically with the height above ground according to the following equation:

$$U(z) = \begin{cases} \frac{U^*}{k} \ln\left(\frac{z}{z_0}\right) & \text{if } z > z_0 \\ 0 & \text{if } z \leq z_0 \end{cases}$$

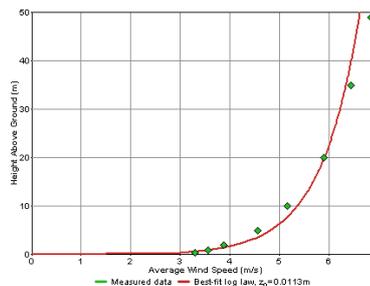
where:

- $U(z)$  is the wind speed [m/s] at some height above ground  $z$  [m]
- $U^*$  is the friction velocity [m/s]
- $k$  is von Karman's constant (0.4)
- $z_0$  is the **surface roughness** [m]
- $\ln$  is the natural logarithm

If you know the average wind speed for two or more heights above ground, you can do a curve fit on the above equation to find the surface roughness. Knowing the surface roughness and the wind speed at some height  $z_1$ , one can use the logarithmic law to calculate the wind speed at another height  $z_2$  using the following equation:

$$\frac{U(z_2)}{U(z_1)} = \frac{\ln(z_2 / z_0)}{\ln(z_1 / z_0)}$$

For data sets comprising two or more anemometers at different heights above ground, Windographer solves for the surface roughness value that causes the logarithmic profile to best fit the measured wind shear profile. (To do so, Windographer uses a linear least squares algorithm to fit a straight line to the graph of average wind speed versus the logarithm of the height above ground.) The following graph compares the resulting best-fit logarithmic profile to the measured wind shear profile we saw earlier:



**Note for 80m wind speed time series for Kialla mast**

The wind speed shear profile has been determined for the Kialla mast based on the Logarithmic Profile as shown by the methodology below. The surface roughness or  $z_0$  is solved utilising a linear least squares algorithm to fit a straight line to the graph of average wind speed vs the log of the height above the ground. Three heights have been used, for Kialla this is 50m, 30m, 10m. The data spans from July 2003 to Feb 2005. The shear profile has been calculated on a directional basis based on 12 30° bins.

This directional shear profile has then been applied to the 10m “Kialla Noise” time series data set to determine the 80m wind speed. This data set spans from July 2007 to April 2007.

**Logarithmic Profile**  
The logarithmic law (or log law) assumes that the wind speed varies logarithmically with the height above ground according to the following equation:

$$U(z) = \begin{cases} \frac{U^*}{k} \ln\left(\frac{z}{z_0}\right) & \text{if } z > z_0 \\ 0 & \text{if } z \leq z_0 \end{cases}$$

where:

- $U(z)$  is the wind speed [m/s] at some height above ground  $z$  [m]
- $U^*$  is the friction velocity [m/s]
- $k$  is von Karman's constant (0.4)
- $z_0$  is the **surface roughness** [m]
- $\ln$  is the natural logarithm

If you know the average wind speed for two or more heights above ground, you can do a curve fit on the above equation to find the surface roughness. Knowing the surface roughness and the wind speed at some height  $z_1$ , one can use the logarithmic law to calculate the wind speed at another height  $z_2$  using the following equation:

$$\frac{U(z_2)}{U(z_1)} = \frac{\ln(z_2 / z_0)}{\ln(z_1 / z_0)}$$

*Disclaimer: The client's acceptance of this data is on the basis that Epuron Pty Ltd are not responsible in any way for the use of the findings of the results from the analysis and thus such responsibility remains with the client.*

**Post-construction data**

Wind speed data from four (4) met masts is available for post-construction assessment works.

**Table 2: Reference met masts**

Mast	Easting:Northing (MGA 94 Zone 55)
Kialla (Met_KIA01)	722343 : 6178469
Bannister (BAN010203)	722639 : 6176829
Bannister (Met_BAN2429)	723915 : 6171461
Gurrundah	724051 : 6170796

The post-construction wind speed data should be referenced to 80m AGL and should take due account of the following factors:

- The data shall represent the wind speed expected to occur in the absence of any influence from the completed wind farm development
- This may require wind data to be obtained from different wind speed measurement references according to wind sectors. For example, for opposing wind directions, two alternative upwind wind speed references may be required to obtain data that is not affected by turbulent wake effects of the wind farm. In instances where a range of alternative wind speed measurement references are utilised, details of any adjustments that have been applied to obtain the reference wind speed shall be specified
- The location and height of the reference wind speed data must be consistent between the pre-construction and post-construction noise monitoring data. In this respect, an important consideration is that pre-construction noise monitoring data relates to meteorological masts at alternative locations. An assessment of the post-construction data will therefore require adjustments to obtain the wind speed that would have otherwise been measured at the pre-construction wind speed locations.

#### **C4 Additional considerations**

The SA Guidelines 2003 require that any data affected by rainfall or extraneous noise events must be excluded from the assessment.

In order to determine rainfall events, a WeatherPro-Plus weather station was placed at dwellings B33, PW09 & B27 for the duration of the monitoring programme. Weather data recorded at these three sites could be relied upon for capturing weather events local to the area, more so than using weather data from the closest Bureau of Meteorology weather station (with sufficient climate records) located in Goulburn, in excess of 30km distance from Gullen Range. The WeatherPro weather station recorded local atmospheric pressure, wind velocity and direction, rainfall, temperature and humidity. The weather station data confirmed that for the entire monitoring period, very little rainfall occurred.

## **C5 Cut-in and cut-out wind speeds**

Section 3.4 *Data analysis* of the SA Guidelines 2003 requires that “data should be collected at wind speeds between the cut-in speed and the speed of rated power”, implying that only wind speeds between cut-in and the wind speed of rated power should be included in the regression analysis.

However, Section 3.1 *Background noise – Data* of the SA Guidelines 2003 notes the following.

*Particular emphasis should be placed on collecting background noise data corresponding to the operating wind speed range of the WTGs.*

Section 3.2 of the 2003 SA Guideline requires the following.

*Data should be provided for at least each integer wind speed from cut-in speed up to the speed of rated power.*

Consistent with these comments, monitored wind speeds below cut-in and above the speed of rated power have, where available, been included in the analysis. This approach is considered to better represent the background noise level trend at higher wind speeds<sup>1</sup>.

## **C6 Further details**

For full details of the background noise monitoring surveys carried out for this project, refer to the MDA 2008 Report.

Background noise vs wind speed charts and resulting noise limit charts are presented in Appendix D and Appendix E respectively.

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<sup>1</sup> Delaire, C., Walsh, D., ‘A Comparison of Background Noise Levels Collected at the Portland Wind Energy Project in Victoria, Australia’, *Proceedings of wind turbine noise 2009*, INCE Europe, Aalborg, Denmark, (2009).

**APPENDIX D BACKGROUND NOISE LEVEL AND WIND SPEED TIME HISTORY CHARTS**

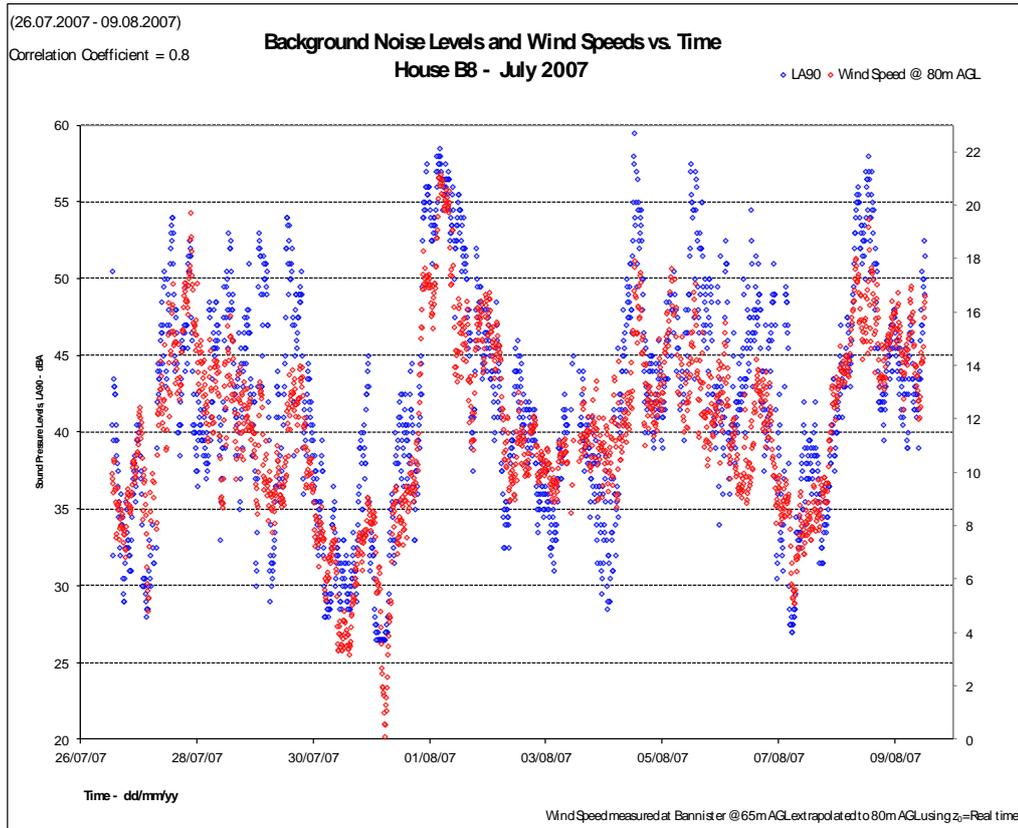


Figure 18: Background noise level and wind speed vs time – House B8

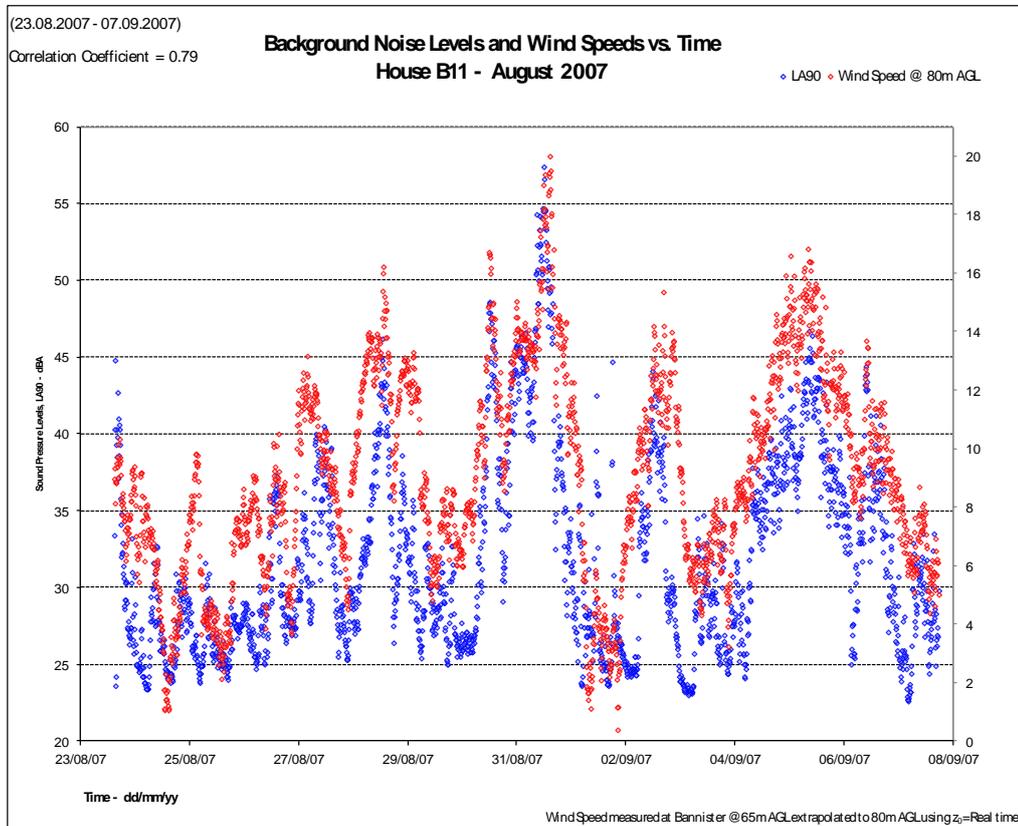


Figure 19: Background noise level and wind speed vs time – House B11

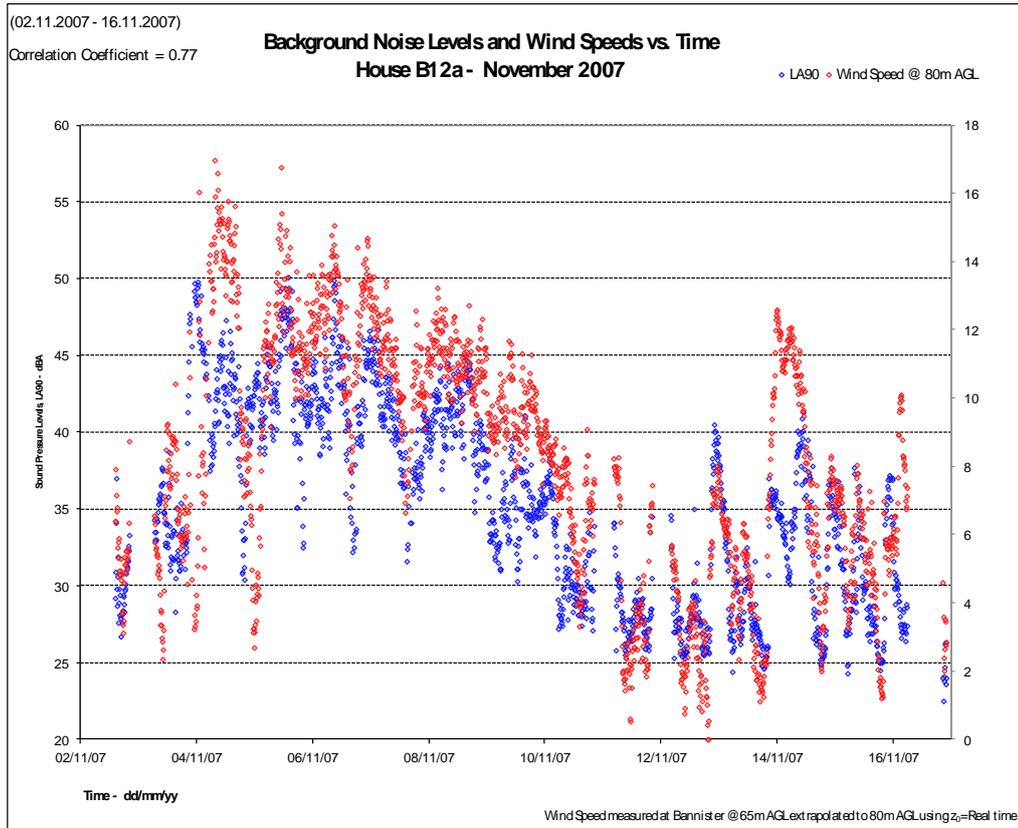


Figure 20: Background noise level and wind speed vs time – House B12a

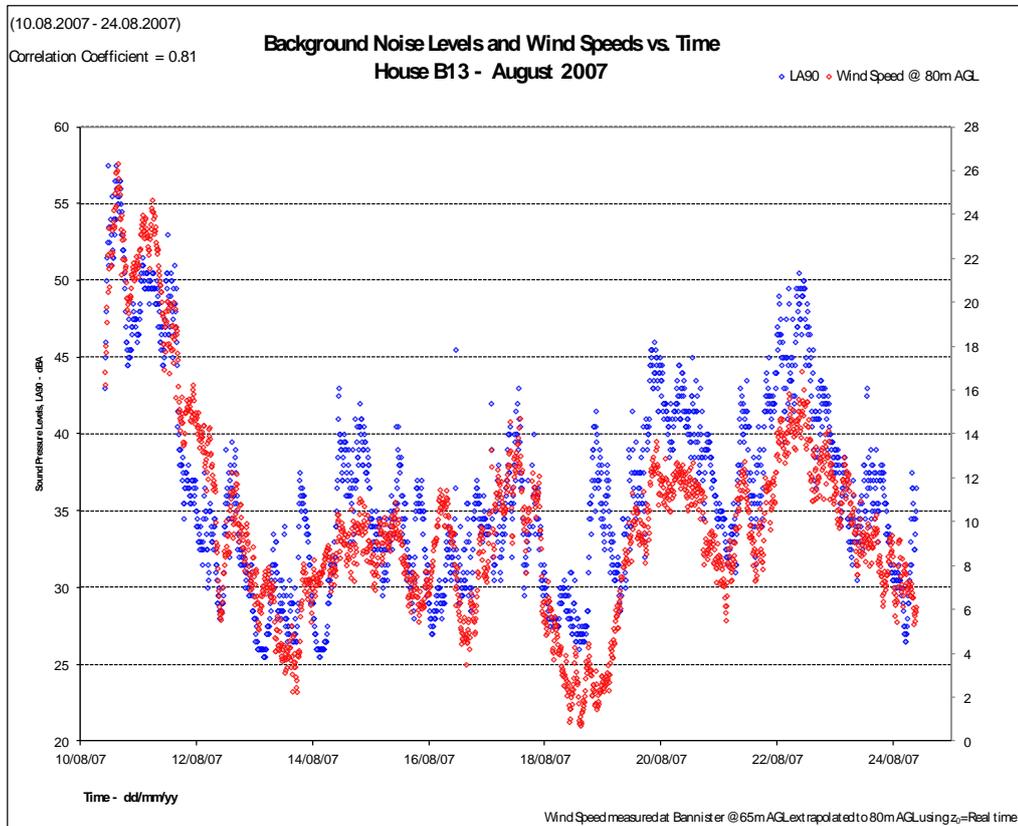


Figure 21: Background noise level and wind speed vs time – House B13

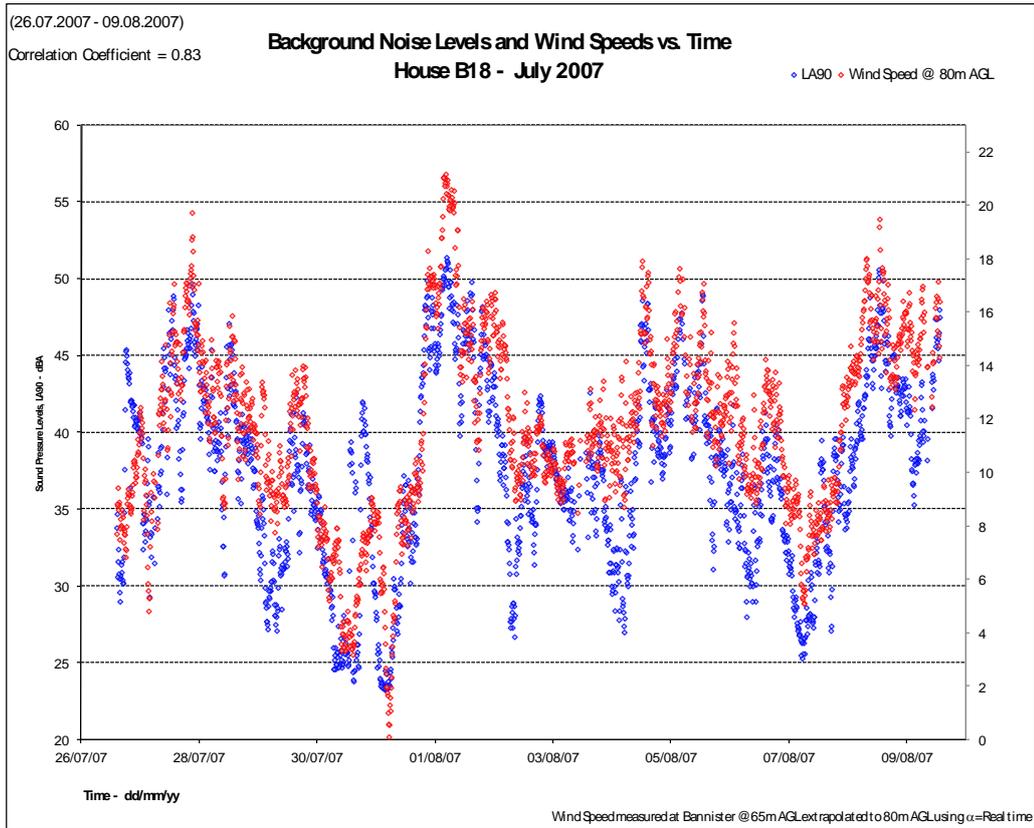


Figure 22: Background noise level and wind speed vs time – House B18

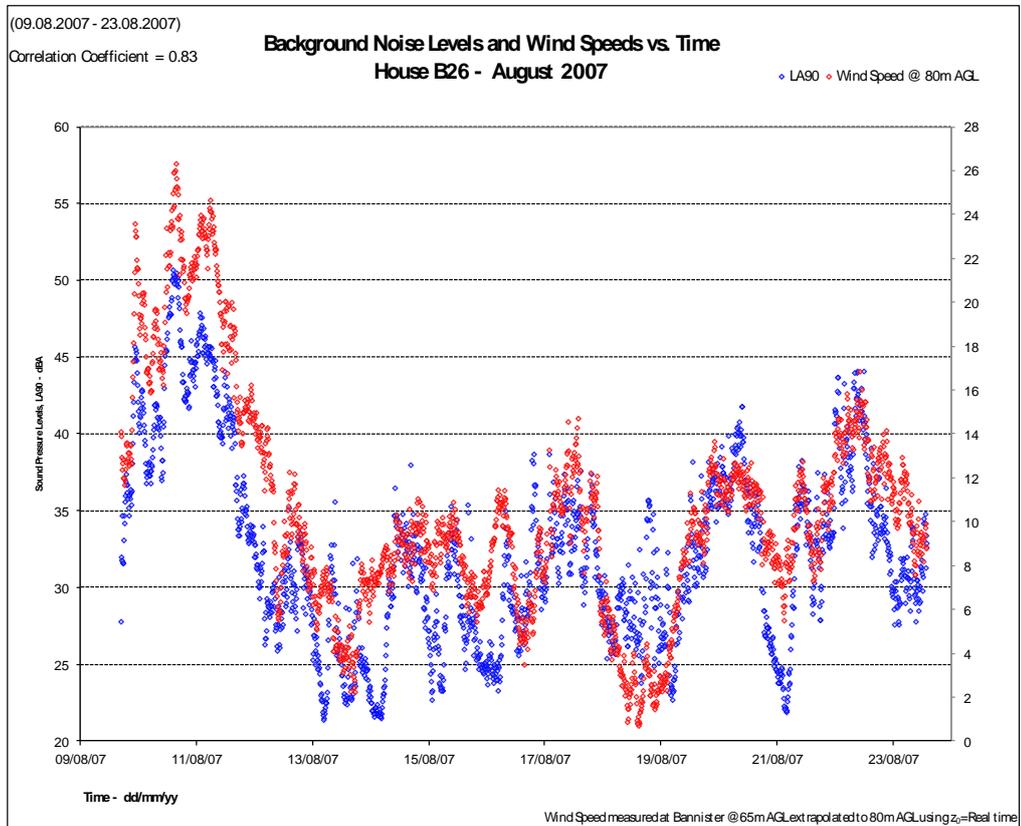


Figure 23: Background noise level and wind speed vs time – House B26

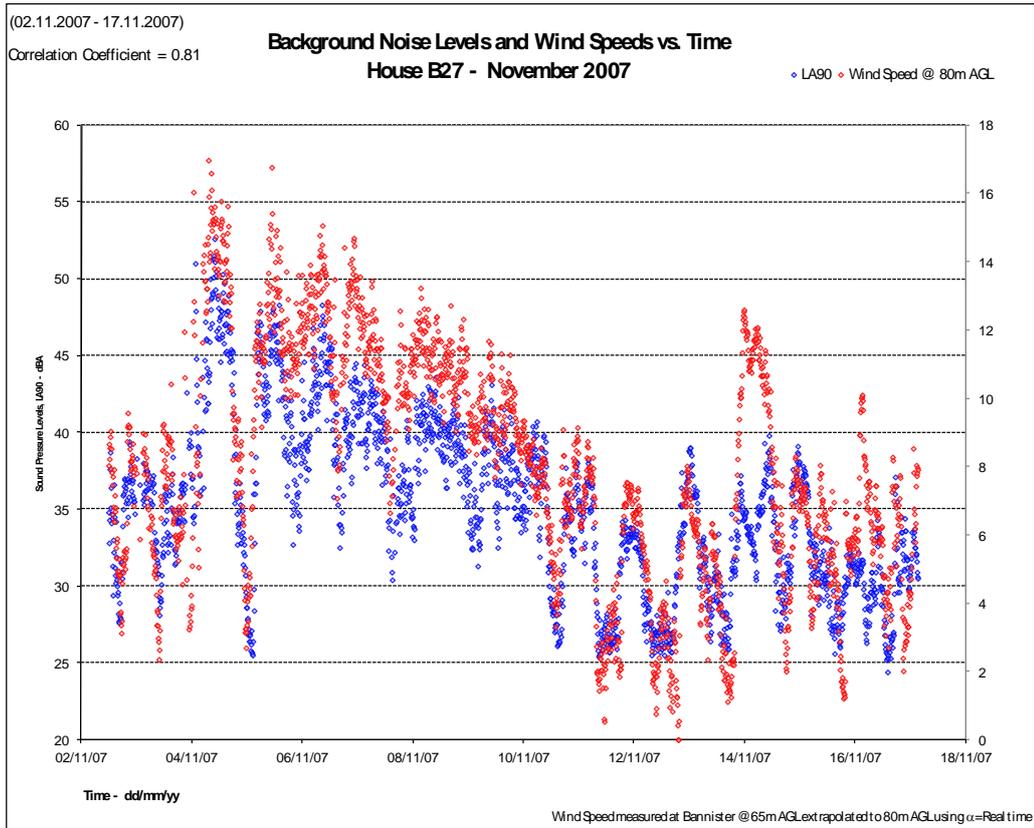


Figure 24: Background noise level and wind speed vs time – House B27

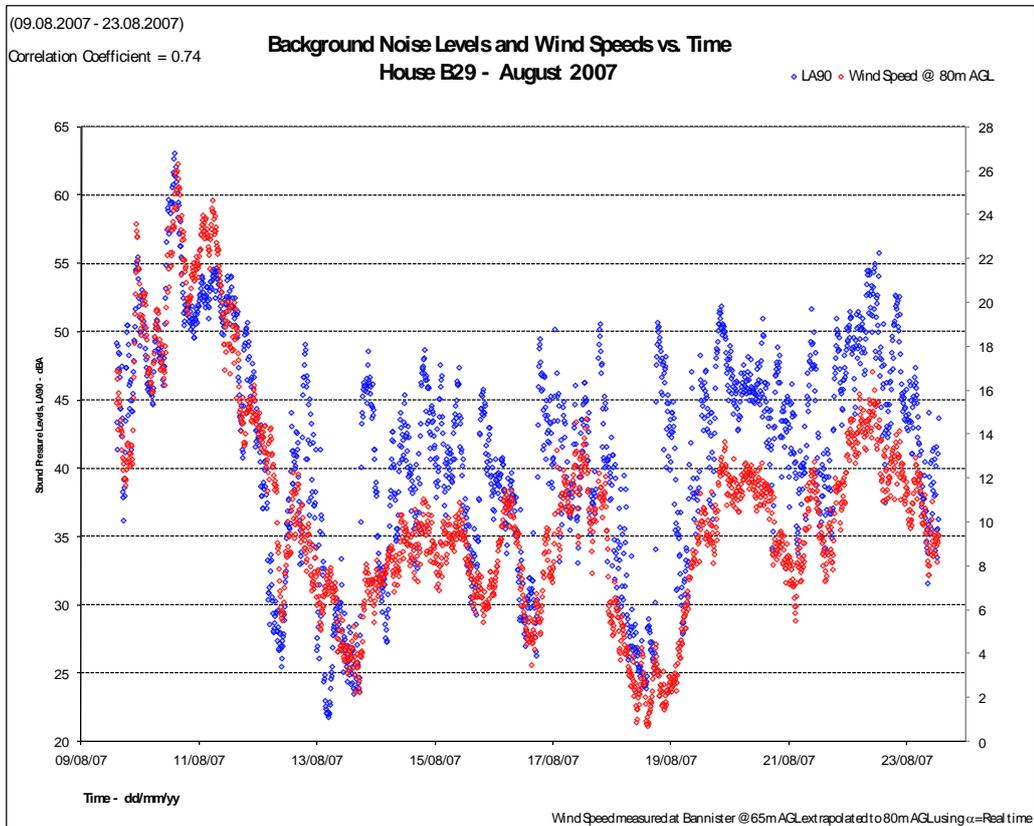


Figure 25: Background noise level and wind speed vs time – House B29

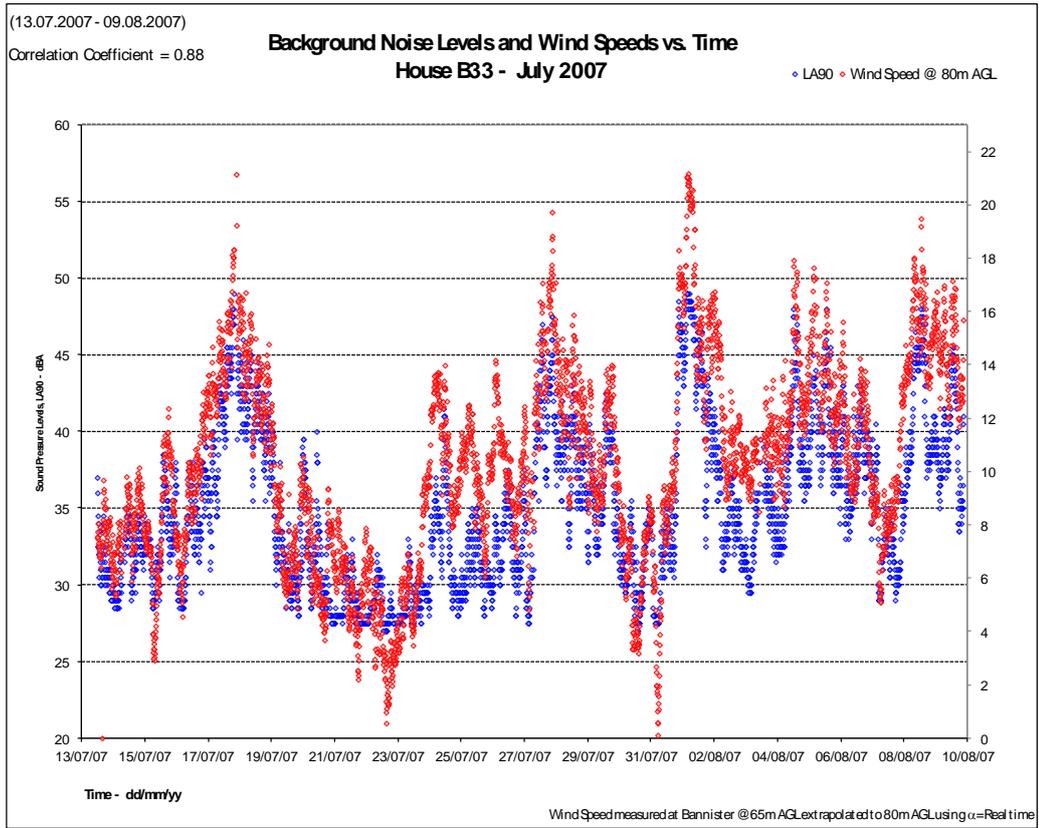


Figure 26: Background noise level and wind speed vs time – House B33

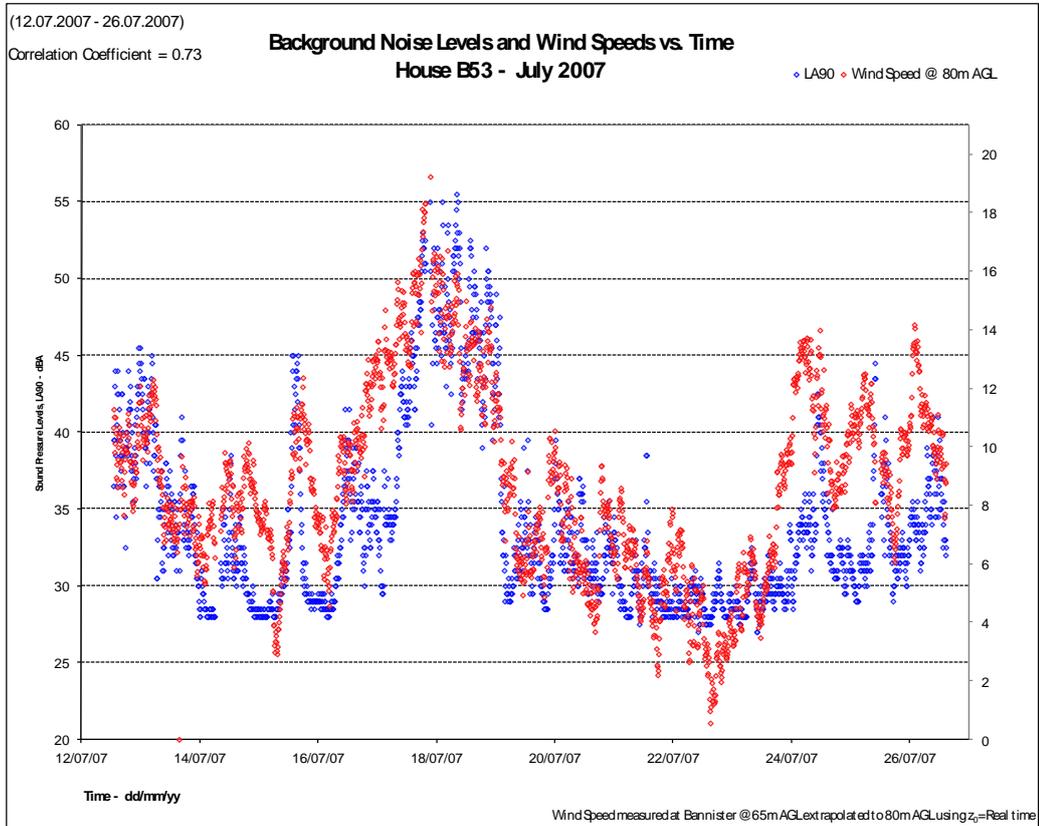


Figure 27: Background noise level and wind speed vs time – House B53

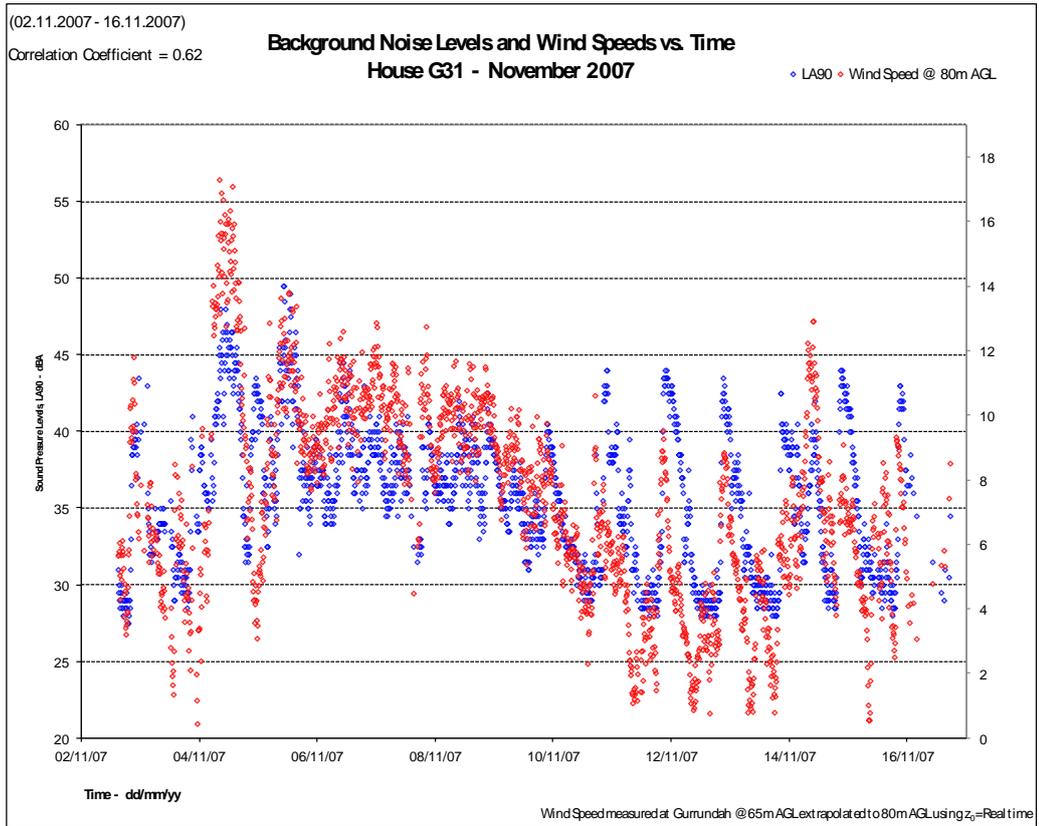


Figure 28: Background noise level and wind speed vs time – House G31

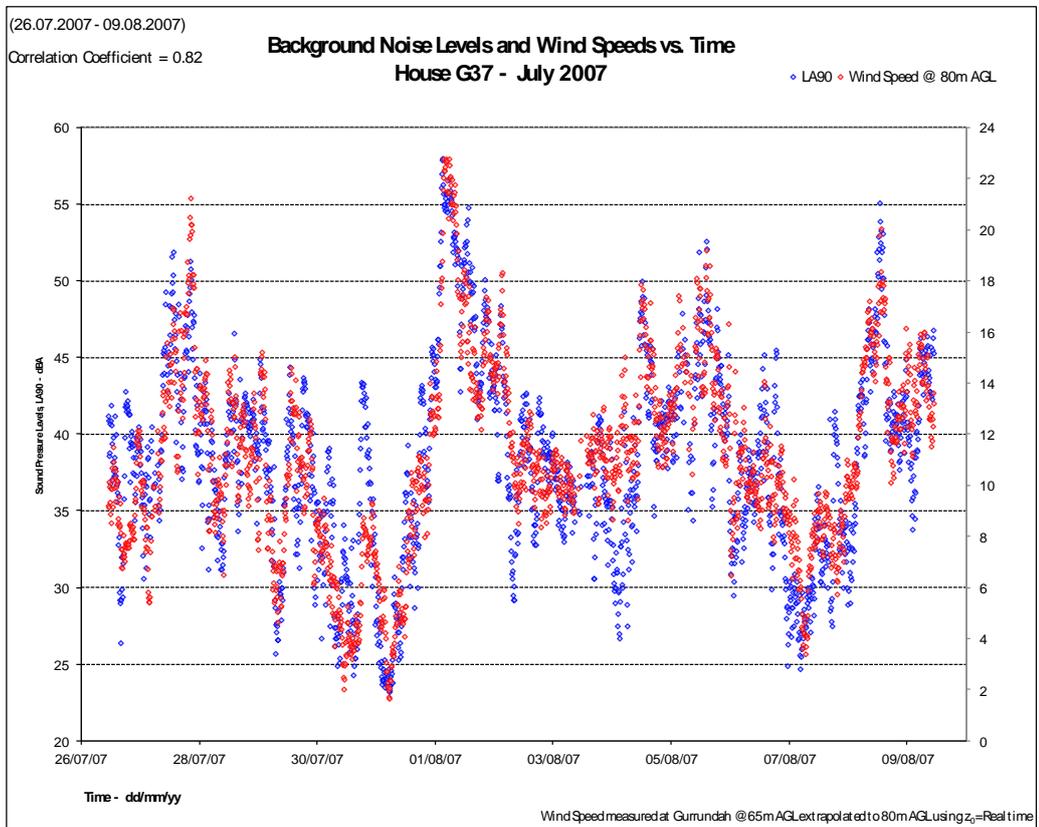


Figure 29: Background noise level and wind speed vs time – House G37

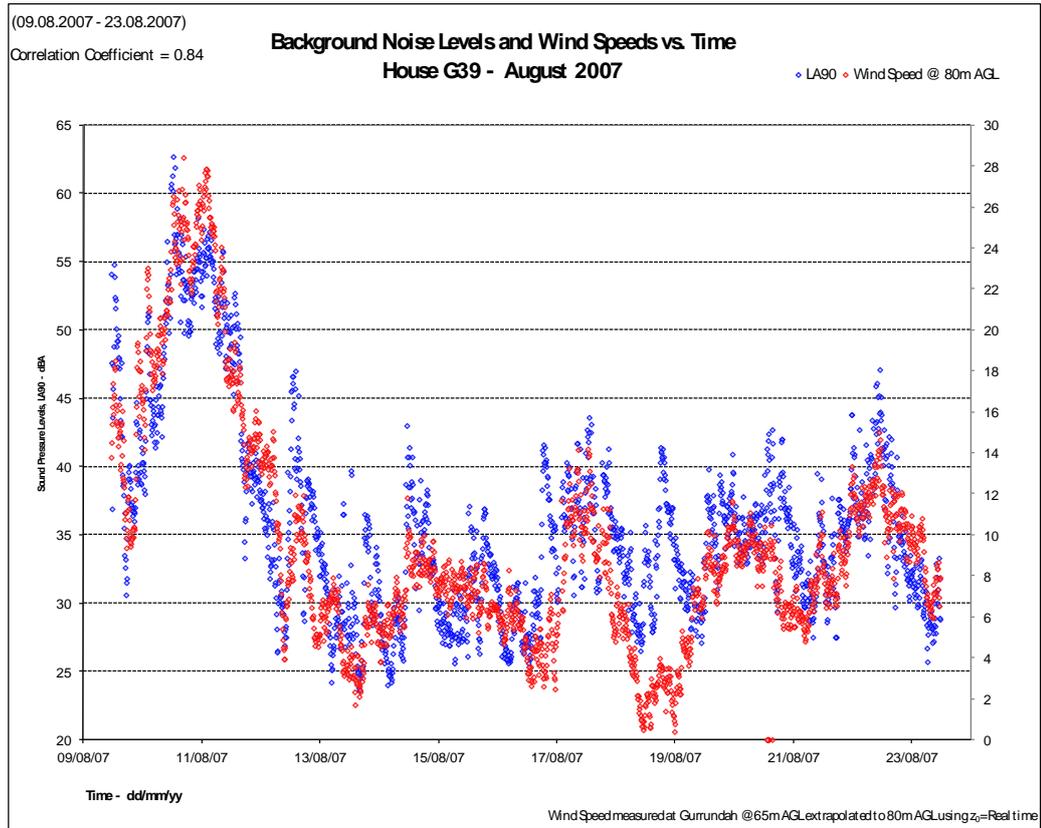


Figure 30: Background noise level and wind speed vs time – House G39

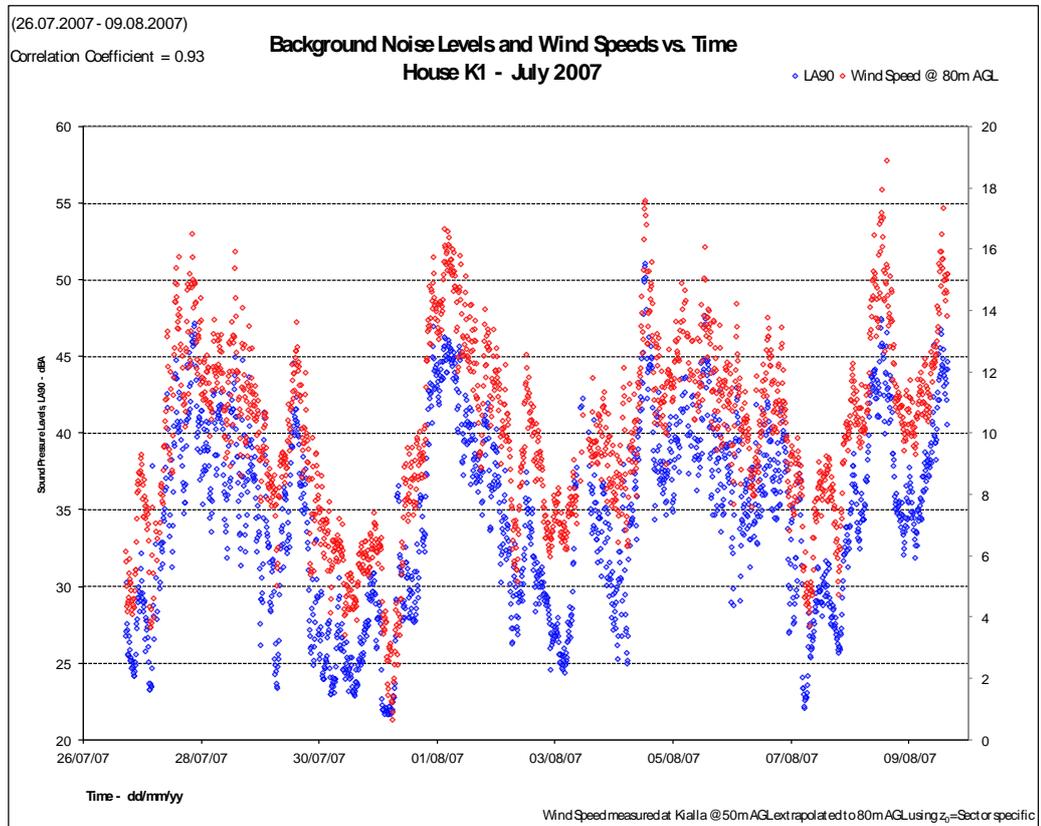


Figure 31: Background noise level and wind speed vs time – House K1

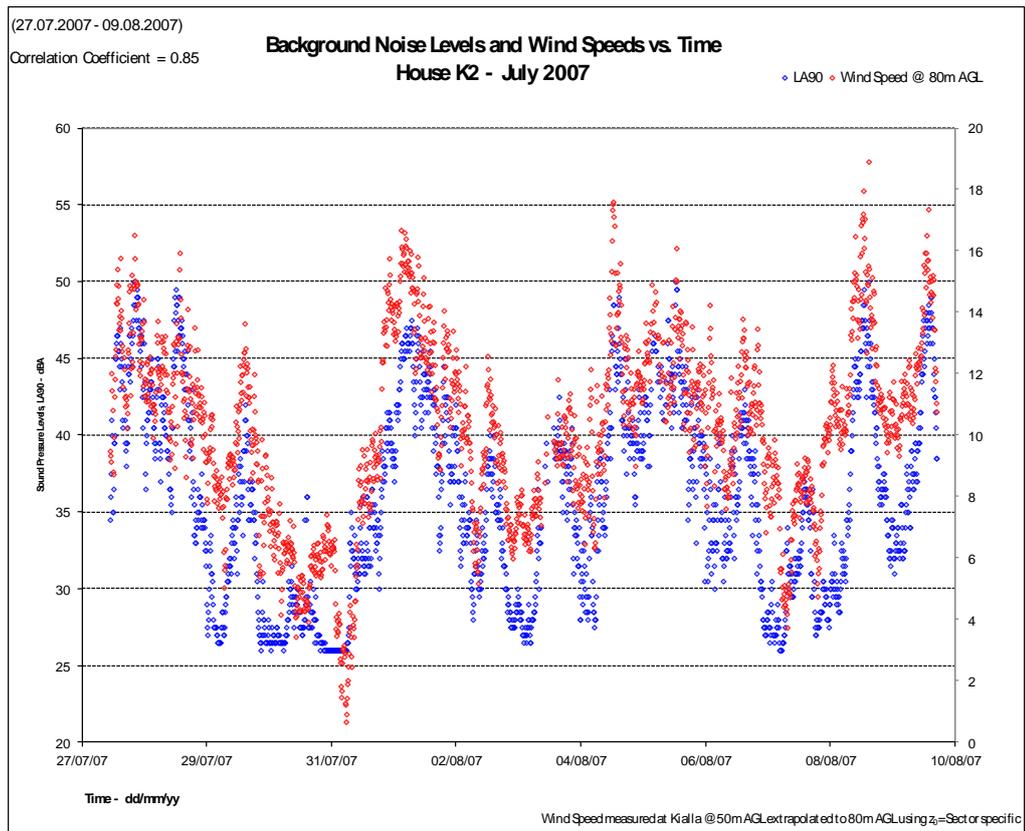


Figure 32: Background noise level and wind speed vs time – House K2

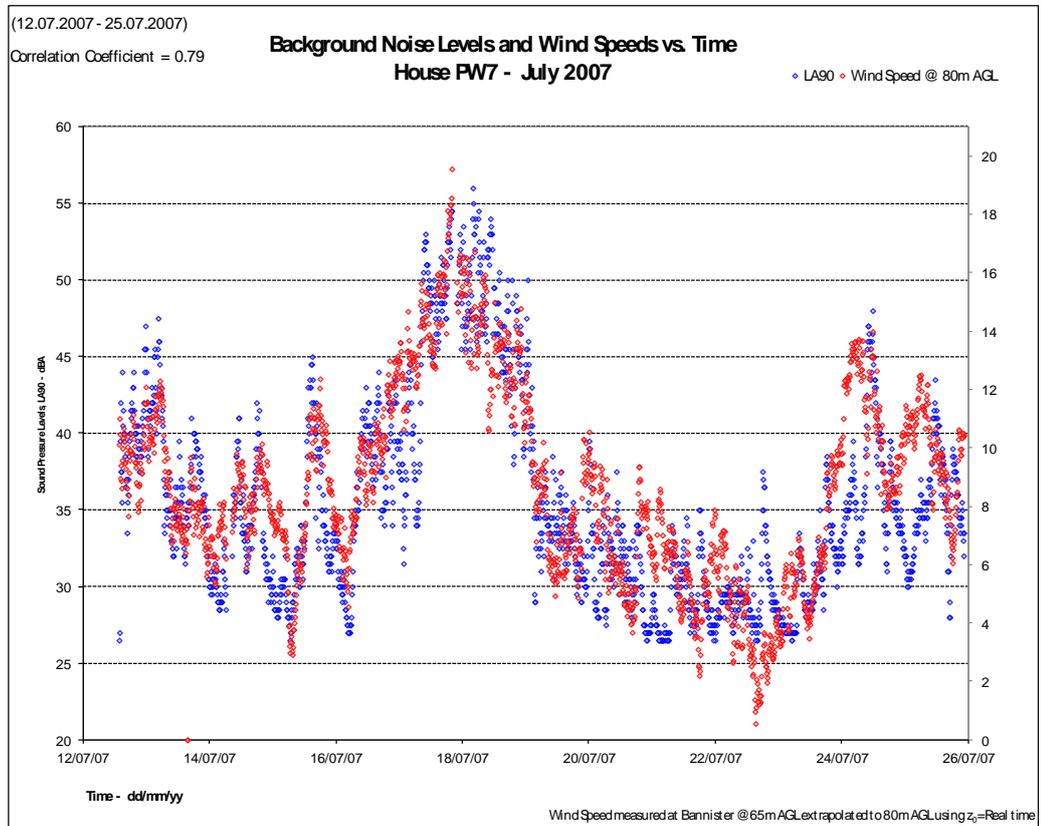


Figure 33: Background noise level and wind speed vs time – House PW7

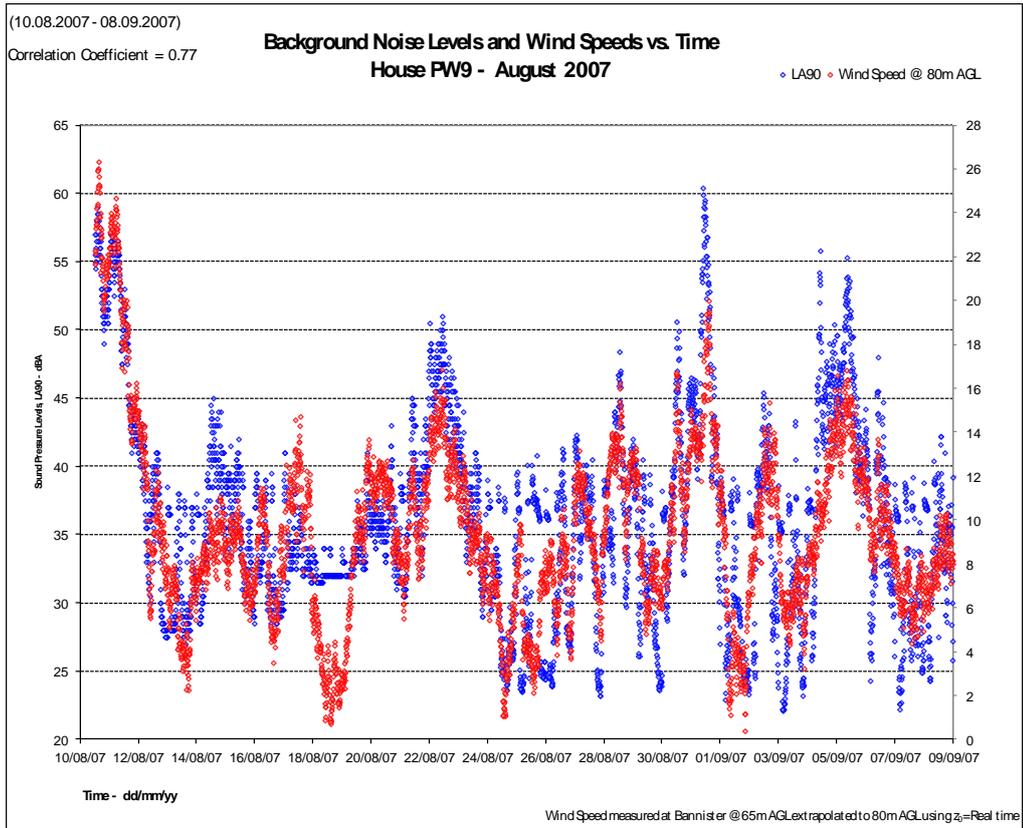


Figure 34: Background noise level and wind speed vs time – House PW9

APPENDIX E NOISE LIMIT CHARTS

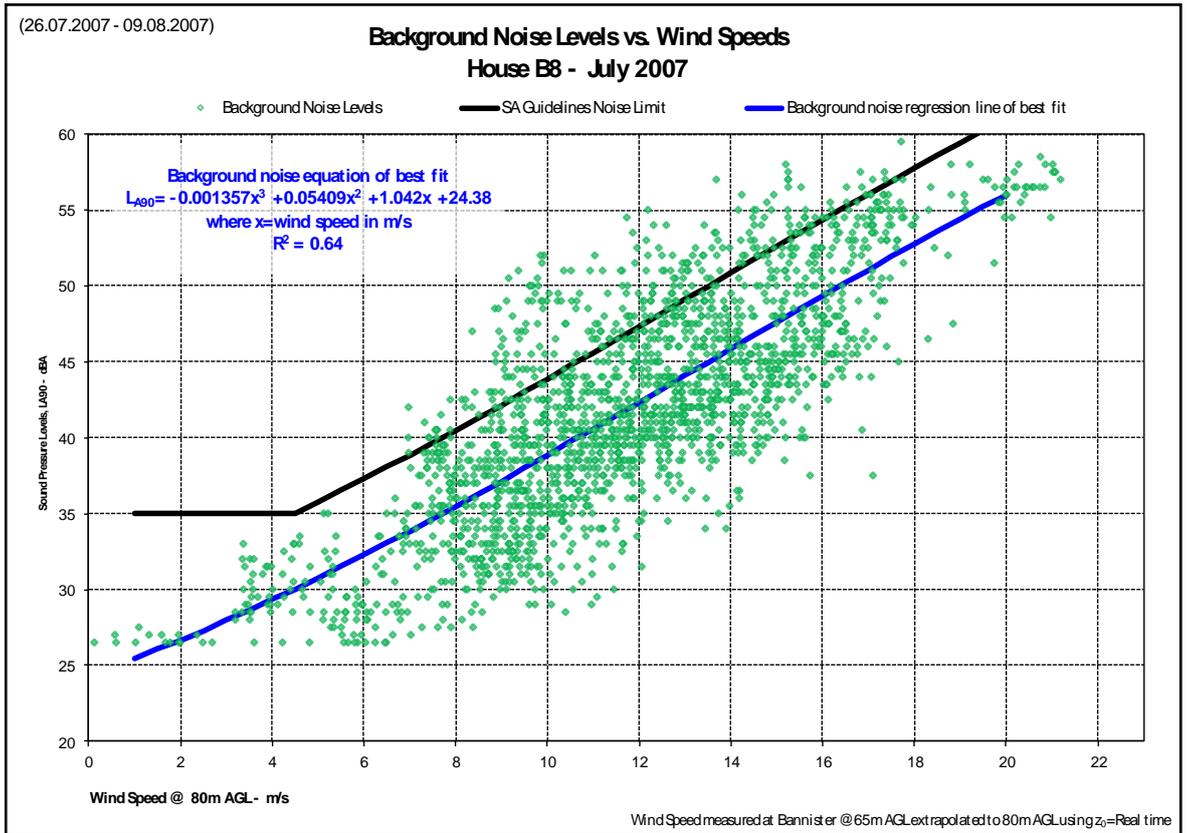


Figure 35: Derived noise limits – House B8

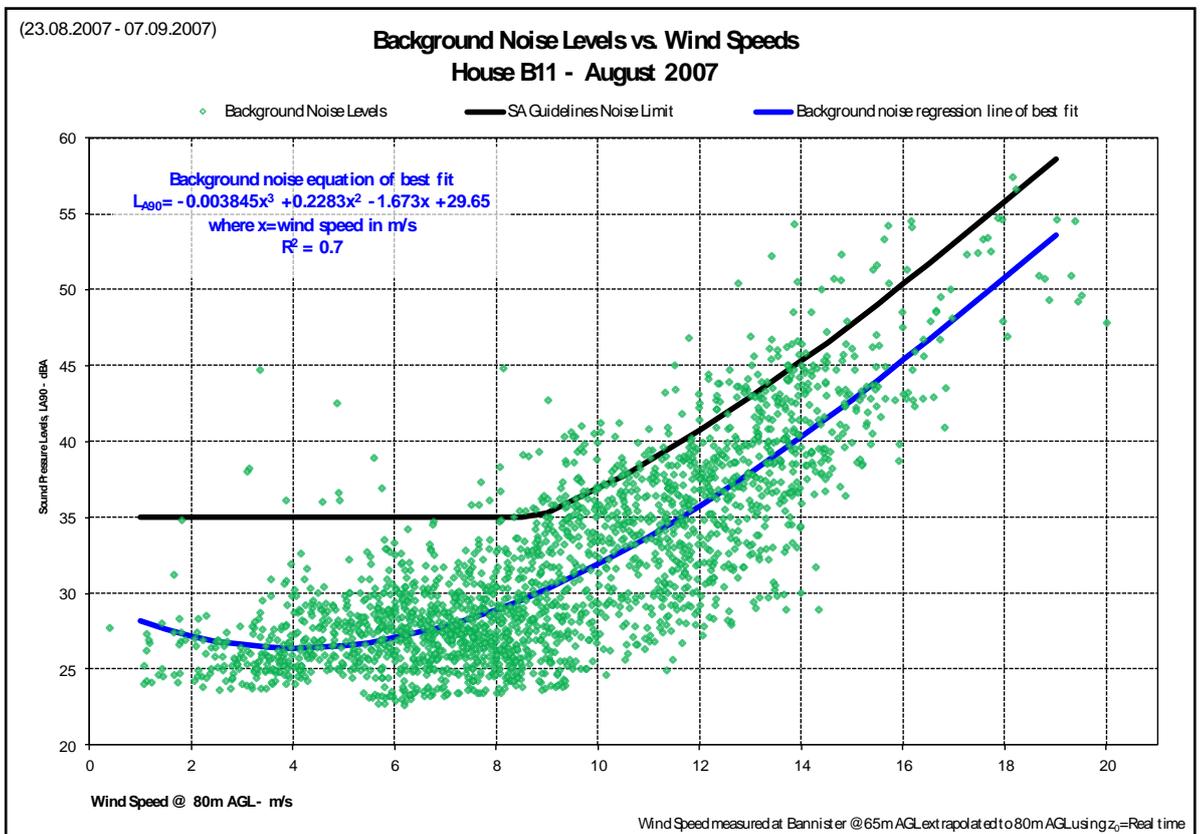


Figure 36: Derived noise limits – House B11

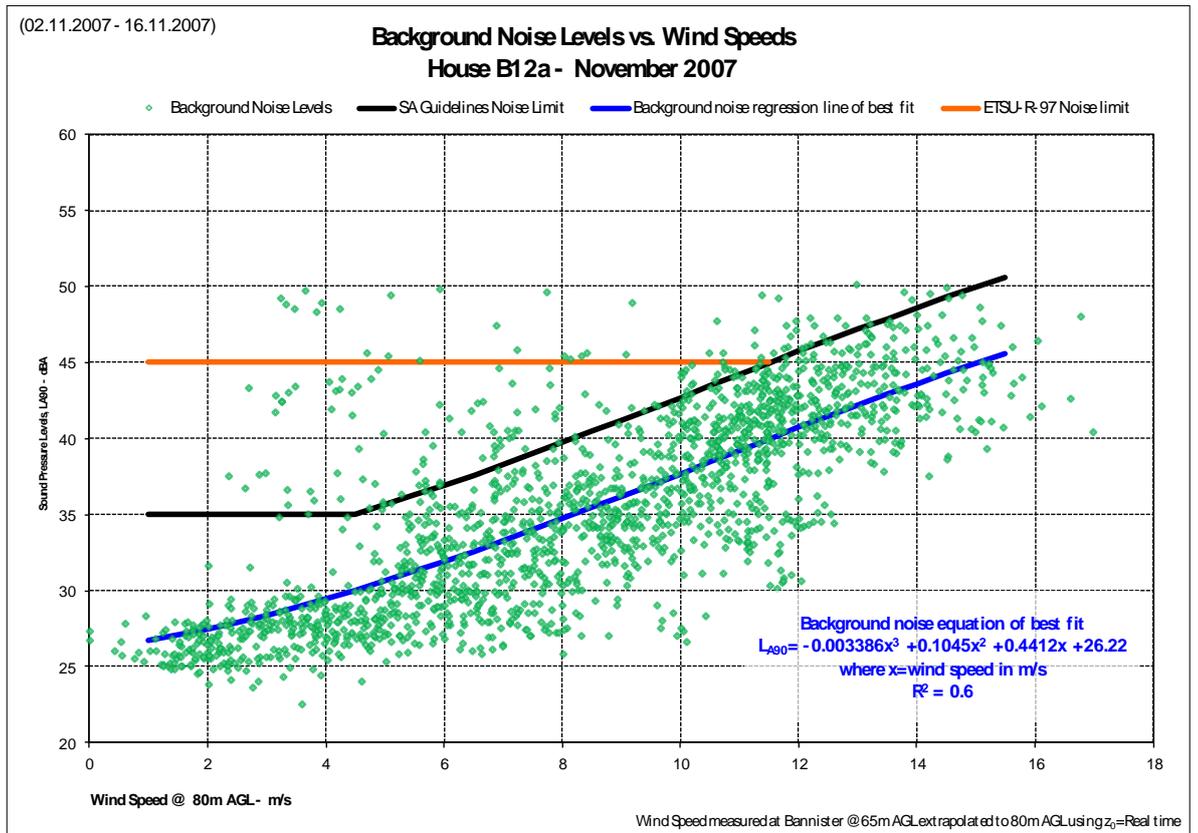


Figure 37: Derived noise limits – House B12a

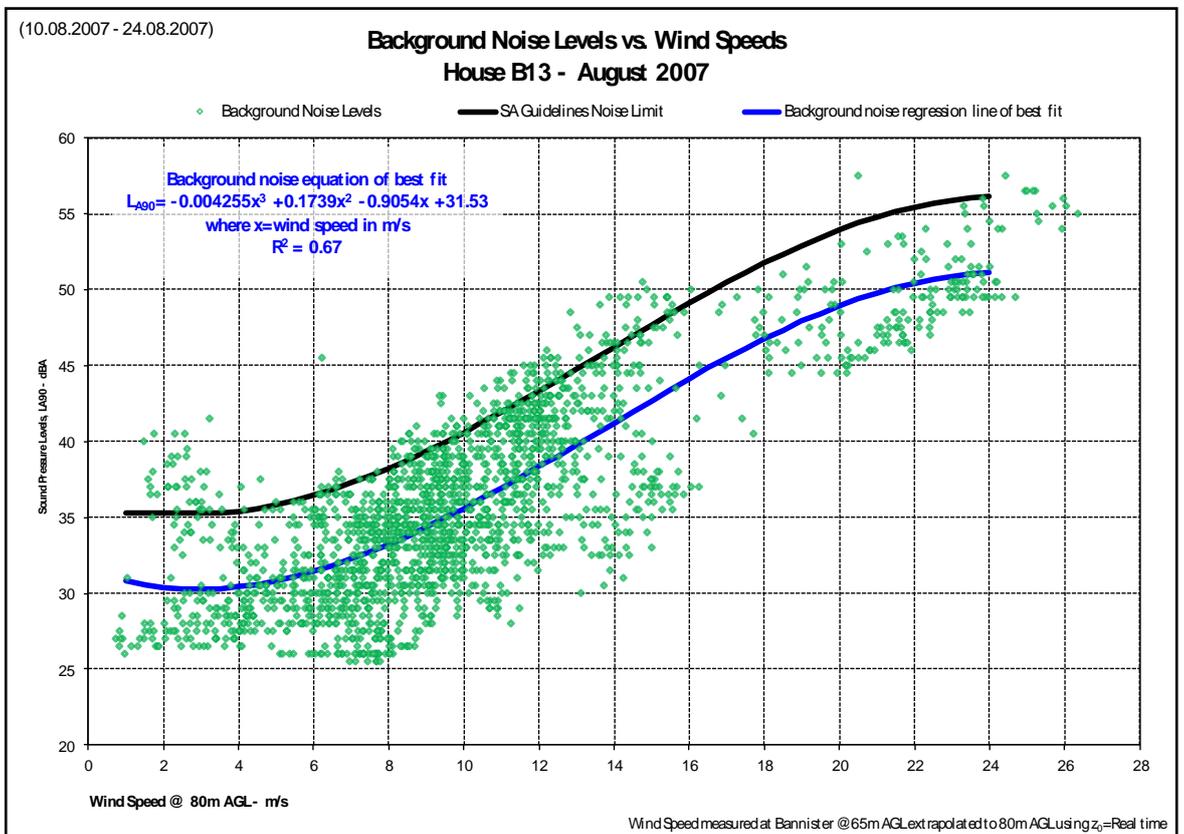


Figure 38: Derived noise limits – House B13

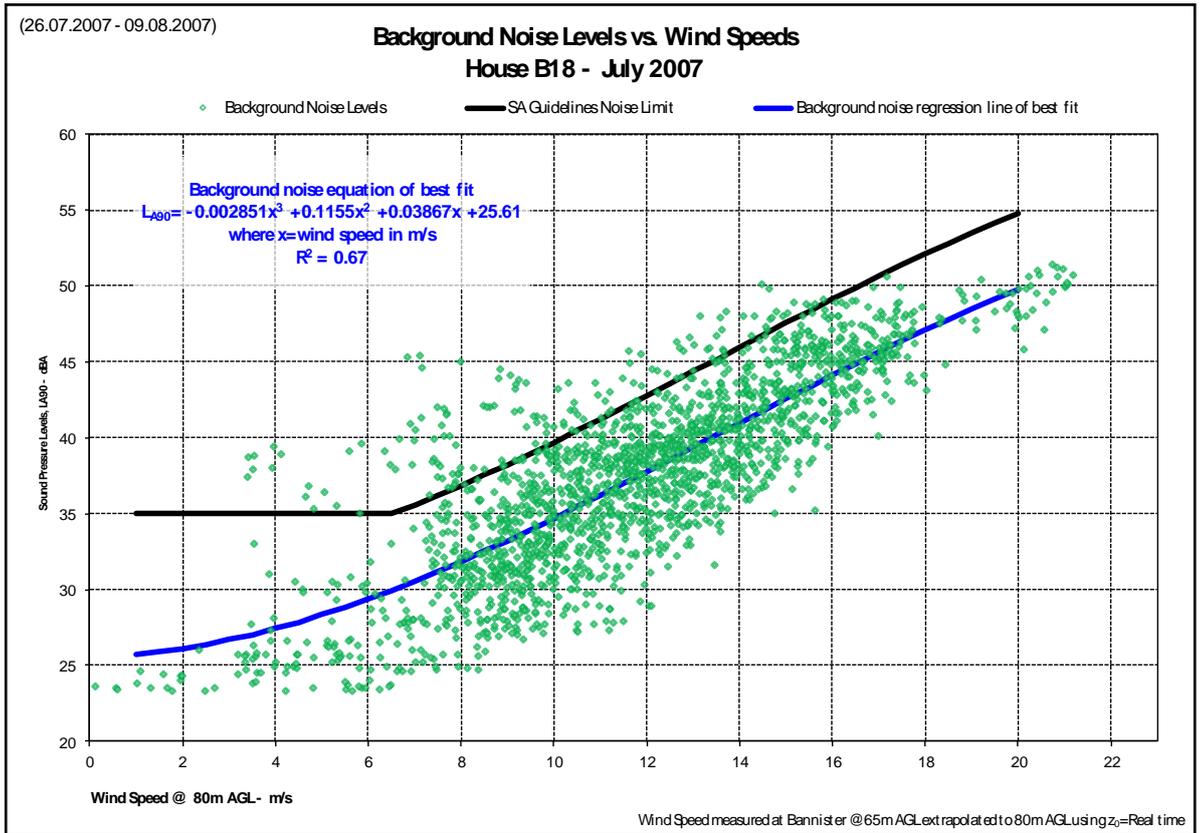


Figure 39: Derived noise limits – House B18

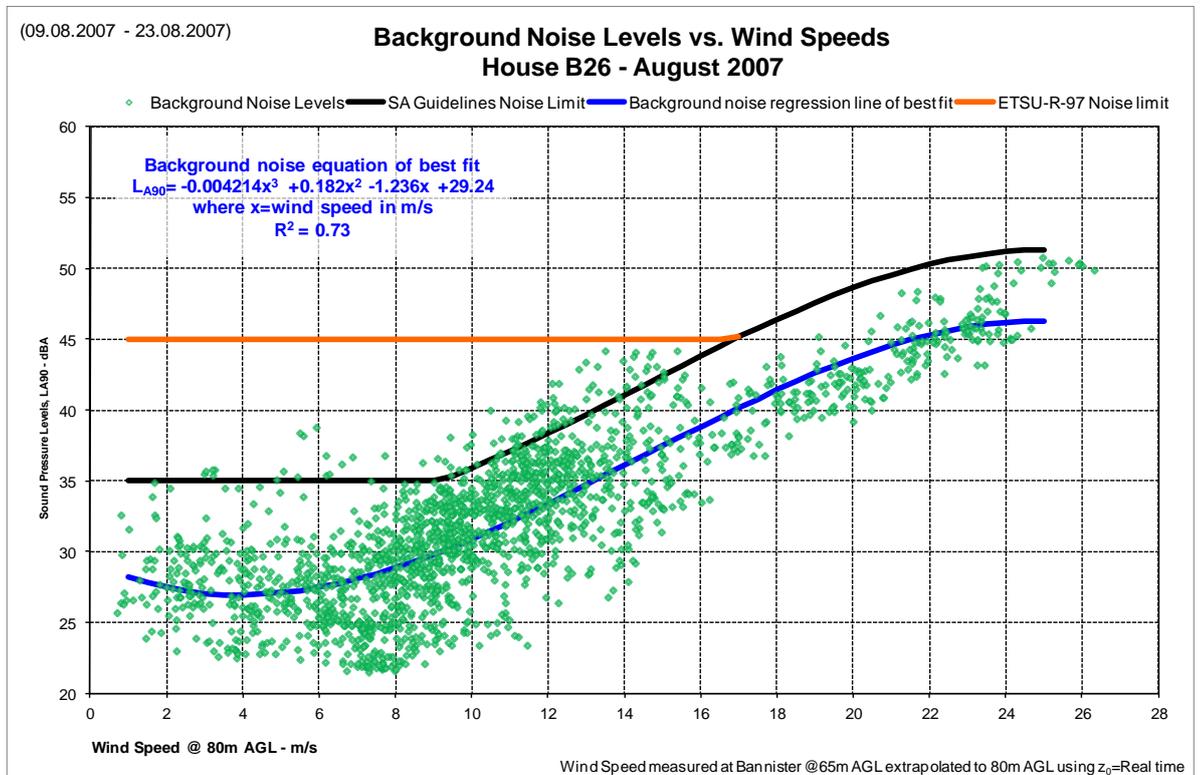


Figure 40: Derived noise limits – House B26

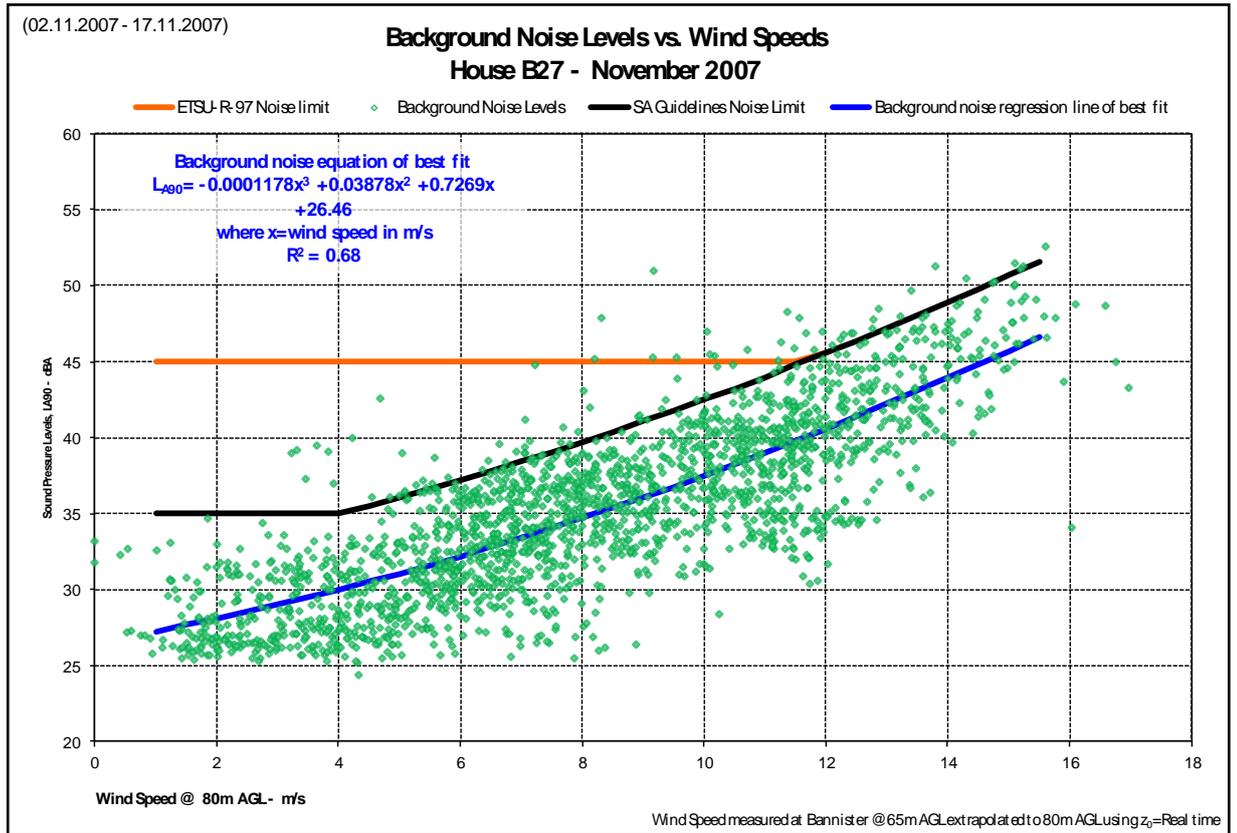


Figure 41: Derived noise limits – House B27

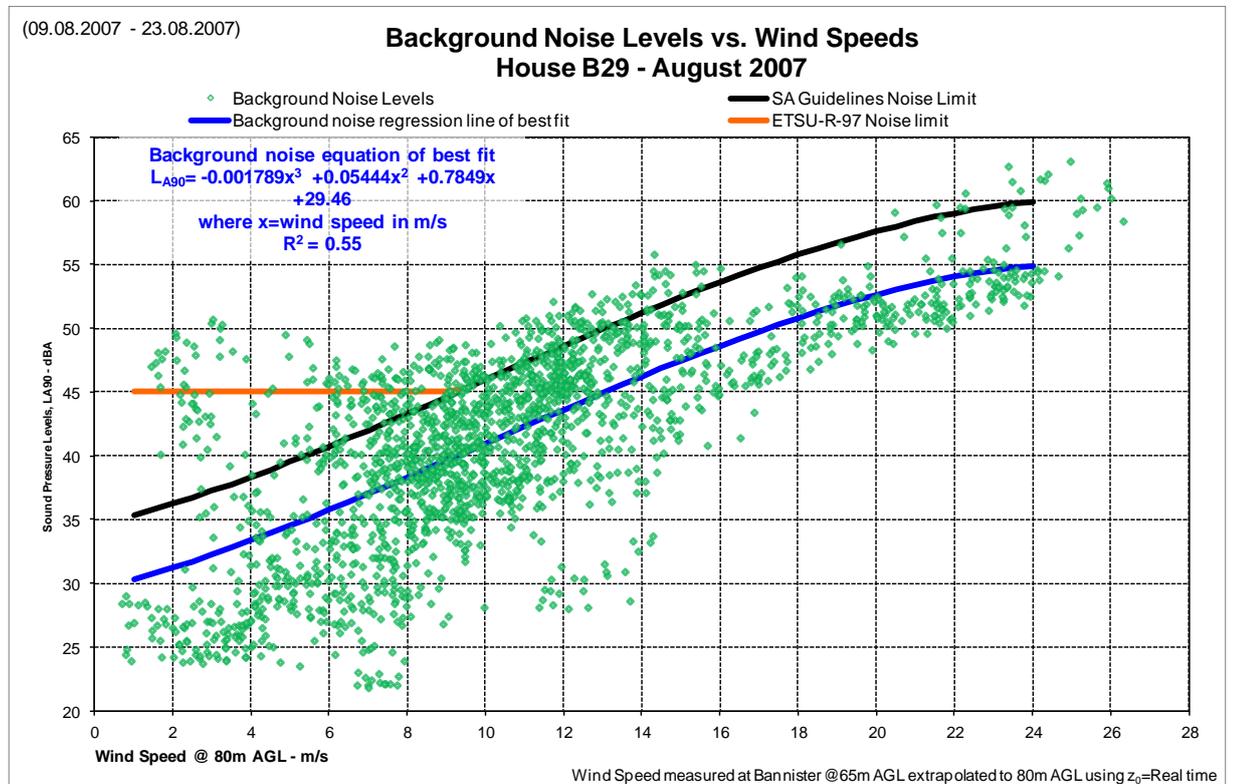


Figure 42: Derived noise limits – House B29

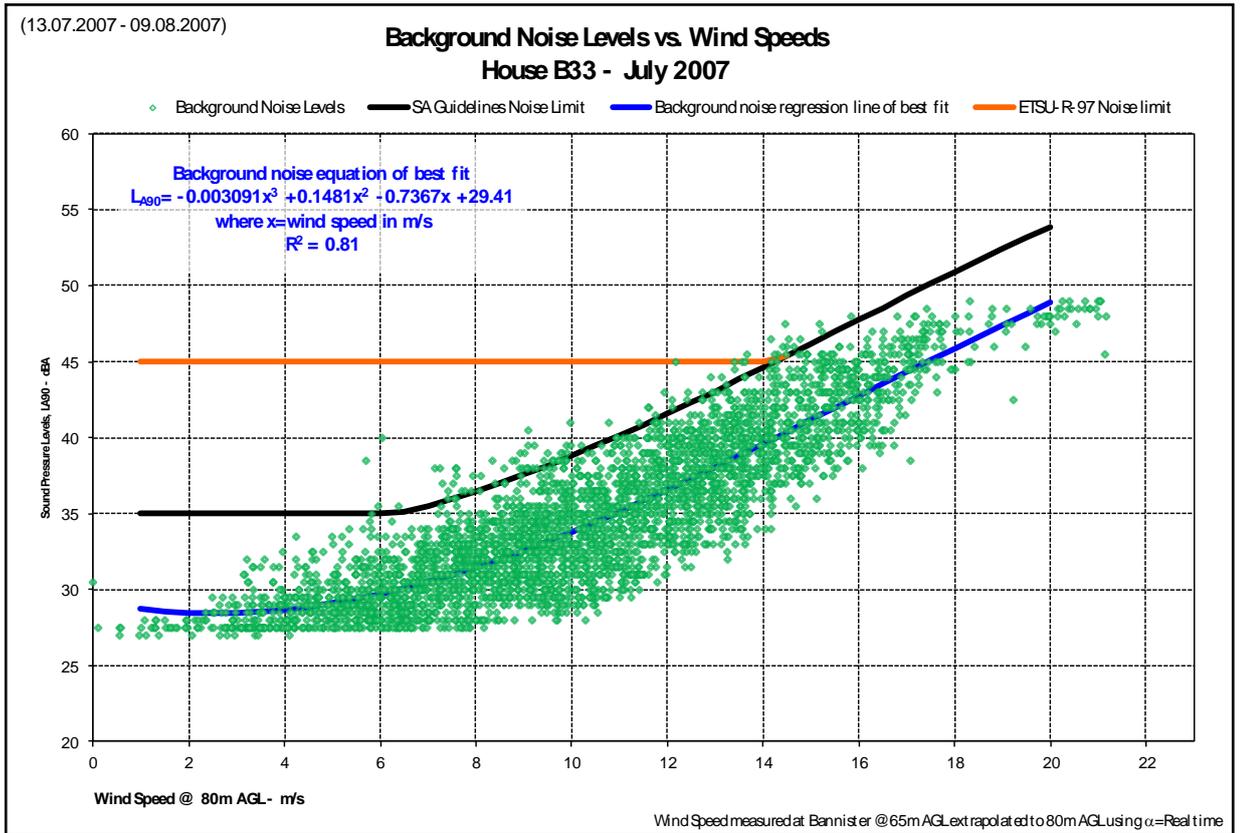


Figure 43: Derived noise limits – House B33

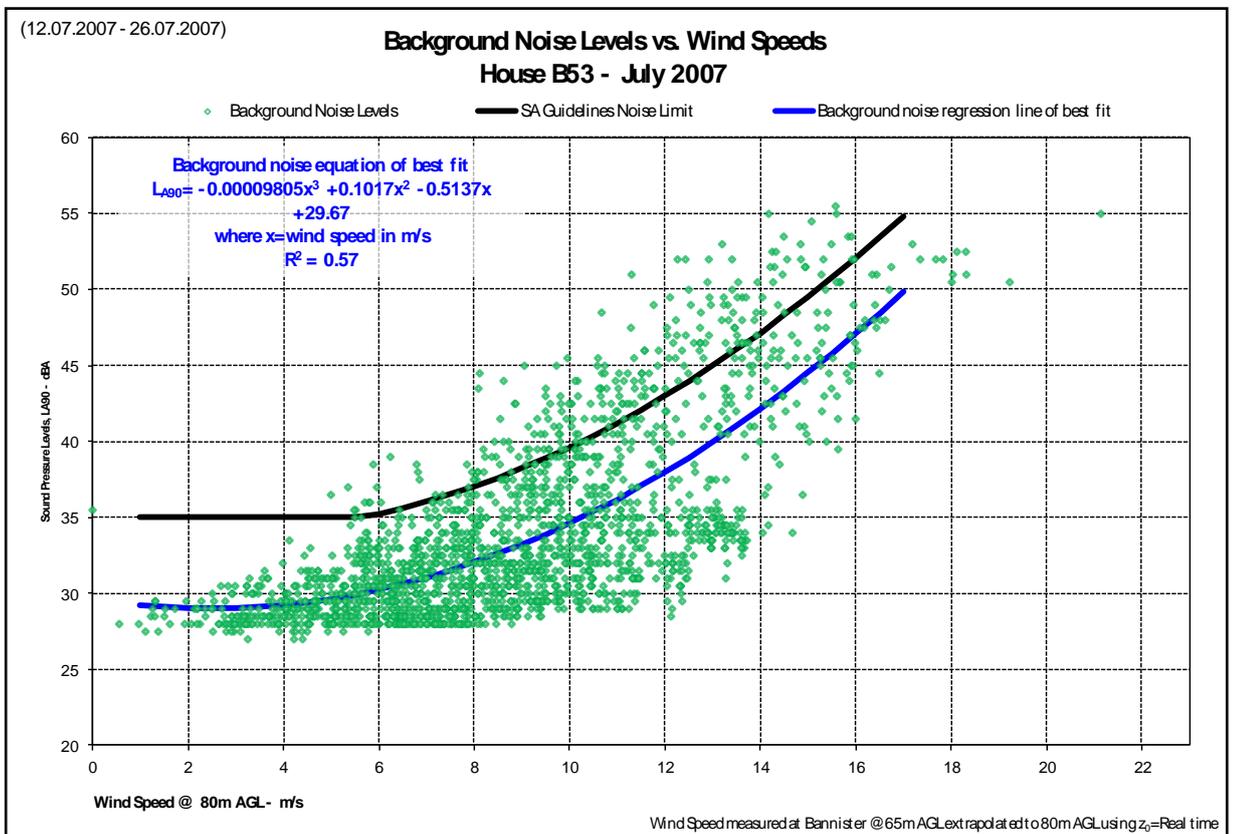


Figure 44: Derived noise limits – House B53

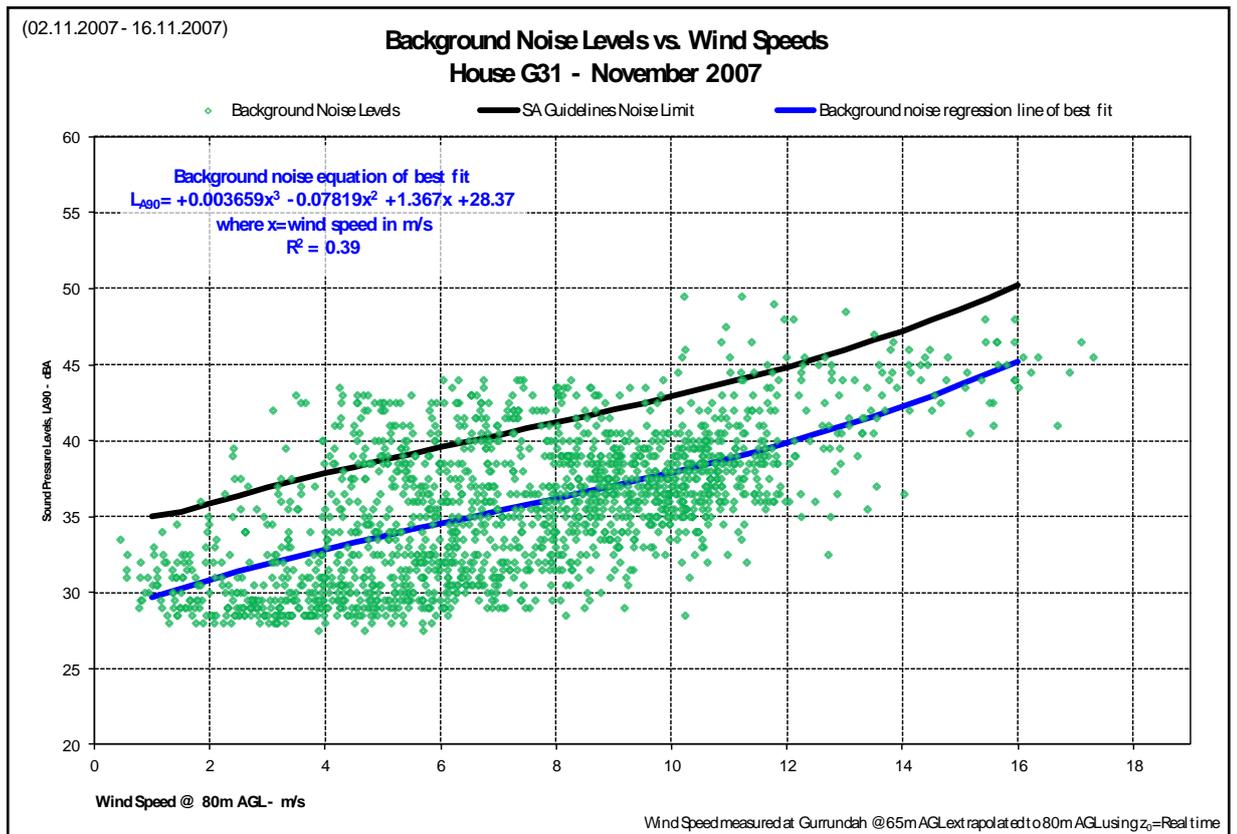


Figure 45: Derived noise limits – House G31

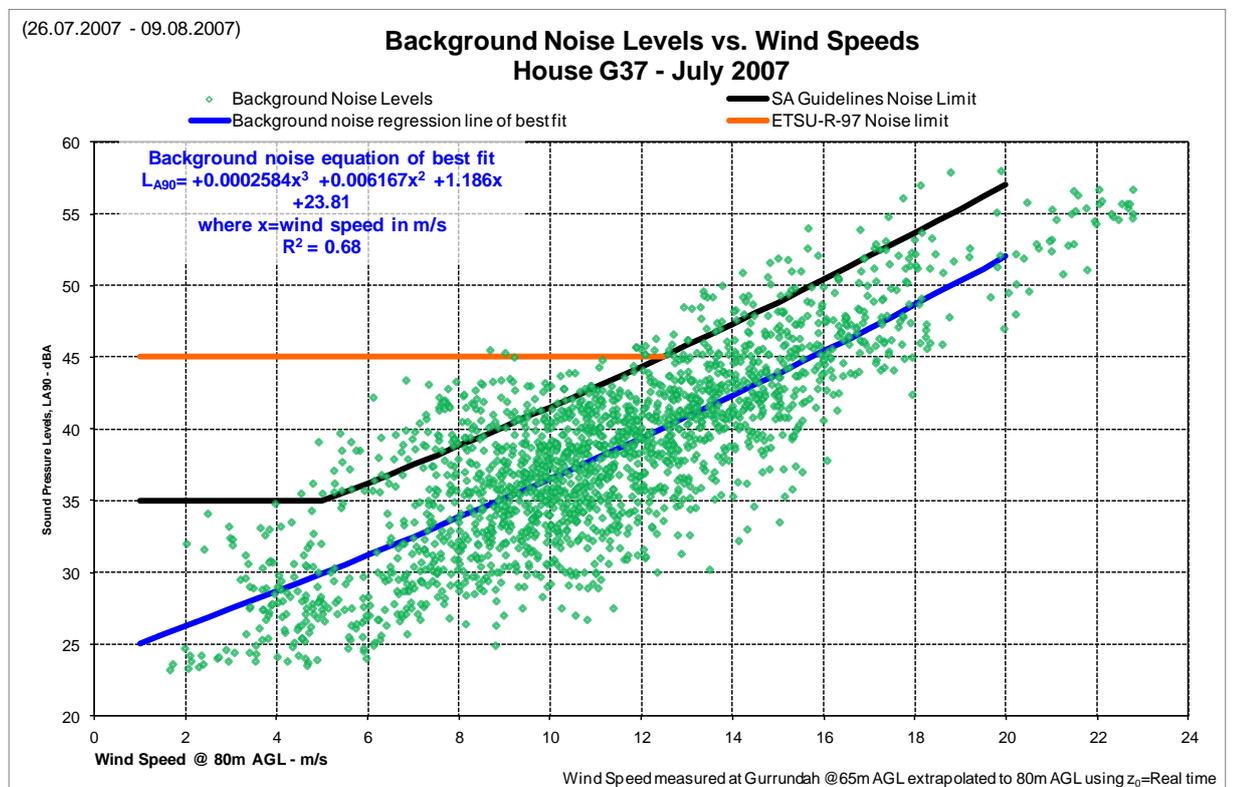


Figure 46: Derived noise limits – House G37

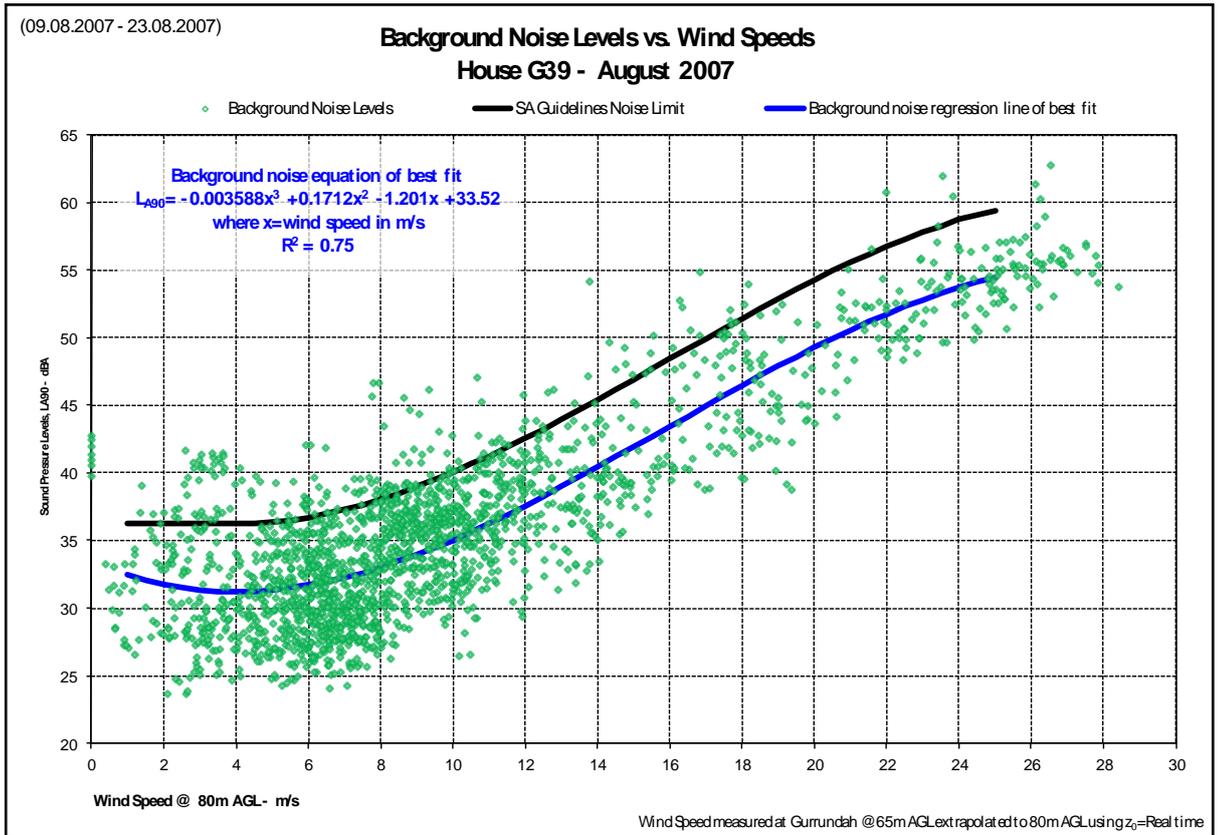


Figure 47: Derived noise limits – House G39

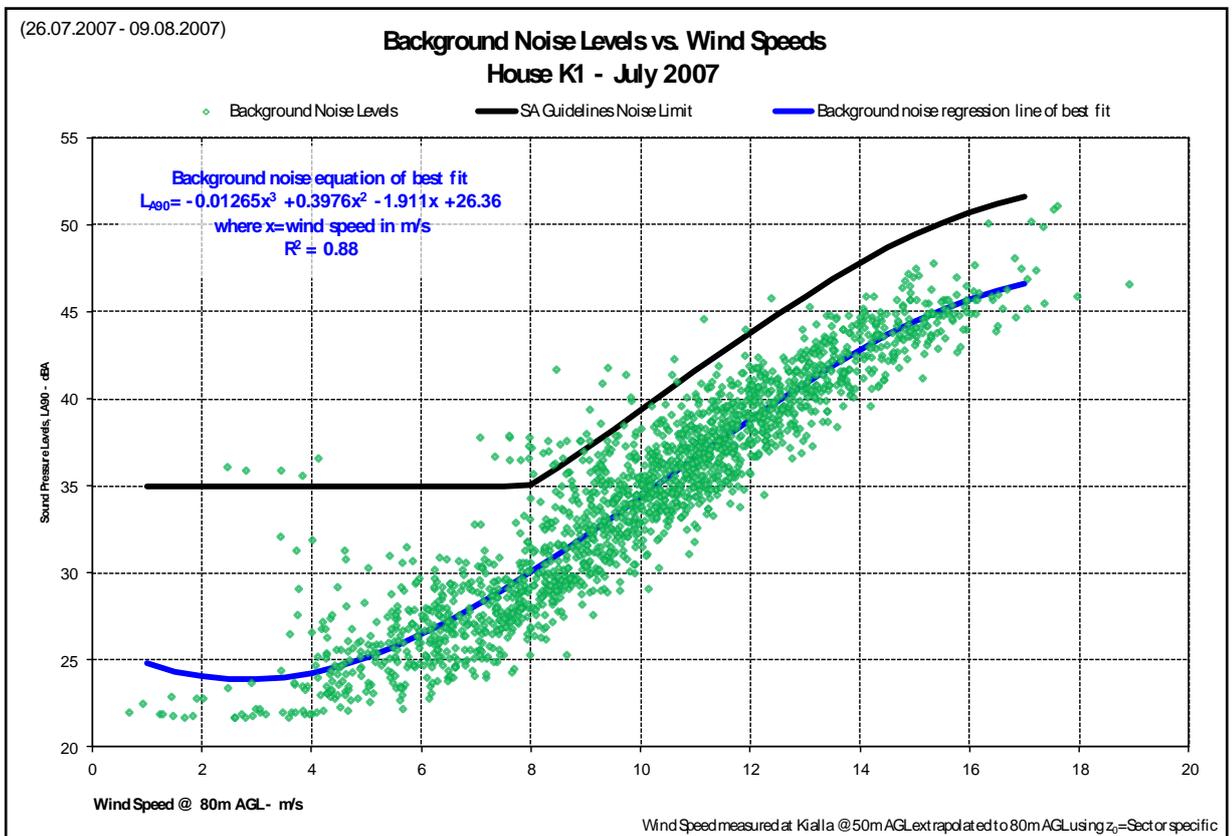


Figure 48: Derived noise limits – House K1

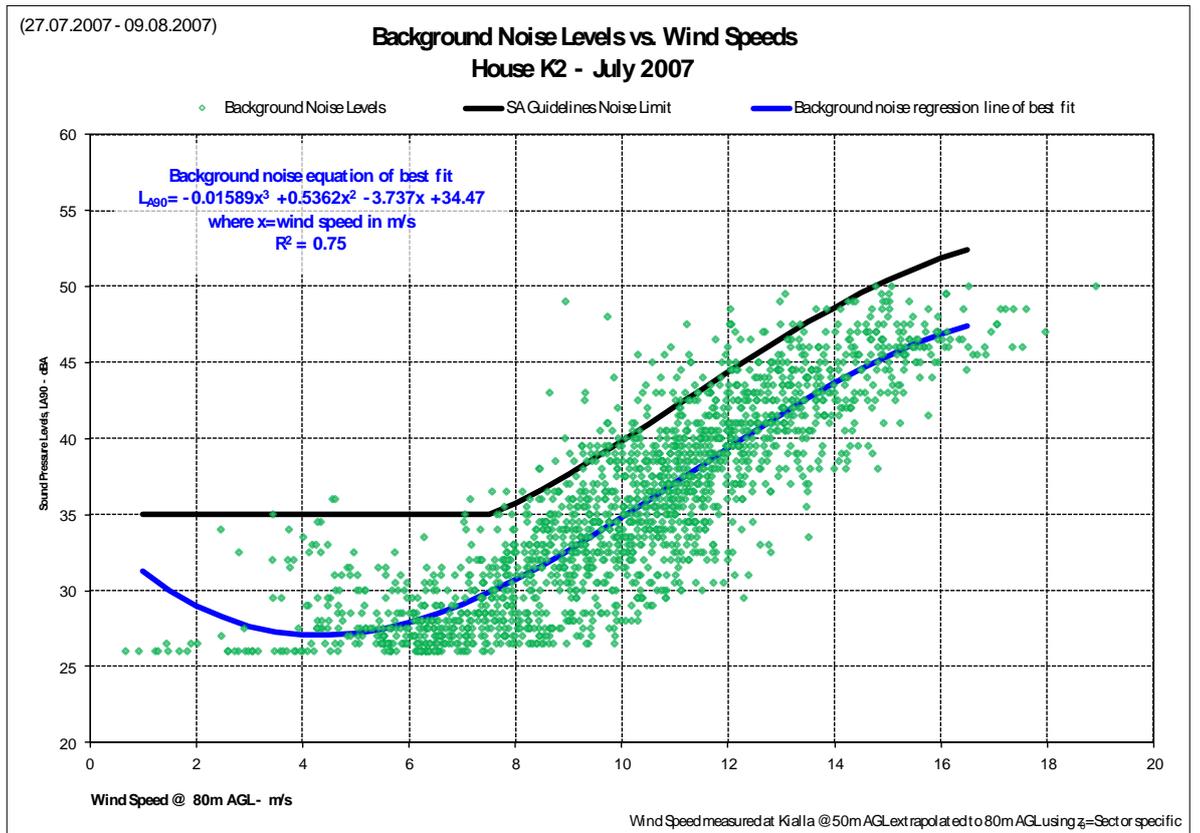


Figure 49: Derived noise limits – House K2

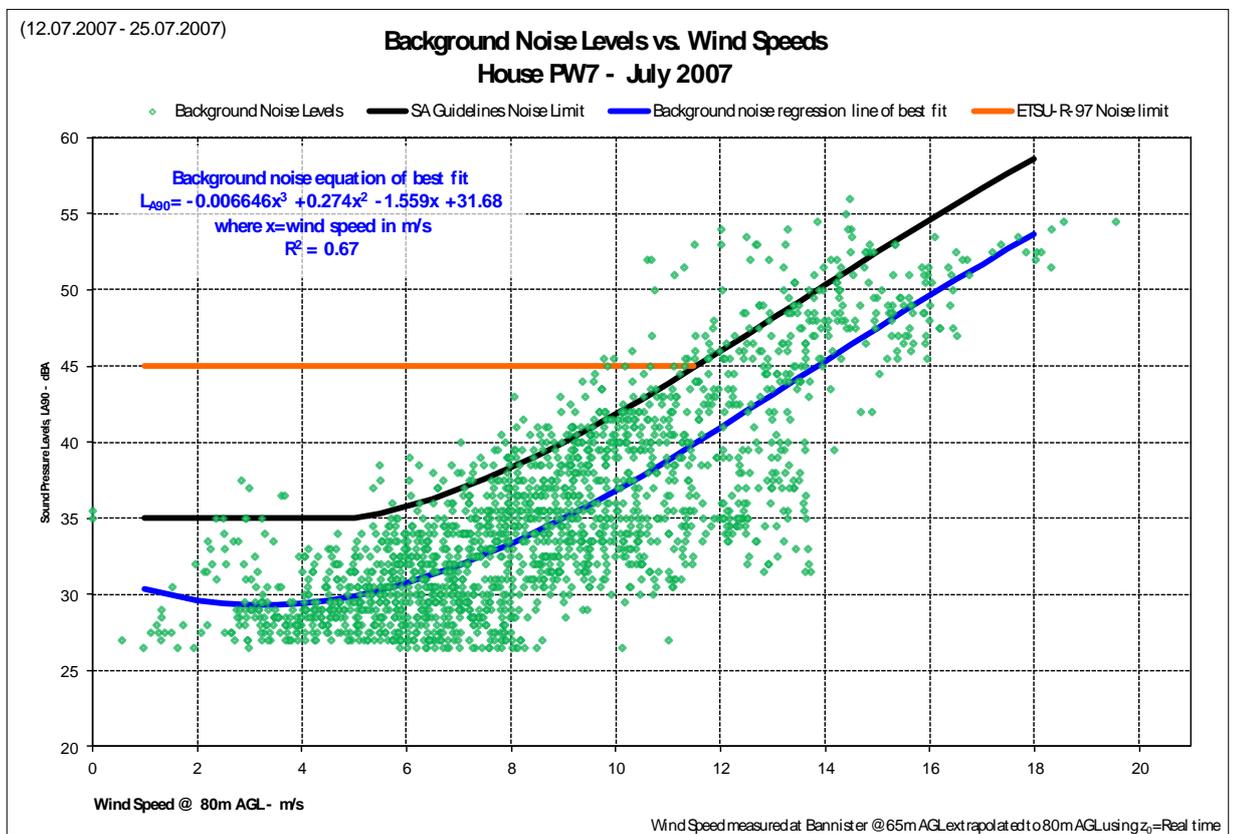


Figure 50: Derived noise limits – House PW7

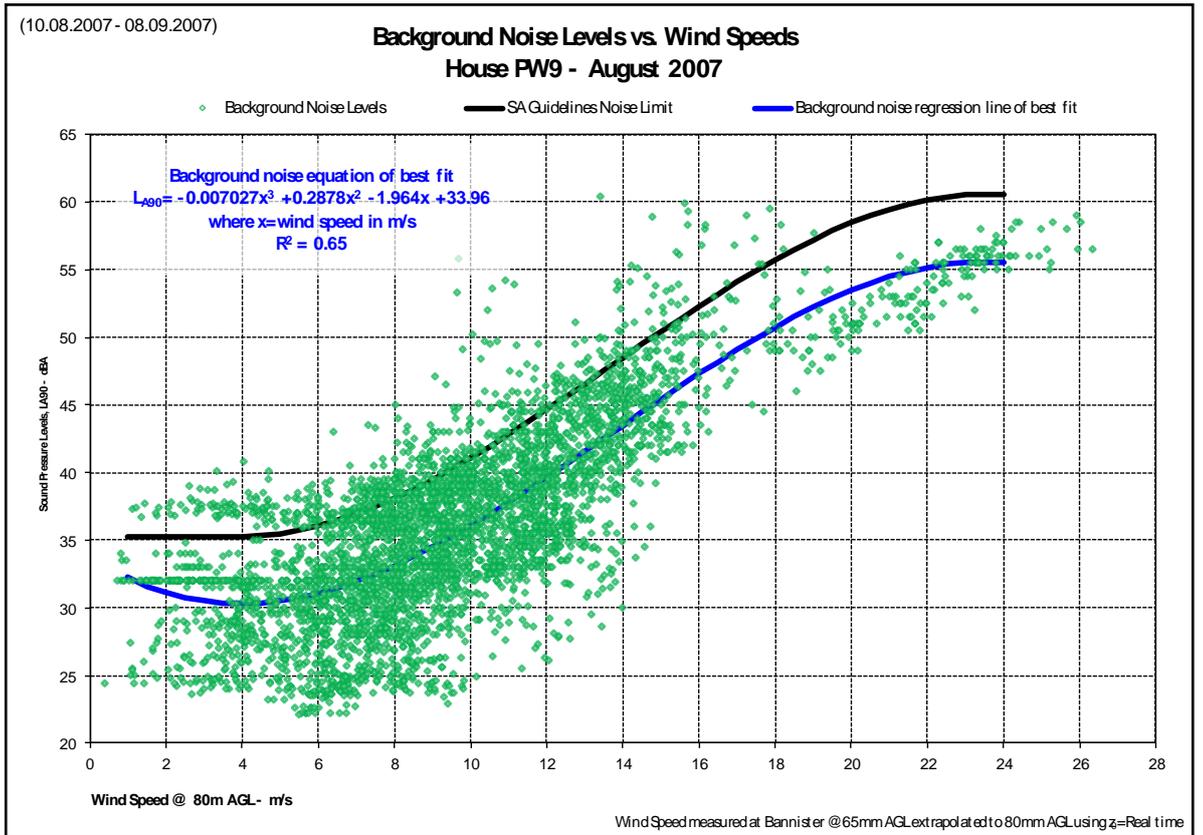


Figure 51: Derived noise limits – House PW9

## APPENDIX F ISO9613-2: 1996 NOISE PREDICTION METHODOLOGY

### F1 ISO9613-2:1996

Environmental noise levels associated with wind farms are predicted using engineering methods. The international standard ISO9613 *Acoustics – Attenuation of sound during propagation outdoors* has been chosen as the most appropriate method to calculate the level of wind farm noise expected to occur at surrounding receptor locations.

The use of this method is supported by international research publications, measurement studies conducted by Marshall Day Acoustics and direct reference to the standard in the South Australian EPA 2009 wind farm noise guidelines, AS4959:2010 *Acoustics – Measurement, prediction and assessment of noise from wind turbine generators* and NZS6808:2010 *Acoustics – Wind farm noise*.

The standard specifies an engineering method for calculating noise at a known distance from a variety of sources under meteorological conditions favourable to sound propagation. The standard defines favourable conditions as downwind propagation where the source blows from the source to the receiver within an angle of +/-45 degrees from a line connecting the source to the receiver, at wind speeds between approximately 1m/s and 5m/s, measured at a height of 3m to 11m above the ground. Equivalently, the method accounts for average propagation under a well-developed moderate ground based thermal inversion. In this respect, it is noted that at the wind speeds relevant to noise emissions from wind turbines, atmospheric conditions do not favour the development of thermal inversions throughout the propagation path from the source to the receiver.

To calculate far-field noise levels according to ISO9613, the noise emissions of each turbine are firstly characterised in the form of octave band frequency levels. A series of octave band attenuation factors are then calculated for a range of effects including:

- Geometric divergence
- Air absorption
- Reflecting obstacles
- Screening
- Vegetation
- Ground reflections

The octave band attenuation factors are then applied to the noise emission data to determine the corresponding octave band and total calculated noise level at relevant receiver locations.

Calculating the attenuation factors for each effect requires a relevant description of the environment into which the sound propagates such as the physical dimensions of the environment, atmospheric conditions and the characteristics of the ground between the source and the receiver.

Wind farm noise propagation has been the subject of considerable research in recent years with studies providing support for the reliability of engineering methods such as ISO9613 when a certain set of input parameters are chosen in combination. Specifically, the studies to date tend to support that the assignment of a ground absorption factor of  $G=0.5$  for the source, middle and receiver ground regions between a wind farm and a calculation point tends to provide a reliable representation of the upper noise levels expected in practice, when modelled in combination with other key assumptions; specifically all turbines operating at identical wind speeds, emitting sound levels equal to the test measured levels plus a margin for uncertainty (or guaranteed values), at a temperature of approximately 10 degrees and relative humidity of approximately 70%.

In support of the use of ISO9613 and the choice of  $G=0.5$  as an appropriate ground characterisation, the following references are noted:

- A factor of  $G=0.5$  is frequently applied in Australia for general environmental noise modelling purposes as a way of accounting for the potential mix of ground porosity which may occur in regions of dry/compacted soils or in regions where persistent damp conditions may be relevant
- NZS6808:2010 refers to ISO9613 as an appropriate prediction methodology for wind farm noise, and notes that soft ground conditions should be characterised by a ground factor of  $G=0.5$
- In 1998, a comprehensive study, part funded by the European Commission, *Development of a Wind Farm Noise Propagation Prediction Model*<sup>2</sup> found that the ISO9613 model provided a robust representation of upper noise levels which may occur in practice, and provided a closer agreement between predicted and measured noise levels than alternative standards such as CONCAWE and ENM. Specifically, the report indicated the ISO 9613 method generally tends to marginally over-predict noise levels expected in practice
- The UK Institute of Acoustics (IoA) journal dated March/April 2009 published a joint agreement between practitioners in the field of wind farm noise assessment, including consultants routinely employed on behalf of both developers and community opposition groups, and indicated the ISO9613 method as the appropriate standard and specifically designated  $G=0.5$  as the appropriate ground characterisation. It is noted that this publication specifically referred to predictions made to receiver heights of 4m in the interest of representing 2-storey dwellings which are more common in the UK. Predictions in Australia are generally based on a lower prediction height of 1.5m which tends to result in higher attenuation factors for a given ground absorption factor, however conversely, predictions in Australia do not generally incorporate a -2dB factor (as applied in the UK) to represent the relationship between  $L_{Aeq}$  and  $L_{A90}$  noise levels. The result is that these differences tend to balance out to a comparable approach and thus supports the use of  $G=0.5$  in the context of Australian prediction methodologies.

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<sup>2</sup> Bass, Bullmore and Sloth - *Development of a wind farm noise propagation prediction model*;  
Contract JOR3-CT95-0051, Final Report, January 1996 to May 1998.

- The IoA document *A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise* (IOA GPG) published in May 2013 provides detailed descriptive advice to assist with the use of ETSU-R-97 for noise assessment of UK wind farm developments. The good practice guide recommends a ground factor of  $G = 0.5$  when used in conjunction with the inputs described in the UK (IoA) journal article noted above.
- A range of comparative measurement and prediction studies<sup>345</sup> for wind farms in which Marshall Day Acoustics' staff have been involved in have provided further support for the use of ISO9613 and  $G=0.5$  as an appropriate representation of typical upper noise levels expected to occur in practice.

The key findings of the above studies demonstrated the suitability of the ISO 9613 method to predict the propagation of wind turbine noise for:

- the types of noise source heights associated with a modern wind farm, extending the scope of application of the method beyond the 30m maximum source heights considered in the original ISO 9613;
- the types of environments in which wind farms are typically developed, and the range of atmospheric conditions and wind speeds typically observed around wind farm sites. Importantly, this supports the extended scope of application to wind speeds in excess of 5m/s.

A ground factor of  $G = 0.5$  has been used for noise predictions in this noise assessment.

## F2 Additional considerations

As noted above, in 1998 a comprehensive study into wind farm noise propagation, part funded by the European Commission, was reported in the document *Development of a Wind Farm Noise Propagation Prediction Model*<sup>6</sup> which is commonly referred to as the Joule Report. The Joule Report details supplementary adjustments of barrier and terrain attenuation in certain cases for which the ISO9613 predictions may potentially underestimate receptor noise levels. The adjustments are as follows:

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<sup>3</sup> Bullmore, Adcock, Jiggins & Cand – *Wind Farm Noise Predictions: The Risks of Conservatism*; Presented at the Second International Meeting on Wind Turbine Noise in Lyon, France September 2007.

<sup>4</sup> Bullmore, Adcock, Jiggins & Cand – *Wind Farm Noise Predictions and Comparisons with Measurements*; Presented at the Third International Meeting on Wind Turbine Noise in Aalborg, Denmark June 2009.

<sup>5</sup> Delaire, Griffin, & Walsh – *Comparison of predicted wind farm noise emission and measured post-construction noise levels at the Portland Wind Energy Project in Victoria, Australia*; Presented at the Fourth International Meeting on Wind Turbine Noise in Rome, April 2011.

<sup>6</sup> Bass, Bullmore and Sloth - *Development of a wind farm noise propagation prediction model*; Contract JOR3-CT95-0051, Final Report, January 1996 to May 1998.

- In instances where the ground terrain provides marginal or partial acoustic screening, the barrier effect should be limited to not more than 3dB
- In instances where the ground falls away significantly between a source and receiver, such as can occur across valleys, an adjustment of 3dB should be added to the calculated sound pressure level. A terrain profile in which the ground falls away significantly is defined as one where the mean sound propagation height is at least 50% greater than would occur over flat ground

A comparable set of adjustments has also recently been detailed in the IOA GPG which recommends:

- Limiting barrier effects to no more than 2dB and only if there is no direct line of sight between the maximum rotor tip height and the receiver
- A correction of +3dB for propagation across a concave ground profile, again defined as a terrain profile in which the mean sound propagation height is at least 50% greater than would occur over flat ground. The IOA GPG does however note that "*small changes in distance and height may trigger (or not) the criterion when the actual saturation has not changed significantly.*"

It is not presently possible to directly apply these barrier and terrain adjustments in the SoundPlan modelling software or any other proprietary noise prediction software package that we are aware of. In lieu, therefore, the SoundPlan model used to calculate noise levels using the ISO 9613 standard has been configured to limit the barrier attenuation to not more than 2dB based on direct line of sight between the turbine hub height and the receiver. Additionally, an informative sensitivity analysis has been carried out to qualify the likelihood of these additional barrier and terrain adjustments influencing predicted noise levels for the project, by considering:

- the likely change in barrier attenuation that may result from line of sight to the maximum rotor tip height rather than the turbine hub height
- the likely influence of areas of concave ground profile between source receiver pairings

This informative analysis indicates a potential reduction in barrier attenuation of up to 0.2dB and a potential terrain adjustment of +3dB for some source-receiver pairings. The sensitivity analysis indicates that these additional adjustments are not expected to affect the compliance outcomes which have been demonstrated in Section 5.0. The analysis has however identified the following receiver locations where the uncertainty tolerance of predicted barrier and terrain effects may be comparatively larger: B12, G29, G37, G39 & PW34.

## **APPENDIX G PREDICTED NOISE LEVELS CHARTS**

The following charts show the applicable noise criteria and the predicted noise levels for all relevant receivers and background noise monitoring locations. The noise criteria displayed on the charts reference the proxy noise monitoring location from which the criteria have been derived.

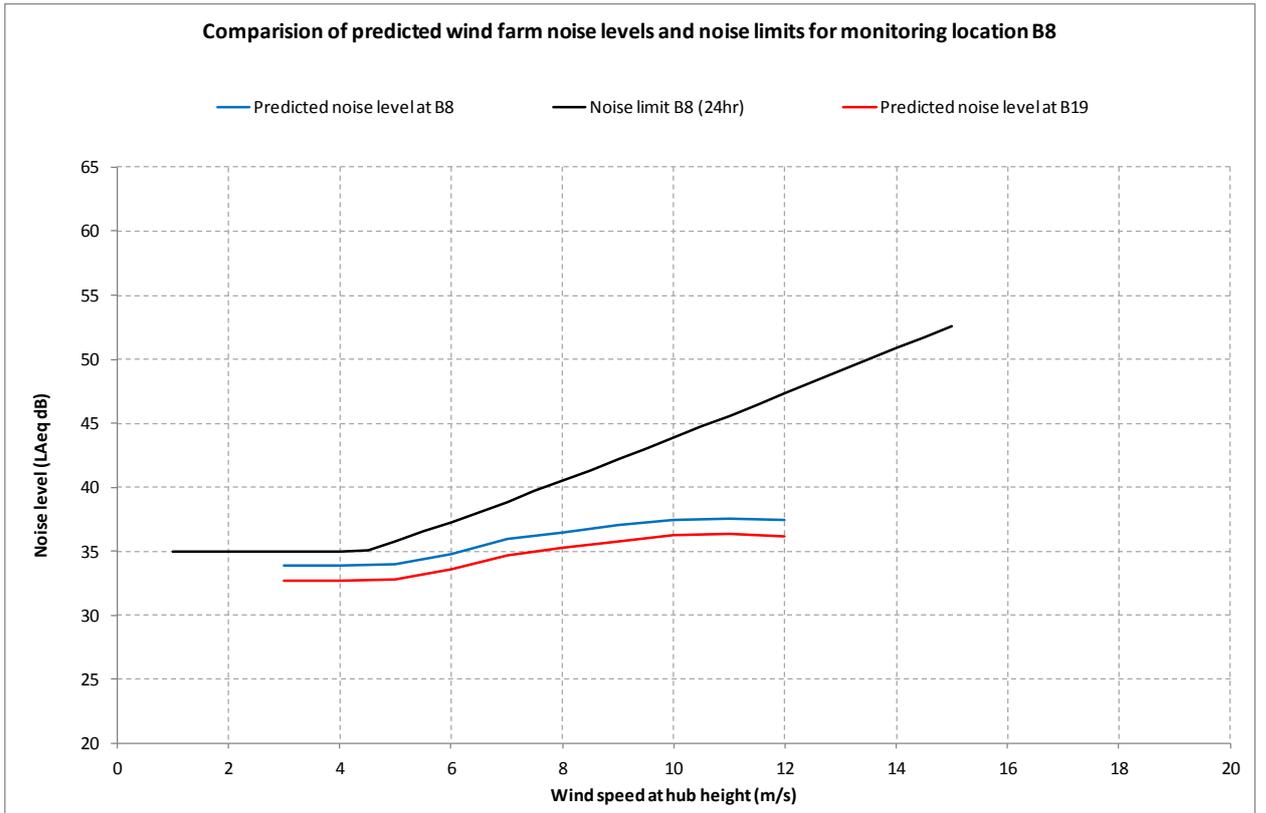


Figure 52: Wind farm compliance for monitoring location B8

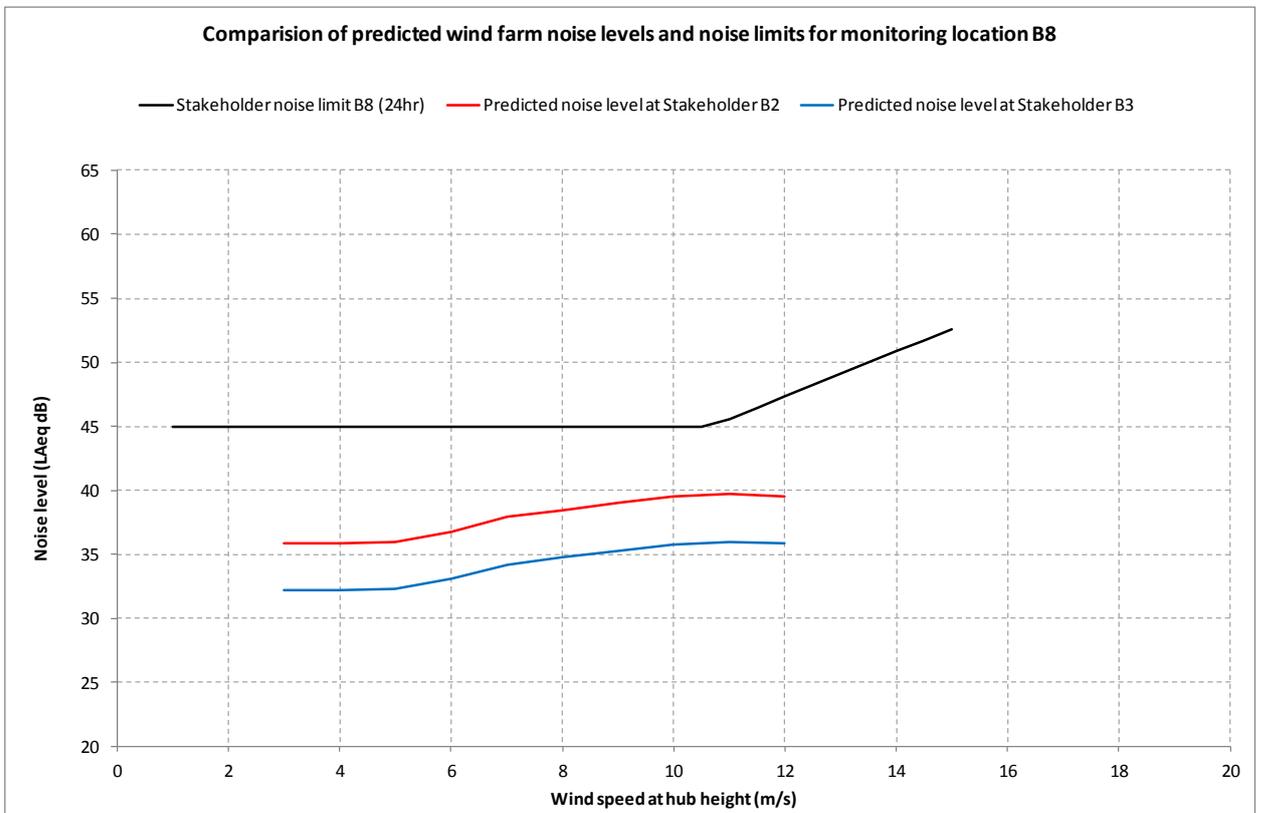


Figure 53: Wind farm compliance for monitoring location B8 ( associated receivers)

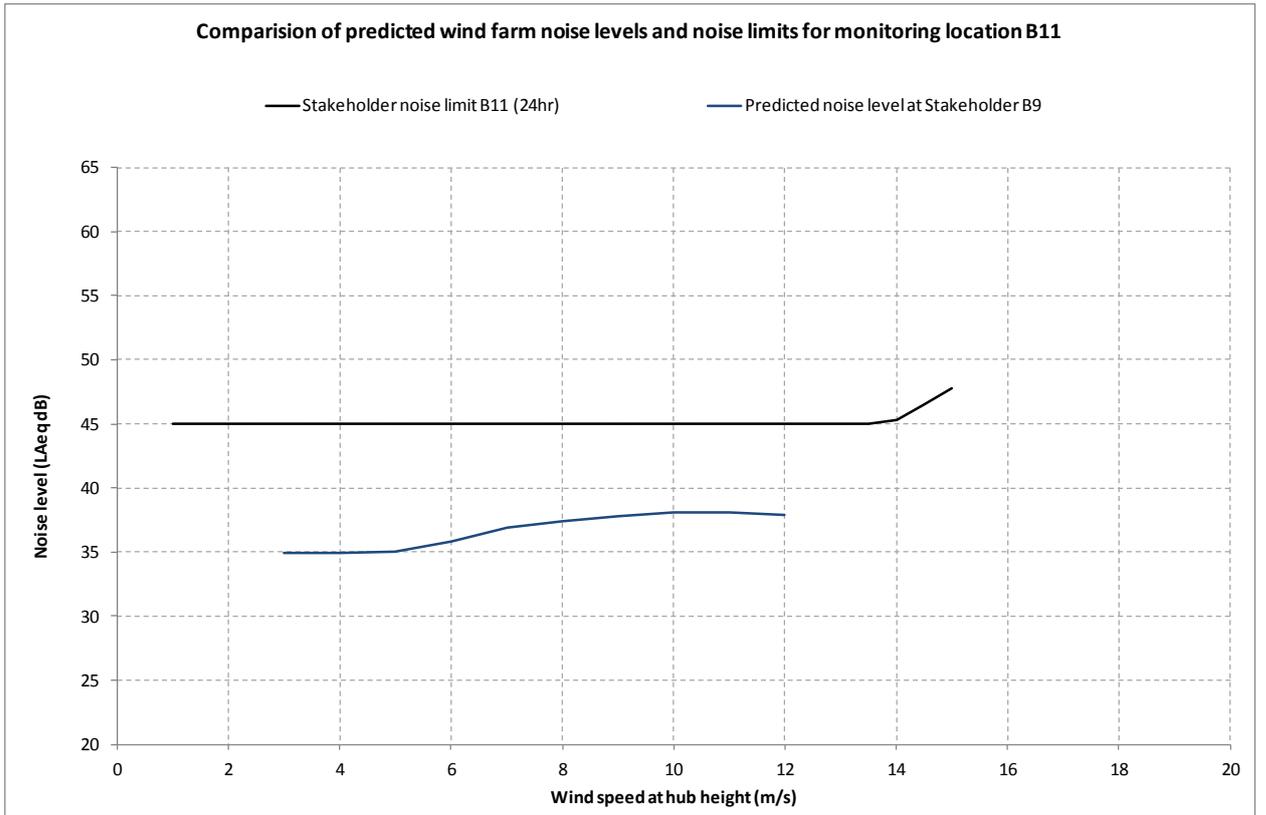


Figure 54: Wind farm compliance for monitoring location B11 ( associated receivers)

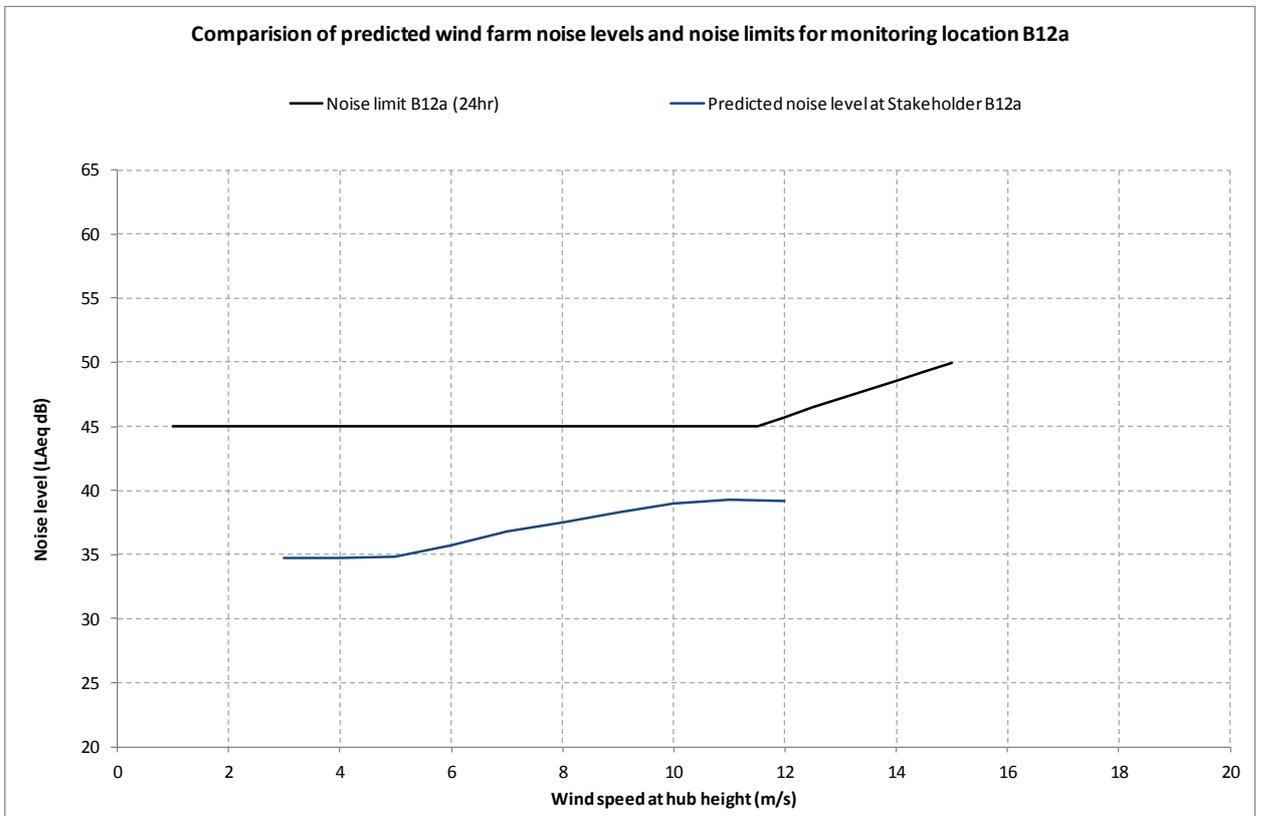


Figure 55: Wind farm compliance for monitoring location B12a ( associated receivers)

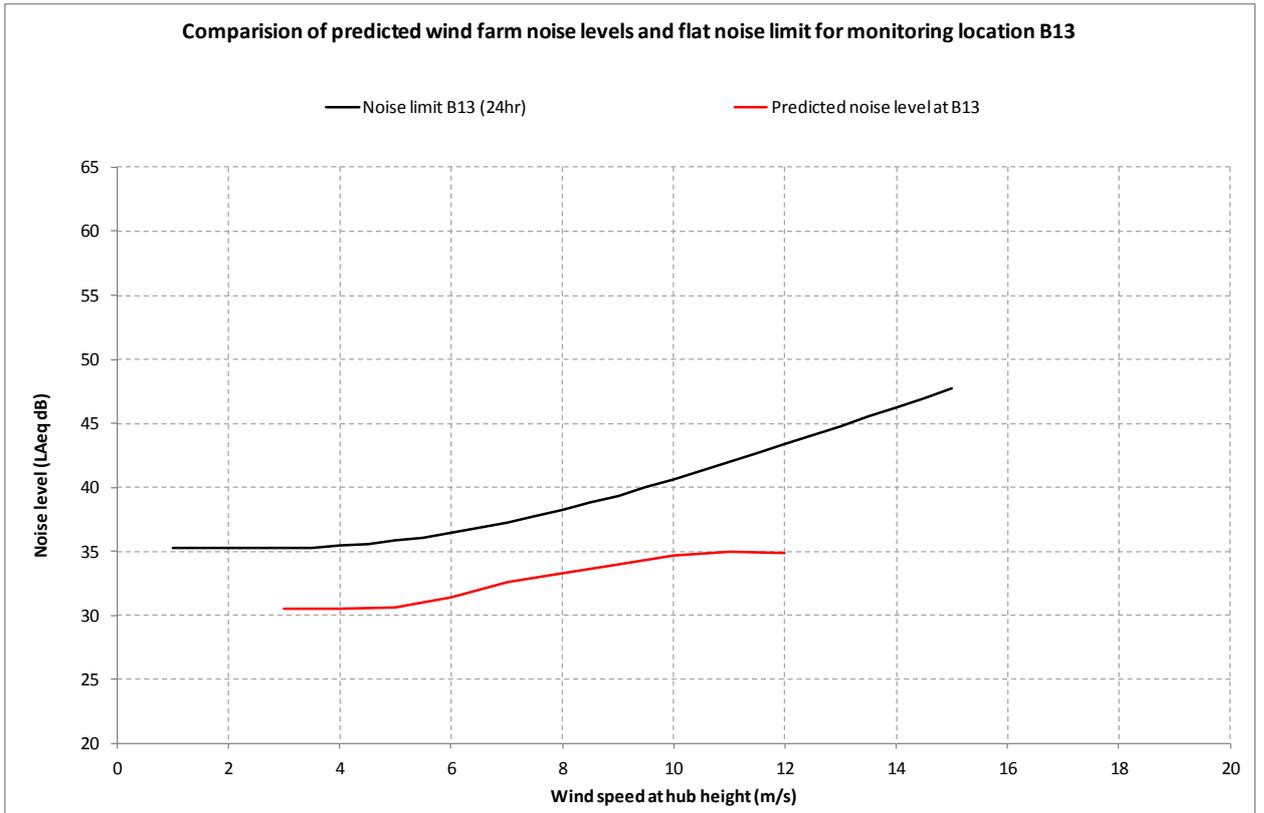


Figure 56: Wind farm compliance for monitoring location B13

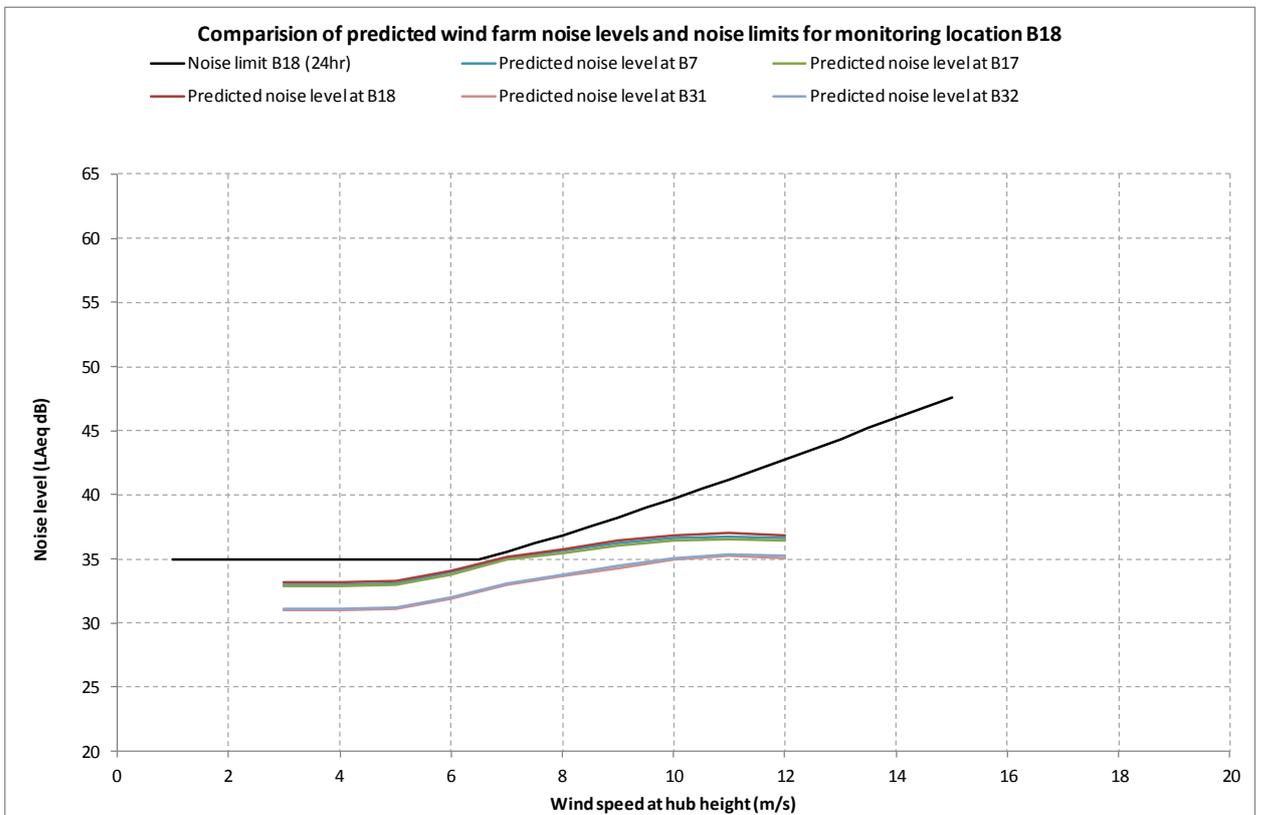


Figure 57: Wind farm compliance for monitoring location B18

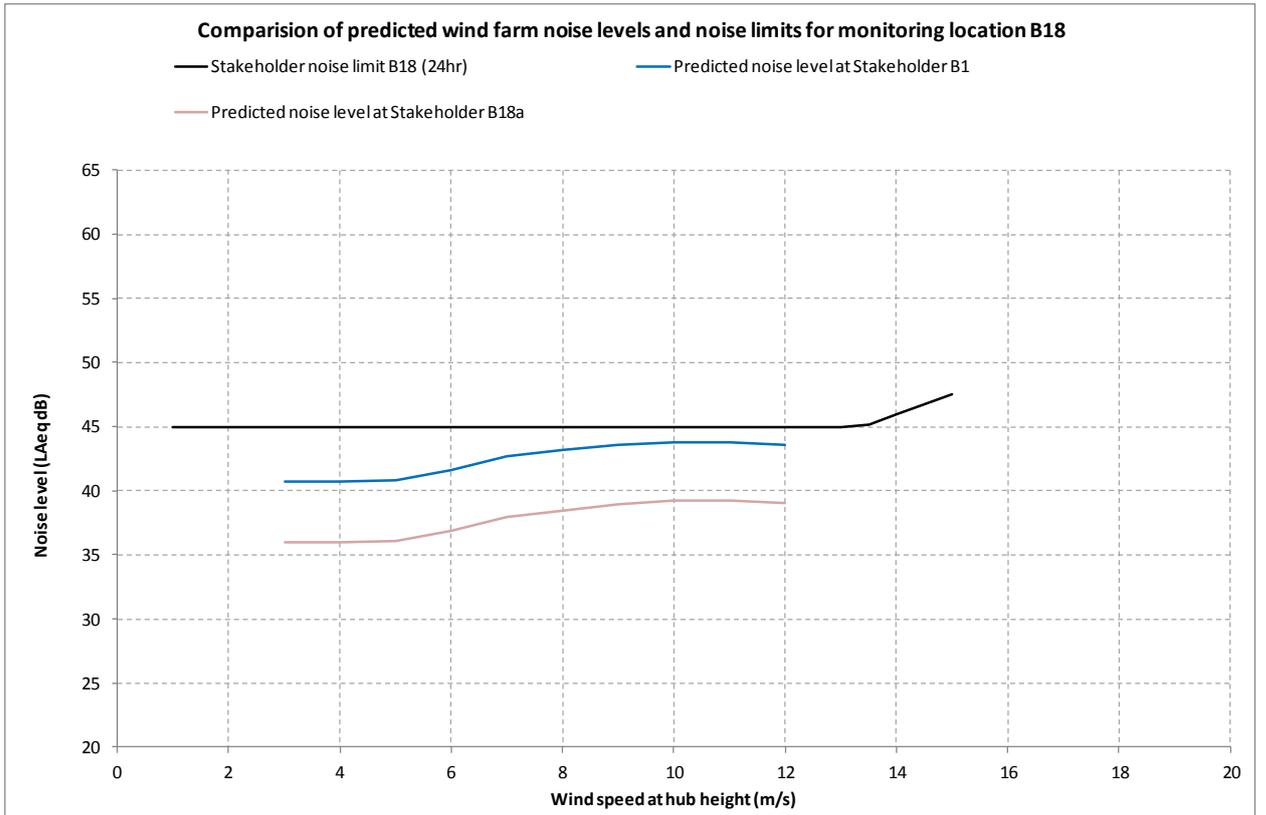


Figure 58: Wind farm compliance for monitoring location B18 ( associated receivers)

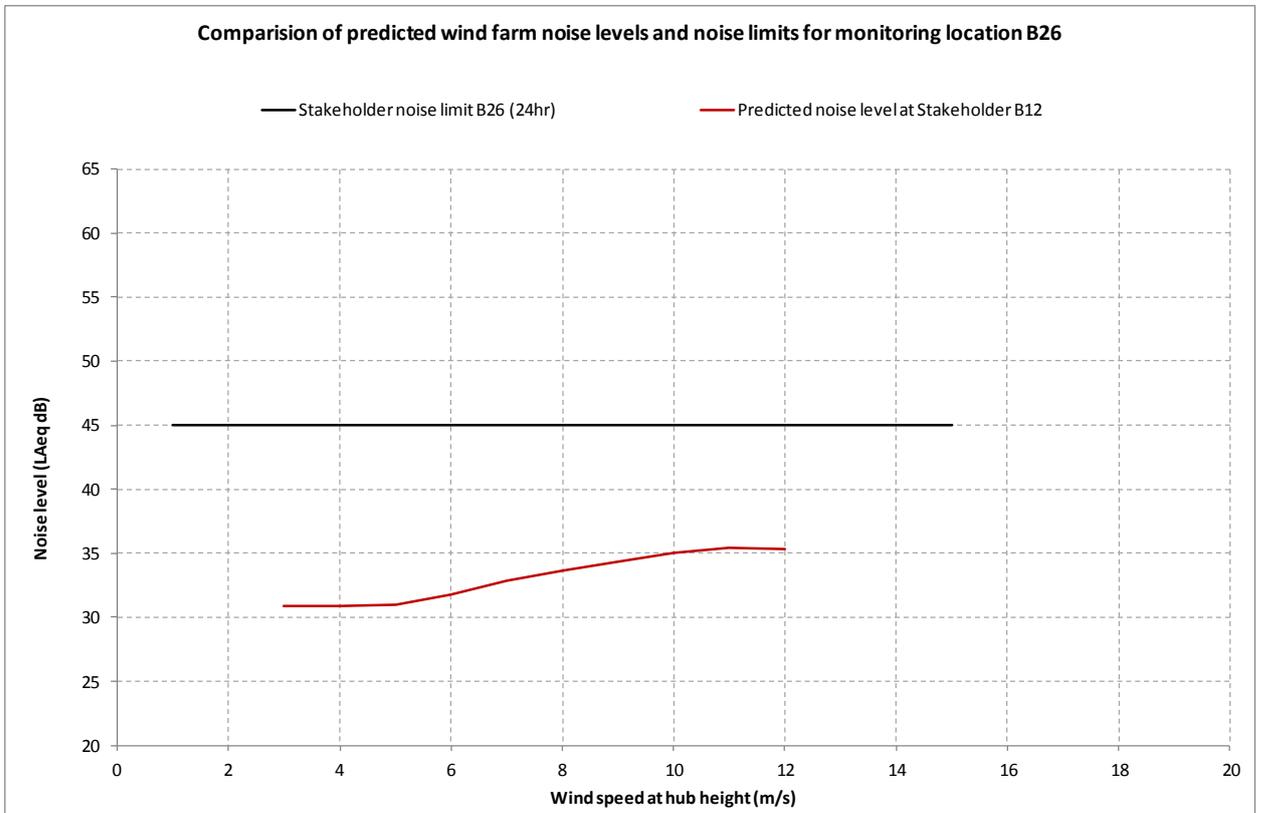


Figure 59: Wind farm compliance for monitoring location B26 ( associated receiver)

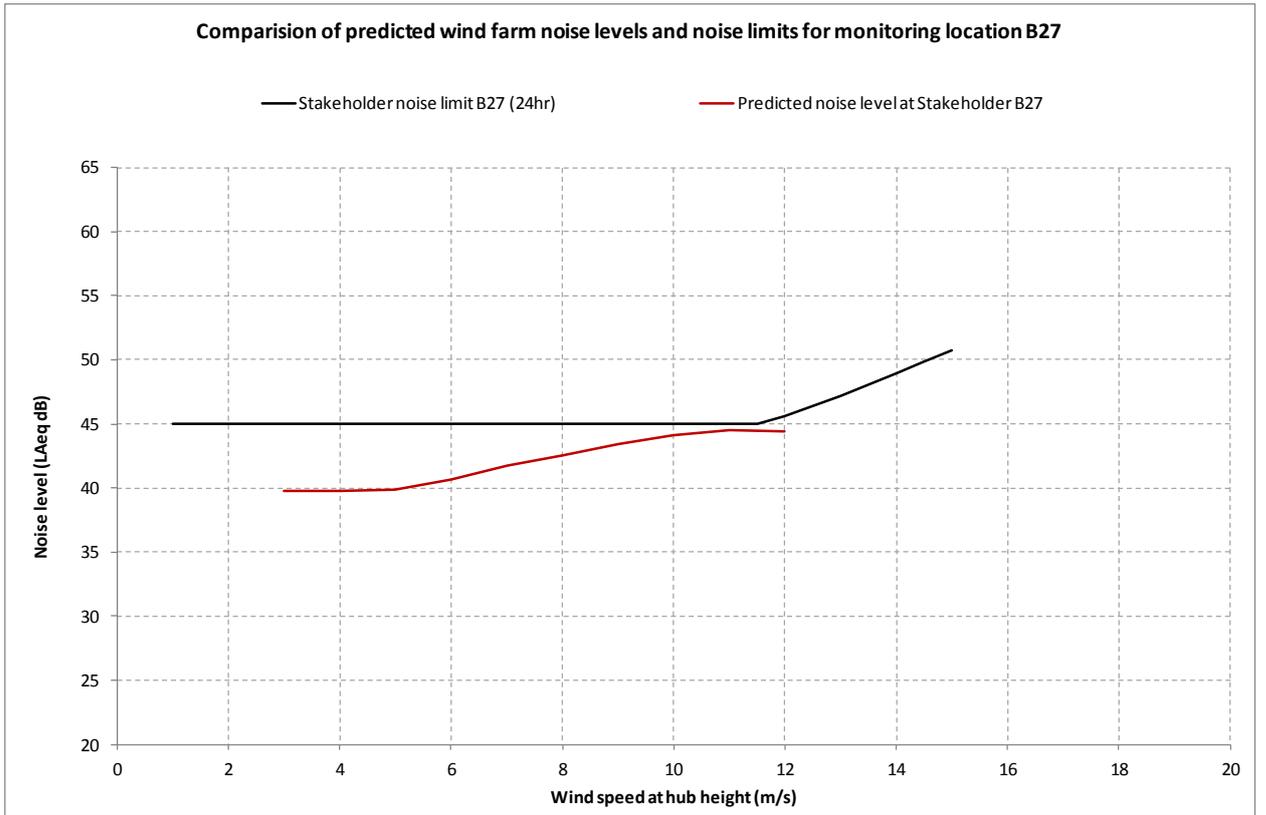


Figure 60: Wind farm compliance for monitoring location B27 ( associated receiver)

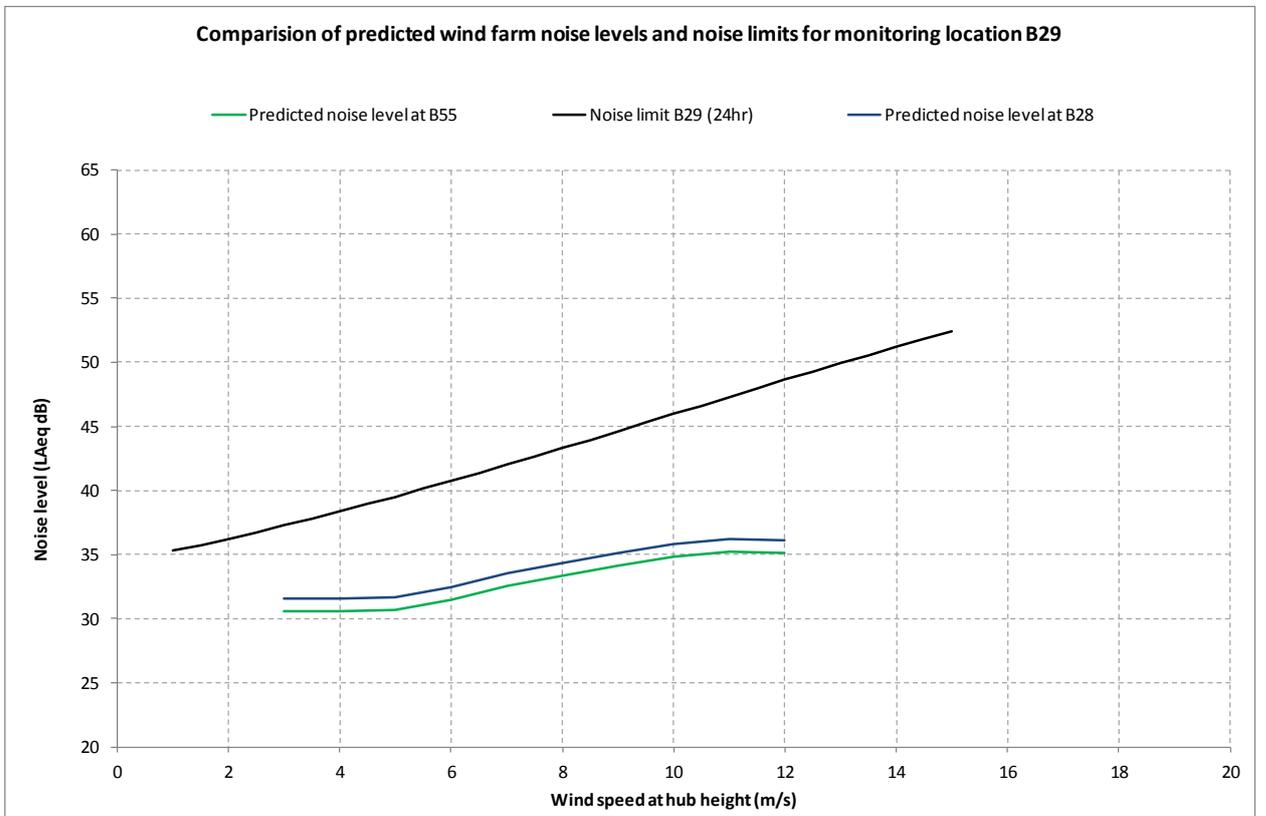


Figure 61: Wind farm compliance for monitoring location B29

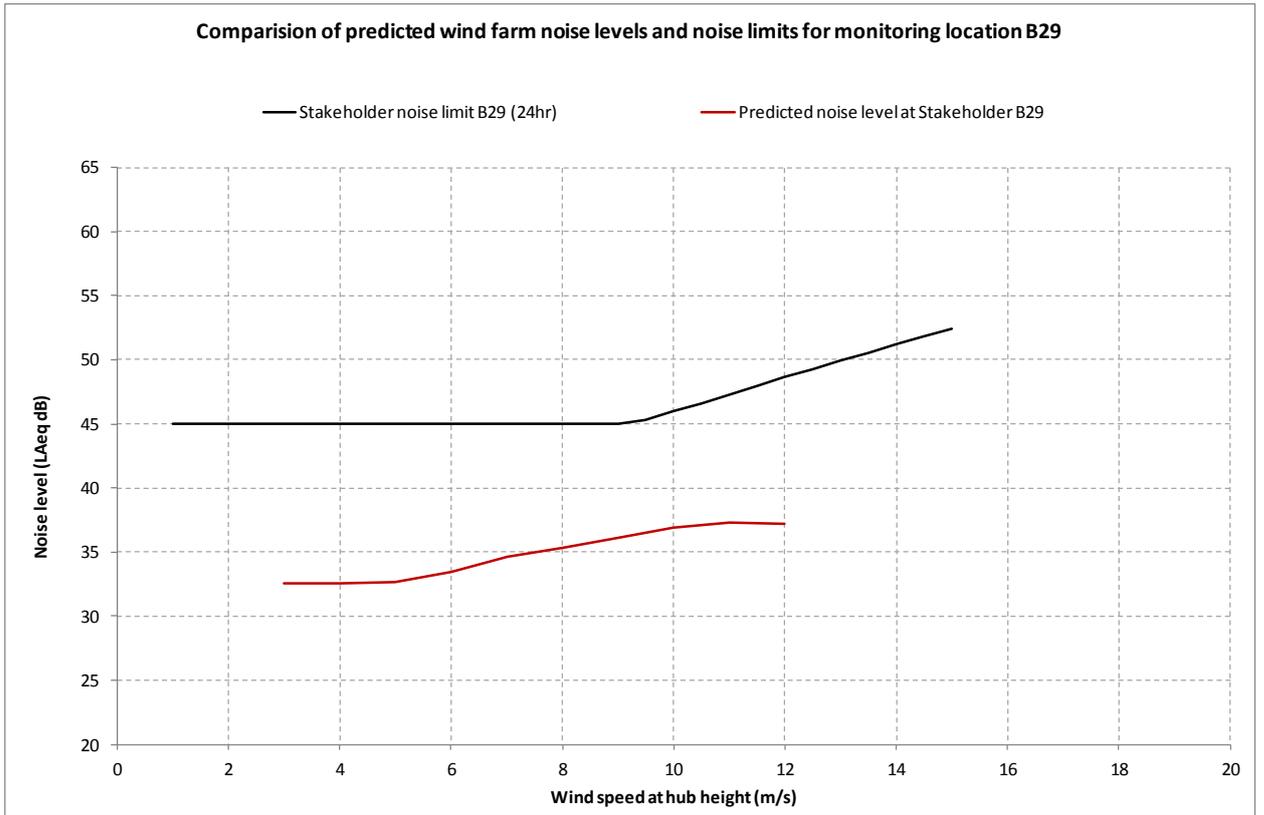


Figure 62: Wind farm compliance for monitoring location B29 (associated receiver)

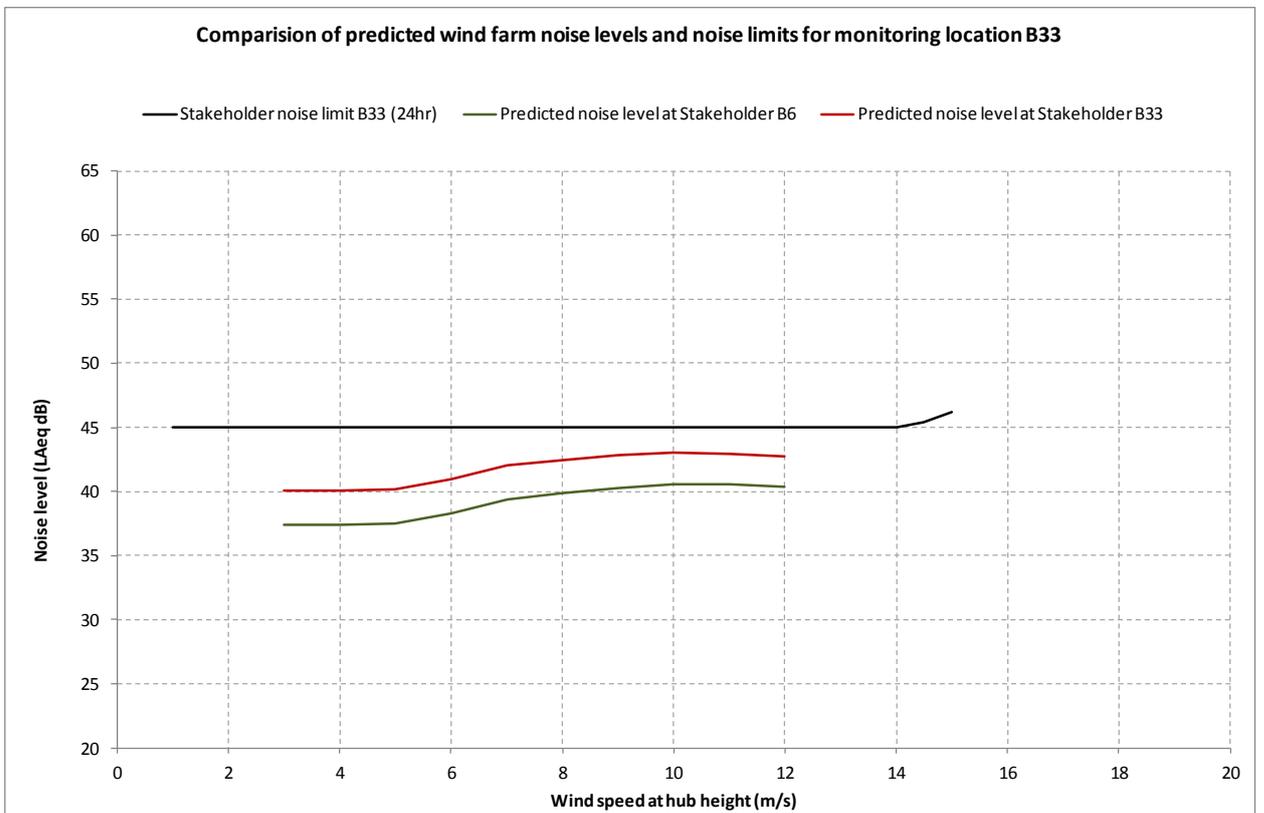


Figure 63: Wind farm compliance for monitoring location B33 (associated receivers)

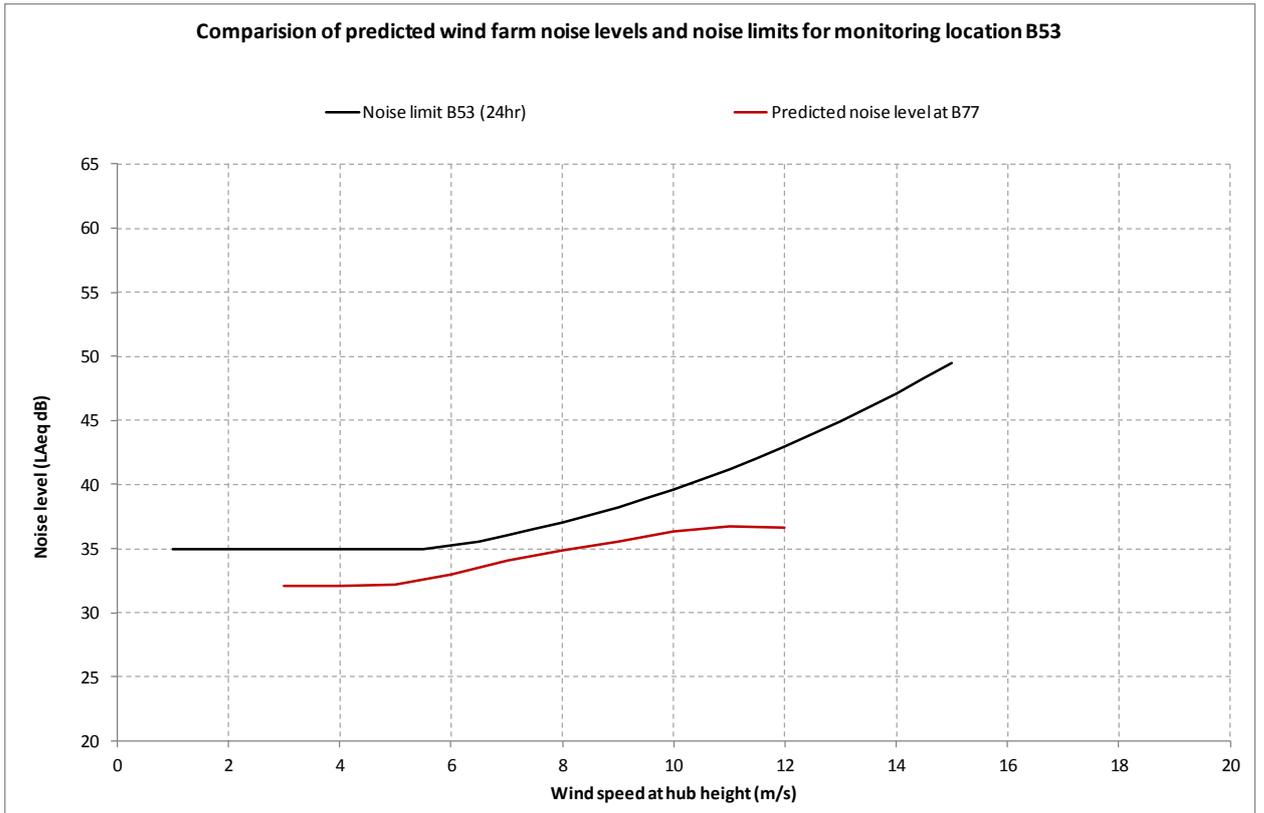


Figure 64: Wind farm compliance for monitoring location B53

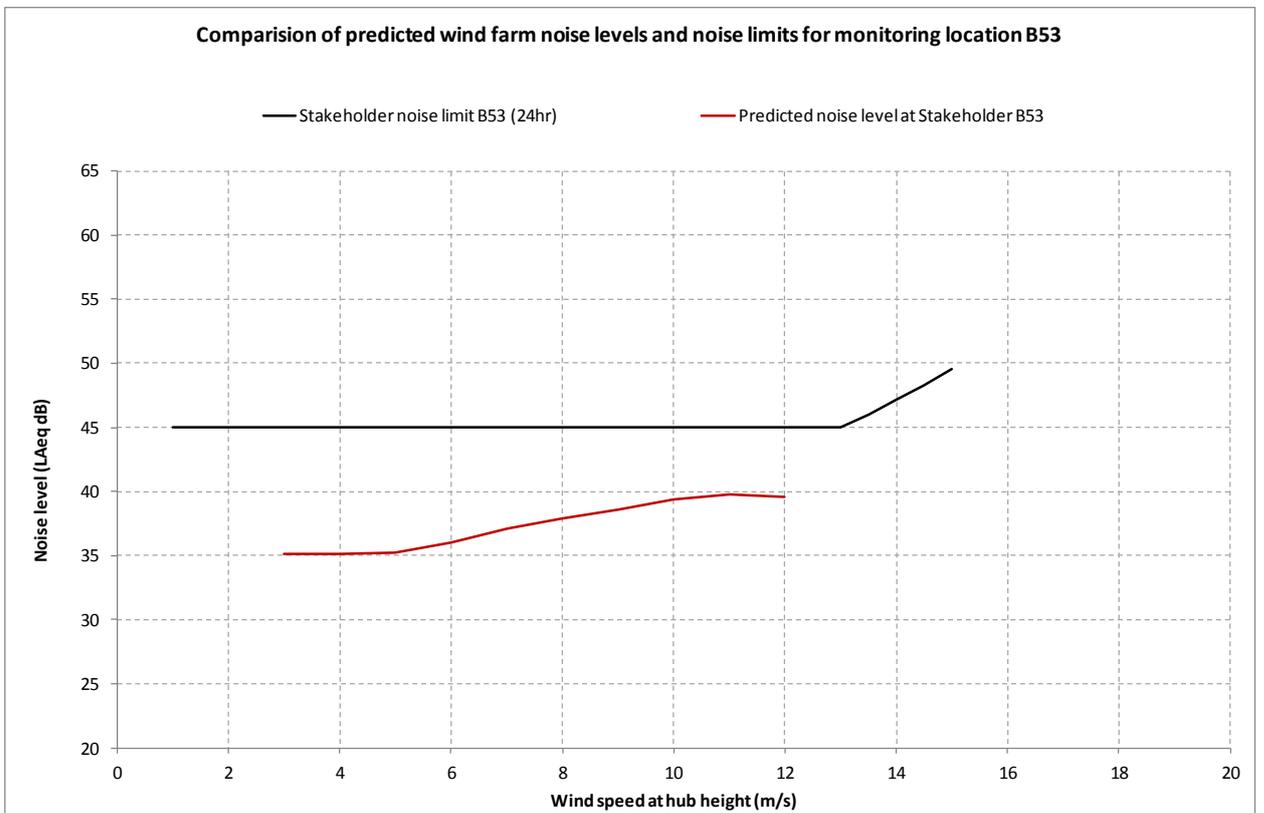


Figure 65: Wind farm compliance for monitoring location B53 (associated receiver)

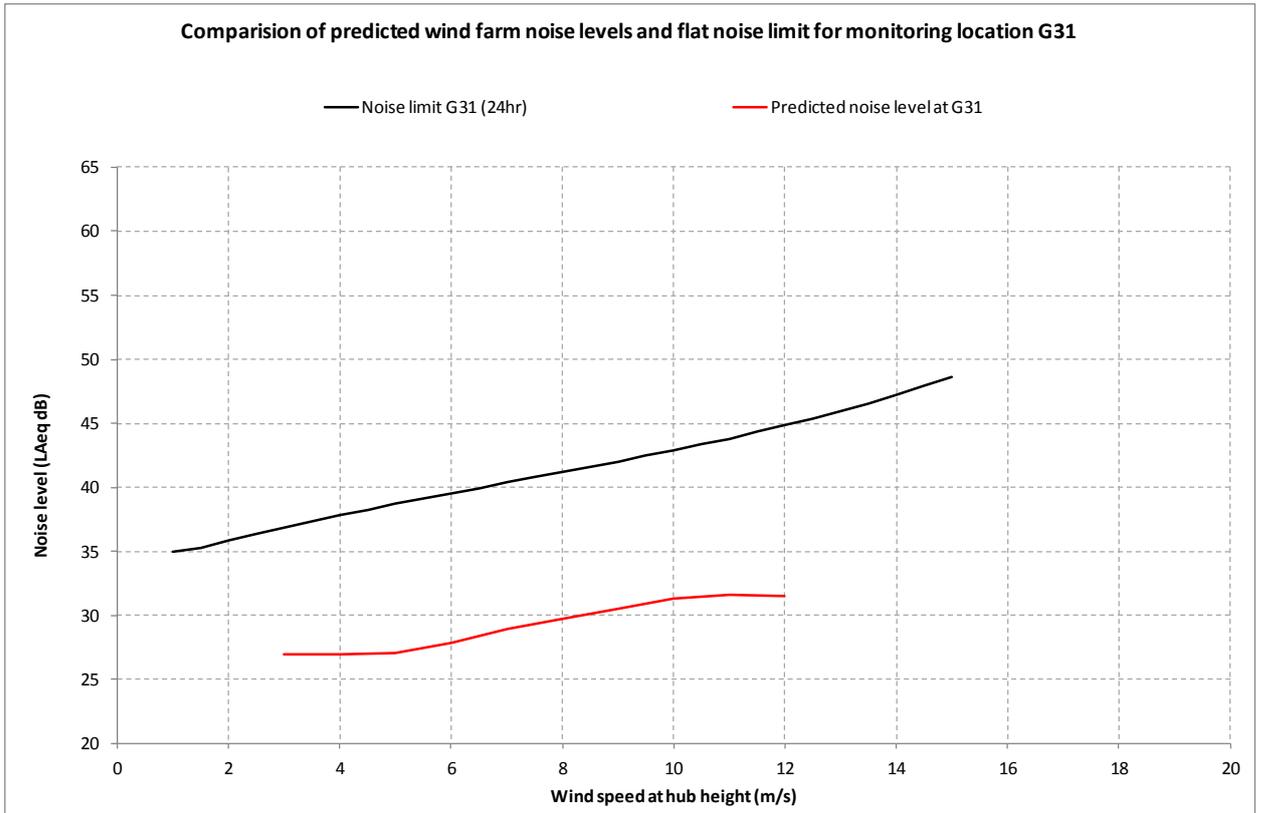


Figure 66: Wind farm compliance for monitoring location G31

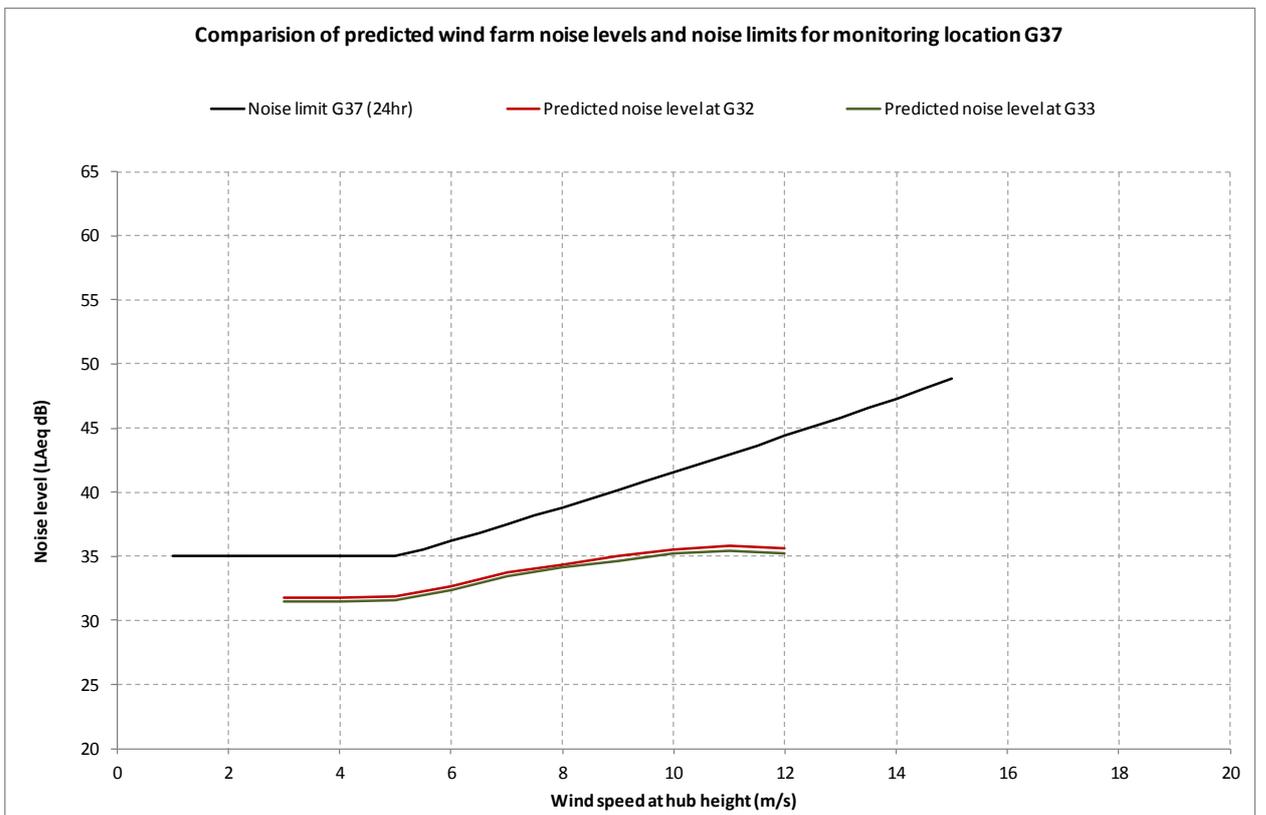


Figure 67: Wind farm compliance for monitoring location G37

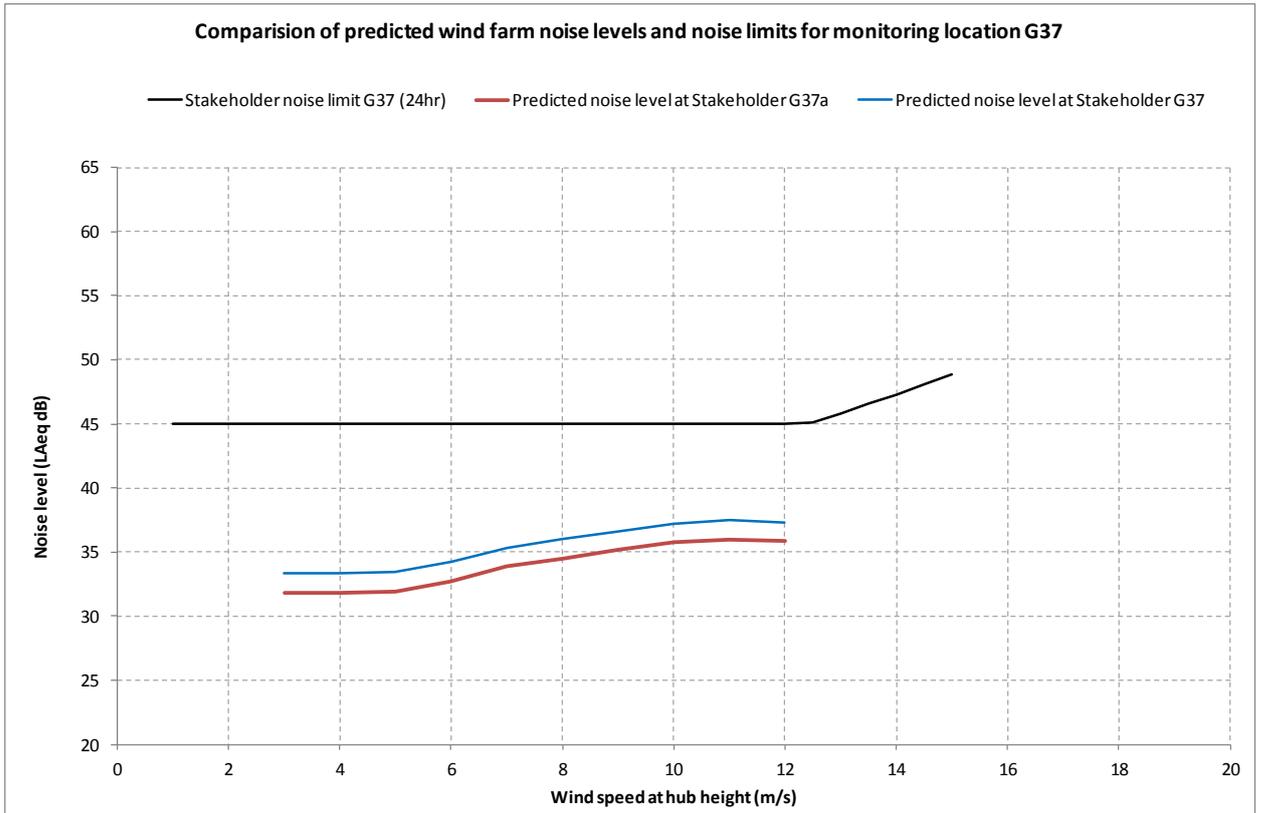


Figure 68: Wind farm compliance for monitoring location G37 (associated receivers)

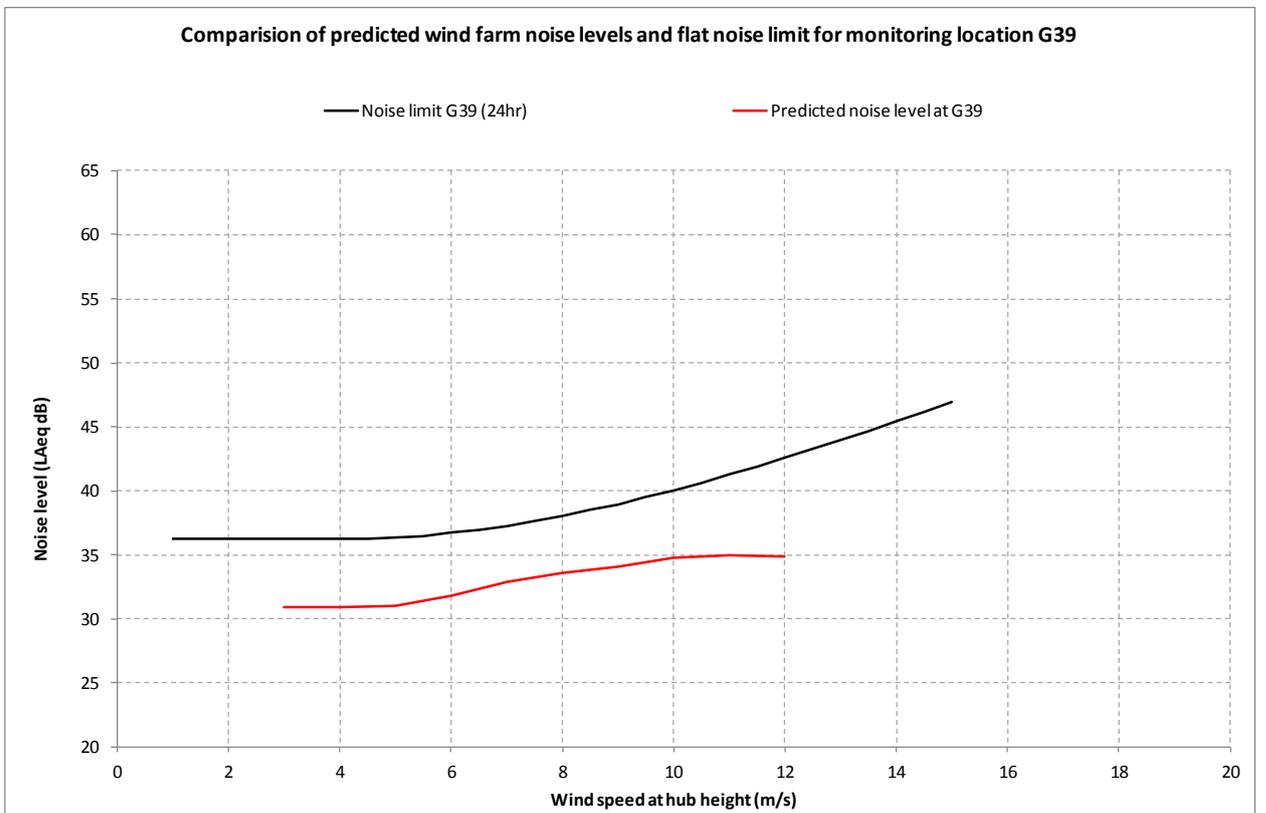


Figure 69: Wind farm compliance for monitoring location G39

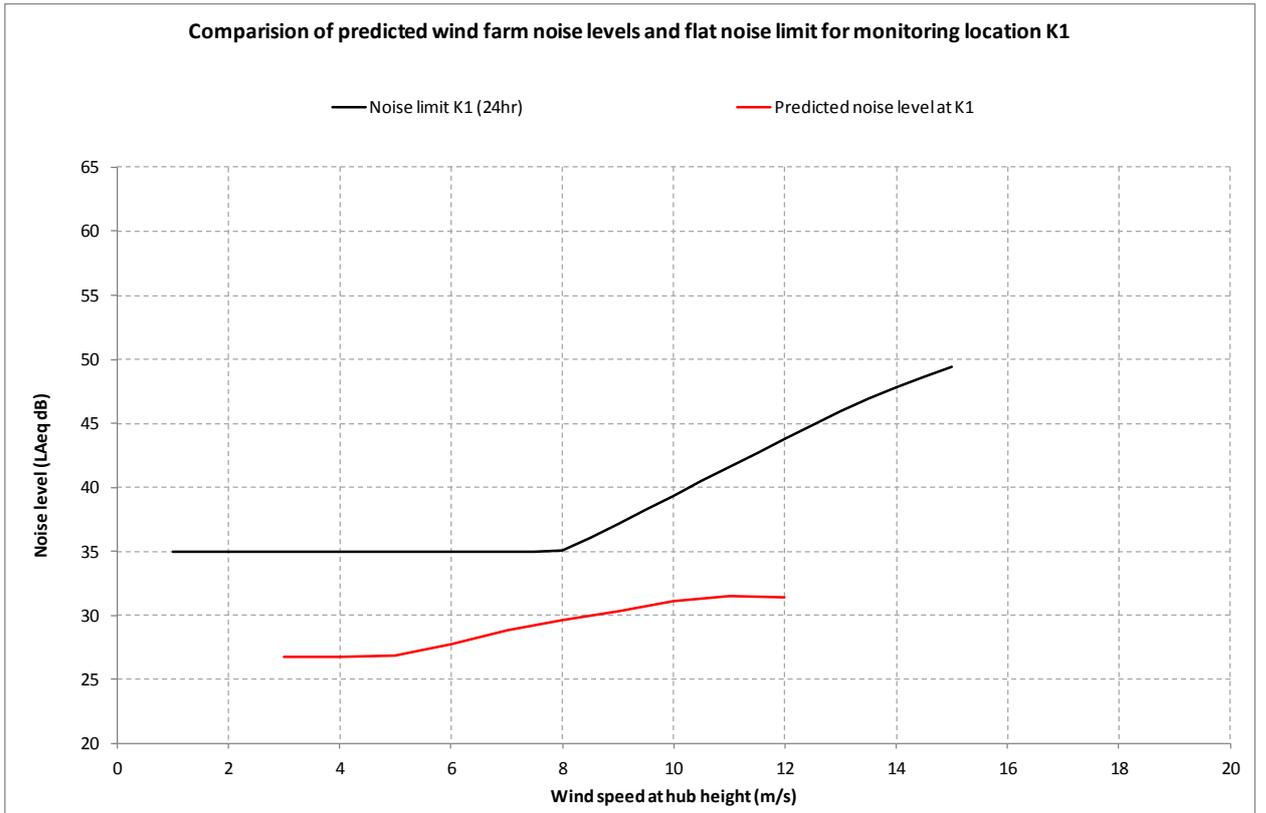


Figure 70: Wind farm compliance for monitoring location K1

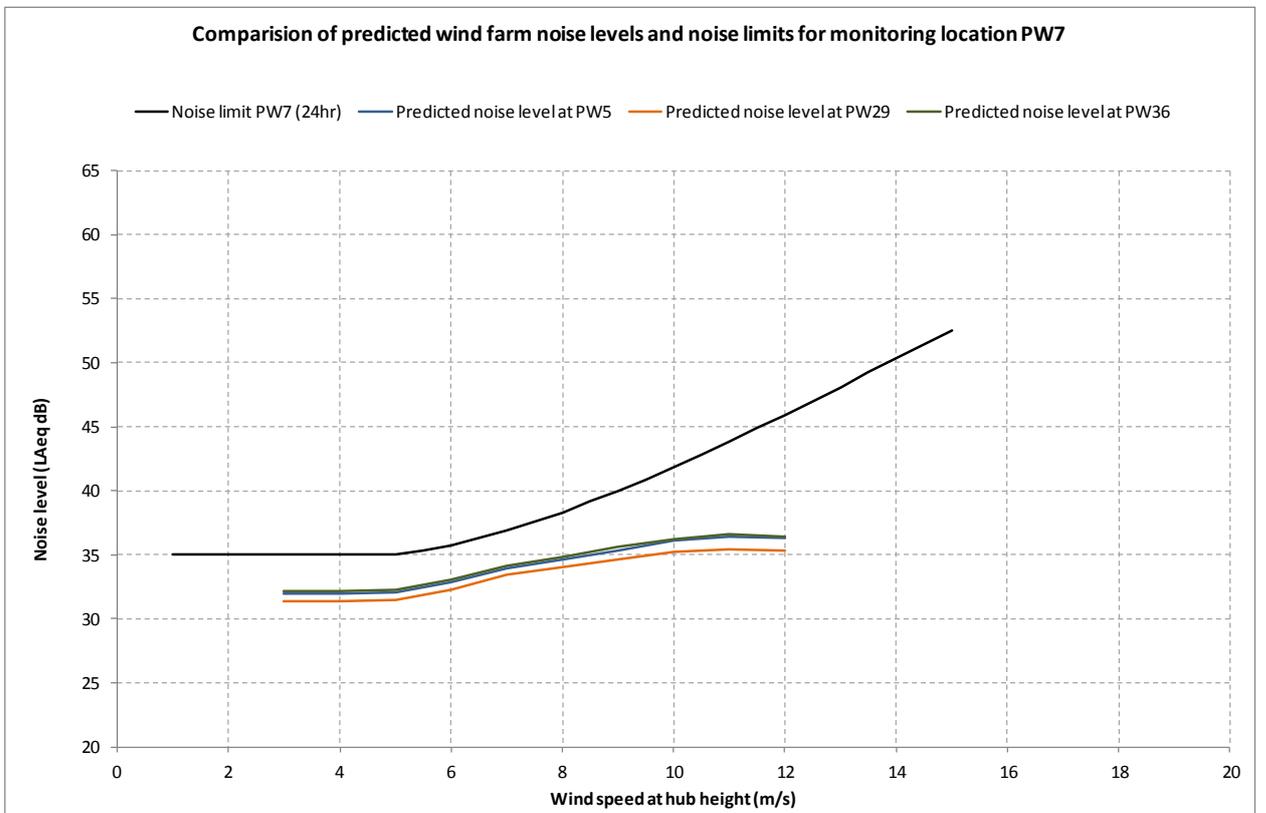


Figure 71: Wind farm compliance for monitoring location PW7

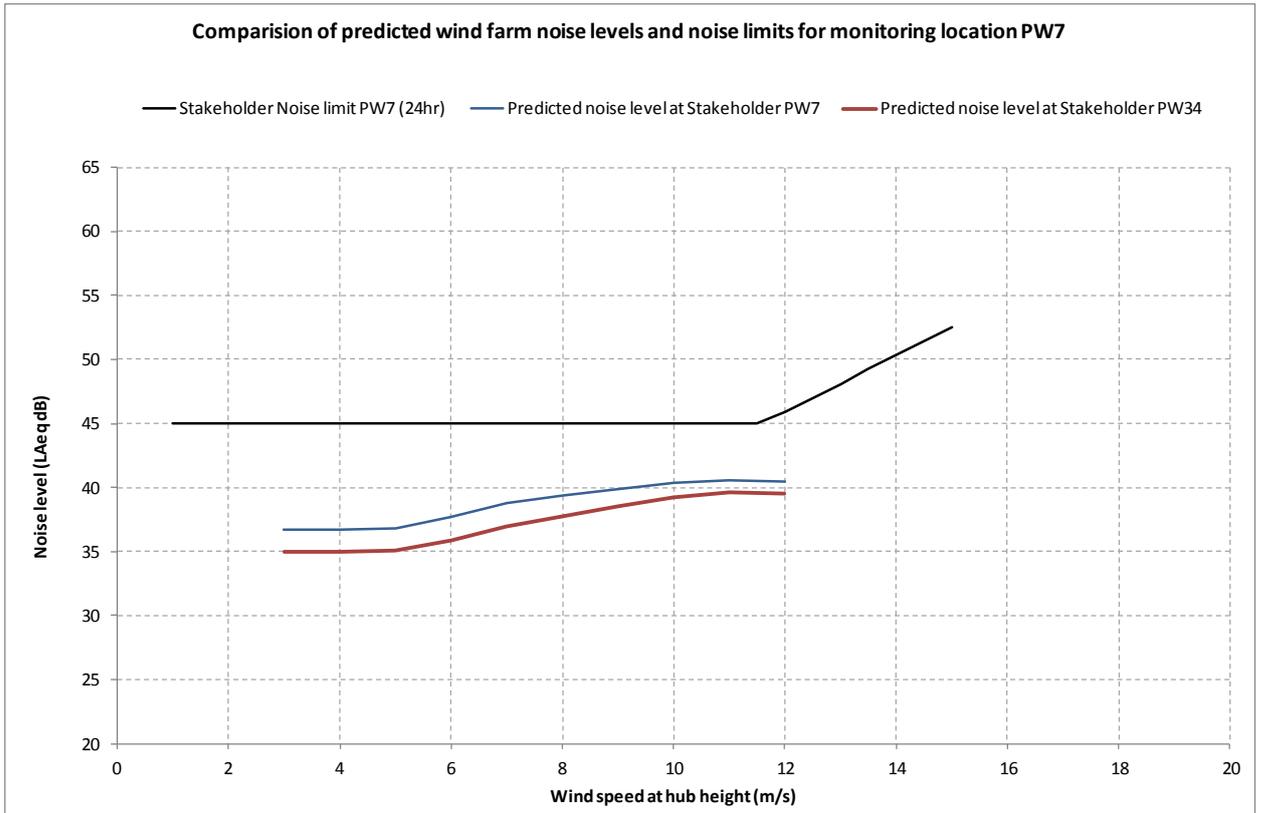


Figure 72: Wind farm compliance for monitoring location PW7 (associated receivers)

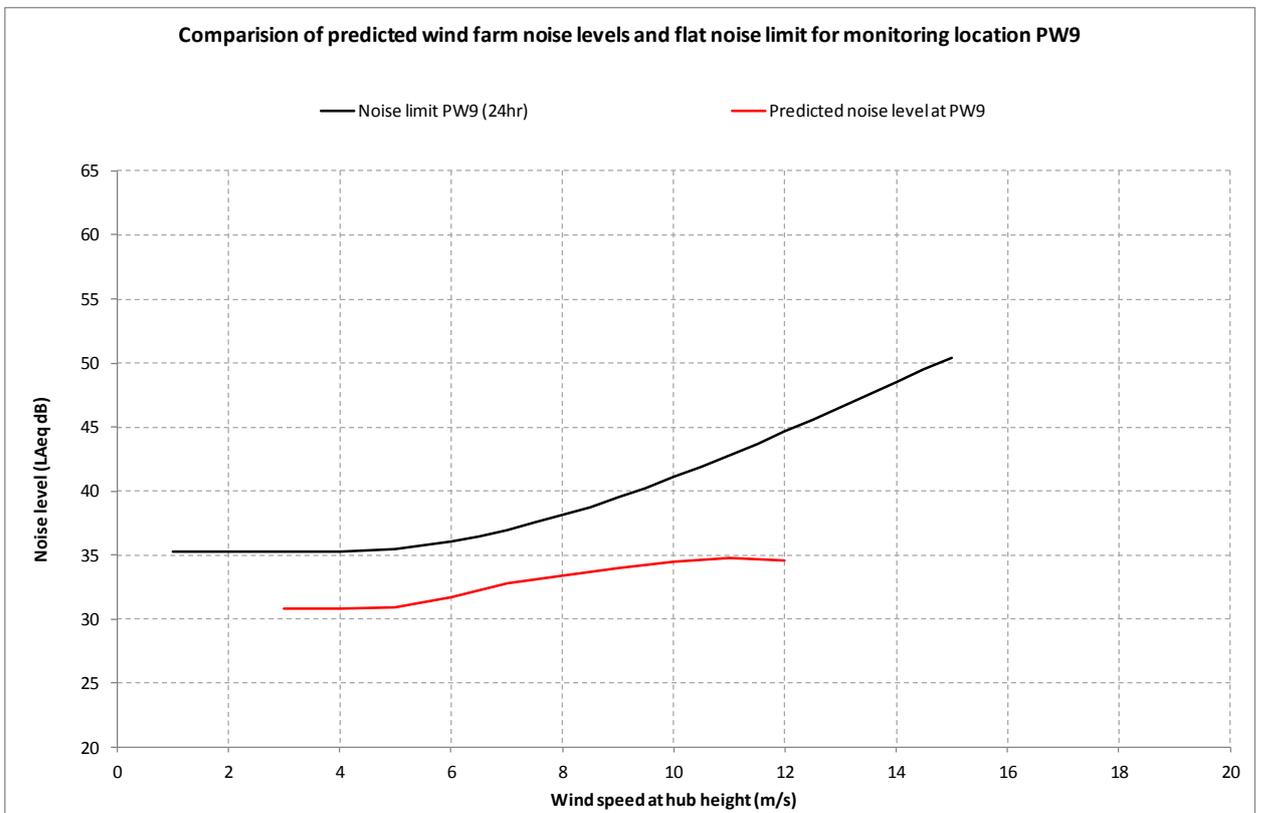


Figure 73: Wind farm compliance for monitoring location PW9

# APPENDIX L PRE-CONSTRUCTION TELEVISION AND RADIO ASSESSMENTS

## L1.1 TV AND RADIO COMPLAINTS PROTOCOL

The Owner will undertake reasonable and feasible mitigation to rectify any television/radio transmission problems reasonably attributable to the operation of the Wind Farm at any residential dwelling located within 5km of a wind turbine as per L&ECO 2.55.

The following process would be undertaken:

1. Upon receiving a complaint about TV/Radio signal the Operations Manager would log all details of the complaint in the Consultation Manager system
2. A review of the location of the house to ascertain the proximity to the wind turbines and if within the 5km zone as set out in L&ECO condition 2.54
3. A review of the pre-commissioning reception study to ascertain if property has been visited and previously assessed
4. A suitably qualified TV/Radio engineer will be commissioned to make an assessment of the property signal and to ascertain the likely causes
5. Any report on signal would be assessed against the pre-commissioning study to ascertain the baseline signal strength of the area
6. Should the wind farm be directly responsible for the reduction of signal then the wind farm owner will negotiate with the landowner in regard to a solution to remedy the signal reduction. This would include but not limited to:
  - Signal boosting antennae
  - Signal boosting receiver for the property
  - Installing a parasitic antennae
  - Installing a landline connection between the affected receiver and an antennae located in an area reasonably and feasibly able to improve the signal
  - Installing satellite antennae
7. Should the wind farm owner and the affected resident fail to reach agreement within a 6 month period the matter would be referred to the DPE for assessment

# APPENDIX M SAFETY MANAGEMENT PLAN

# Gullen Range Wind Farm



## Operational Management Plan

Prepared by:



Goldwind Australia Pty. Ltd.  
Level 1 – 379 Collins Street,  
Melbourne VIC 3000

GR-PM-PLN-0023  
2016 V3.0

## Revision Details

### Document Information

	Information
Document Number and Name	GR-PLN-0023 GRWF Operational Management Plan
Document Owner	Rob Brady
Version:	3.0
Issue Date	21/05/2016

### Document Release

This document will comply with GWA Document Management Procedure and will therefore be assigned with a registered document number. Issued copies of this document shall be labelled with a registered document number and identified as major version 1.0, 2.0, 3.0 etc. indicating an approved document, where the first issue will start at version 1.0. Document reviews where procedural content has not changes and only minor modification have been made, will display 1.1, 1.2, 1.3 etc.

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### Document History

Version	Issue Date	Changes
1.0	17/09/2013	First release
2.0	27/10/2014	Review Ed and updated for O&M handover gate check.
2.1	12/12/2014	Minor modifications. Legal, CoP and standards review (Section 5)
2.2	24/06/2015	Minor modification. Added the National Issues Register (Section 7.1)
2.3	01/12/2015	Updated distribution list
3.0	21/05/2016	Annual review – format and grammatical error corrections. Update of procedures, organisation chart and HSE System org chart and general improvements.

### Document Approval

Role	Name	Signature	Date
Reviewed:	Adrian Hewerdine		24/02/16
Checked:	Julian King & Rob Brady		24/02/16
Approved:	Rob Brady	 Digitally signed by Rob Brady DN: cn=Rob Brady, o=GWA Pty Ltd, ou=Service Department, email=rob.brady@gwdenscontrol.com, c=AU Date: 2016.05.21 20:22:30 +1000	21/05/16

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21/05/2016	3.0	TBA	Senior HSE AdvisorSenior HSE Advisor
21/05/2016	3.0	Derek Powell	Asset Manager New Gullen Range Wind Farm Pty Ltd
21/05/2016	3.0	Julian King	GRWF Site Supervisor
21/05/2016	3.0	Michael McNally	Service Technician
21/05/2016	3.0	Jodie Marr	Lead Service Technician
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21/05/2016	3.0	Paul Lewis	Trades Assistant
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21/05/2016	3.0	Haixing Wang	Service Technician
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## 1 Introduction and Scope

### 1.1 Requirement

This document is the Operational Management Plan (OMP) for the Gullen Range Wind Farm (GRWF). The OMP is an all-encompassing document which provides a complete overview of how to undertake the Operation and Maintenance at the GRWF.

The systems and processes provided within this document are aimed to guarantee that all relevant service personnel meet the intention of GWA which is to ensure that workers, contractors, consultants and the general public are provided with a working environment that is, as far as reasonably practicable, free from the risk of injury and illness in conjunction with minimal environmental impact.

The OMP also provides procedures which aim to ensure that safety and technical standards conducted at the site are established and complied with and to minimise the impact on the environment during the Operation and Maintenance term.

The OMP has been prepared by GWA in its role as Operator of the GRWF for and on behalf of the Owner.

It is a GWA requirement that all persons follow and adhere to the principles outlined in the OMP.

### 1.2 References

The reference symbol below will identify other documents which may contain further information, useful links and forms, checklists and templates to assist in completing tasks.



### 1.3 Objective

The objective of the OMP is to identify, describe and outline the mandatory systems and processes adopted at the GRWF for works conducted in accordance with the WOM contract.

The systems and processes are used to provide all GWA workers, sub-contractors, owner representatives and visitors a clear understanding of the minimum requirements whenever entering or working at the GRWF. It ensures that Safety and Technical aspects of operating and maintaining the site, meets GWA management systems, owner and legislative requirements.

The plan aims to ensure all works conducted during the Operation and Maintenance term are performed safely, minimise environmental impact and eliminate pollution.

### 1.4 Scope

The Operational Management Plan (OMP) is an overarching document designed to meet the requirements of the WOM contract. The aim of the OMP is to define:

- The Safety Management System for GRWF including references documents, in accordance with:
  - NSW WHS legislation (refer to *Table 7: List of Relevant Legislation*)

- The DoP Hazardous Industry Planning Advisory Paper No 9, 'Safety Management System'.
- Contractual elements in ongoing and operational plans which form the Environmental Management Framework (refer to *Figure 2: Environmental Management Framework*) including:
  - Ongoing Plans:
    - Noise Compliance Plan
    - Community and Stakeholder Communications Plan
    - Bird and Bat Adaptive Management Plan
    - Community Enhancement Program
    - Compliance Tracking Program
  - Operational Plans:
    - Operational Environmental Management Plan (OEMP)
    - Landscape Management Plan
    - Bushfire Risk Management Plan
- Quality Management
- Site specific admin, HR, finance and other business processes

This OMP does not extend to the full requirements of the Owner/Principal at GRWF which are not contained in the WOM contract.

This plan, in conjunction with the relevant Federal, State & Local Safety legislation & Australian Standards, provides the minimum requirements for all companies and persons associated with the project. The extent of WHS obligation is depicted in the following diagram:

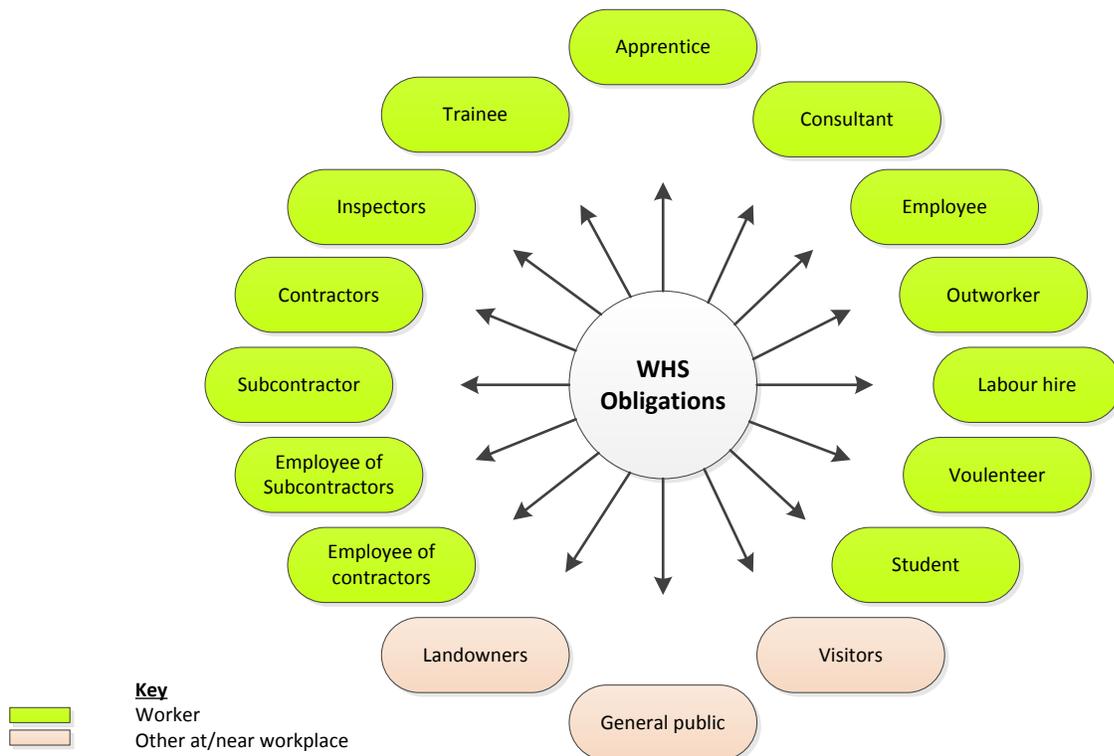


Figure 1: WHS Obligations

### 1.5 Interaction with other documents



Figure 2: Environmental Management Framework



Reference

Refer to:

- [Bushfire Risk Management Plan](#)
- [OEMP v7](#)
- [GUL\\_BBMP\\_Final\\_V4\\_1](#)
- [Gullen Range Community Enhancement Program](#)
- [Gullen Range Operational Noise Management and Noise Compliance Plan\\_R3](#)
- [KMH-2012\\_093-WO-Stakeholder and Community Involvement Plan-VerB](#)

### 1.6 Goldwind Details

Founded in 1998, Goldwind is one of the largest turbine manufacturers in the world, their Head Office is located in Beijing, prior to this Goldwinds main office was located in Ürümqi in the western Uyghur autonomous region of Xinjiang.

Goldwind Australia (GWA) is a wholly owned subsidiary of Xinjiang Goldwind Science & Technology Co. Ltd, and was established in 2009 to serve the Australian and regional wind power markets. With offices in Sydney and Melbourne, GWA is ideally situated for regional renewable energy projects across Australia. GWA has over 30 specialised members of staff with over 70 years of combined experience in the wind industry in Australia and internationally.

GWA offers competitive wind farm solutions including:

- EPC Contracting
- Project Investment
- Turbine Supply Agreements
- Warranty and Maintenance
- The GW109/2.5 wind turbine

The Australian organisation has two offices located in Sydney (Head Office) and Melbourne.

Sydney (Head Office)	Melbourne
Suite 2 Level 23, 201 Elizabeth Street, Sydney NSW 2000	Level 1 379 Collins Street, Melbourne Victoria 3000

Table 3: Australian Office Locations

Goldwinds business activities include:

- Development of wind-farms in all State and Territories in Australia;
- Operation of wind-farms in all State and Territories in Australia; and
- Supply & commissioning of wind turbine equipment to wind-farm developers.

Goldwinds Mission Statement is: Preserving White Clouds and Blue Skies for the future.

### 1.7 Site Location

The GRWF is located along a north-south running ridge system of the Great Dividing Range between Gunning, Crookwell and Goulburn in NSW’s southern tablelands (Figure 2). The wind farm will occur across four different precincts. All four precincts where infrastructure would be installed, Kialla, Bannister, Pomeroy and Gurrundah, are located on private property within and adjacent to agricultural areas used for sheep and cattle grazing. As well, residential dwellings and two commercial operations (chicken farms) are located nearby. In general, the precincts can be characterised as grassland ridges

and flats with woodland patches on slopes and in gullies. The nearest township is that of Grabben Gullen, with larger towns including Crookwell, Gunning, Breadalbane and Goulburn in the region.

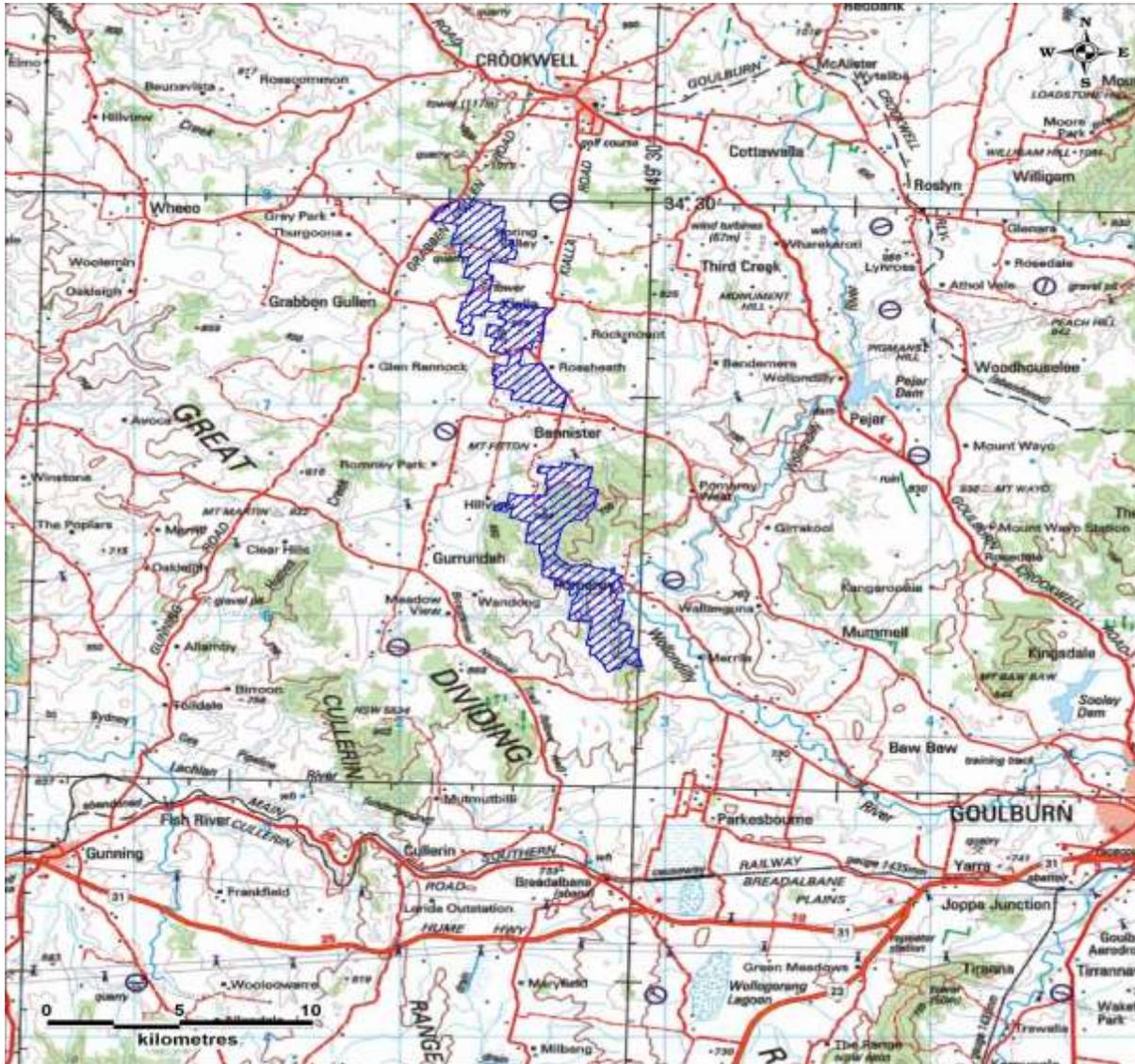


Figure 3: Gullen Range Site Location

### 1.8 Site Description

Owned by New Gullen Range Wind Farm Pty Ltd the GRWF project involves the operation of 73 wind turbines consisting of 17x GW82/1500 and 56x GW100/2500 wind turbines, at Gullen Range in the Southern Tablelands region of NSW.

The GRWF is to operate as an un-manned, remotely controlled electricity generator providing up to 165.5MW of renewable power at full capacity into the 330kV network owned by TransGrid.

The following activities are likely to occur during the operation of the Wind Farm:

- Generation of electricity

- Switching turbines on/off depending on the suitability of the wind resource in generating electricity
- Maintenance of WTG components
- Maintenance of the GRWF substation (In conjunction with TransGrid)
- Maintenance of other electrical infrastructure, including underground cables
- Maintenance of access roads and other civil infrastructure

The wind turbines consist of the Goldwind Permanent Magnet Direct Drive design. The wind farm also includes associated infrastructure and facilities such as a switchyard, substation, underground power and telecommunications cabling, and wind monitoring masts.

## 2 Abbreviations, Terms and Definitions

Term: Abbreviation	Definition
CPR	Contractors Performance Report
ERP	Emergency Response Plan
GR	Gullen Range
GRWF	Gullen Range Wind Farm
GWA	Goldwind Australia Pty. Ltd.
HIRAC	Hazard Identification Risk Assessment and Control
HSE	Health Safety and Environmental
JSA	Job Safety Analysis
JSEA	Job Safety Environment Analysis
MSDS	Material Safety Data Sheet
OEMP	Operation Environmental Management Plan
OMP	Operational Management Plan
MP	Management Plan
O&M	Operations and Maintenance
RFS	Rural Fire Service
RTW	Return to Work
SCADA	Supervisory, Control and Data Acquisition
SDS	Safety Data Sheet
SRD	Static Reference Document Register. A read only library containing controlled documents and located on the SharePoint Home Page
SWMS	Safe Work Method Statement
EPC	Engineering, Procurement and Construction
WOM	Warranty, Operations and Maintenance
WTG	Wind Turbine Generator
Worker(s)	<p>A person is a <b>worker</b> if the person carries out work in any capacity for a person conducting a business or undertaking, including work as:</p> <ul style="list-style-type: none"> <li>(a) an employee, or</li> <li>(b) a contractor or subcontractor, or</li> <li>(c) an employee of a contractor or subcontractor, or</li> <li>(d) an employee of a labour hire company who has been assigned to work in the person's business or undertaking, or</li> </ul>

Term: Abbreviation	Definition
	(e) an outworker, or (f) an apprentice or trainee, or (g) a student gaining work experience, or (h) a volunteer, or (i) a person of a prescribed class. <i>Source: WHS Act 2011, Clause 7</i>
WHSMP	Work, Health and Safety and Environment Management Plan. Otherwise known as a Site Safety Plan or Site Safety Management Plan
WHS	Work, Health and Safety

Table 4: Abbreviations, Terms and Definitions

### 3 Policy

Up to date versions of all GWA Policies are available in the Static Reference Document Register library on SharePoint.

HSEQ Policies shall be displayed on HSEQ Notice boards.

#### 3.1 WHS Policy

## GWA-CO-POL-0001 WHS Policy

---

**1. Vision**

OUR VISION is to foster a workplace culture across Goldwind Australia operations where safety is considered a core value and safe behavior is encouraged and respected. Goldwind Australia is recognised for setting & achieving high standards for health and safety “The GOLD standard”.

**2. Goal and Scope**

OUR GOAL is to eliminate work related injury and ill health, to provide work environments that do not compromise the safety of any individual and to ensure that work health and safety is proactively managed to achieve continuous improvement throughout Goldwind Australia operations.

GWA is committed to complying with the specification standards:

- AS/NZS 4801:2001 Occupational Health and Safety Management System, Requirements; and
- OHSAS 18001:2007 International Occupational Health and Safety Management System Specification.

**3. Responsibilities**

Role	Responsibilities
Management (the employer, supervisor and/or manager)	<ul style="list-style-type: none"> <li>Providing and maintaining a safe working environment including the control of risks associated with major hazards;</li> <li>Providing and maintaining safe systems of work, including any information, training, supervision and resources needed to make sure that all employees are free from injury and risks to their health;</li> <li>Facilitating open consultation with all employees and stakeholders on the development, implementation and refinement of our WHS systems and programs;</li> <li>Investigate and report on all incidents including near misses; and</li> <li>Monitor WHS performance and strive for continuous improvement.</li> </ul>
GWA Employees and persons contracted by GWA	<ul style="list-style-type: none"> <li>Ensuring their own personal safety and the safety of others in the workplace;</li> <li>Participate in WHS training, consultation and initiatives to improve health and safety;</li> <li>Reporting all accidents, incidents, near misses and hazardous observations to their supervisor or manager and assist with actions to reduce and eliminate hazards; and</li> <li>Complying with any reasonable directions given by management that relates to health and safety; and</li> <li>Eliminating hazards when safe to do so.</li> </ul>

GWA-CO-POL-0001 WHS Policy
UNCONTROLLED WHEN PRINTED
Page 2 of 3

	[GWA-CO-POL-0001 WHS Policy]	Version 3.0	Effective Date: 09/08/13
			Review Date: 19/5/17

**4. Evaluation**

- ✓ Encourage appropriate consultation with all relevant stakeholders on health and safety policies and standards, and ensuring that these are communicated and observed.
- ✓ Establishing appropriate objectives and targets and continuously monitoring and benchmarking these to identify opportunities for continual improvement.
- ✓ Implementing risk management systems to identify, assess, monitor and control workplace risks and hazards.
- ✓ Complying with all applicable occupational health and safety laws, regulations, statutory obligations, client, and industry requirements.

**5. Breaches**

Non compliances arising from a breach against this Policy may result in disciplinary action being taken.

**6. Related information**

**Supporting documents:**

- GWA-CO-MAN-0001 GWA Management System Manual
- GWA-CO-PRC-0009 WHS Discipline Procedure

Signature:



John Titchen  
Managing Director

Date: 19 May 2016

## 3.2 Environmental Policy

	GWA-HSE-POL-0008 Environmental Policy	Version 3.0	Effective Date: 18/02/14 Review Date: 19/5/17
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# GWA-HSE-POL-0008 ENVIRONMENTAL POLICY

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### 1. Policy statement

Goldwind Australia (GWA) is committed to caring for and protecting the natural environment. As an environmentally conscious and responsible company our aim is to integrate responsible environmental management into all that we do.

The workplace health and safety of our people and the preservation of the environment in which we operate are an integral part of our operations at GWA.

We ensure that our employees and contractors understand our environment policy and the significant environmental aspects of our activities. All staff members, including contractors and visitors, are to receive information about the policy during the induction. A copy of this policy will be displayed in all GWA office locations.

Consistent with this, GWA will strive to eliminate any impacts and harm that would be detrimental to the environment.

### 2. Scope and coverage

All visitors, GWA employees and persons contracted by GWA are expected to comply with this policy.

GWA is committed to complying with the specification standard ISO 14001:2004 Environmental Management Systems.

### 3. Purpose and intended outcomes

To achieve this, GWA have the following objectives:

- Comply with all environmental statutory requirements and other applicable environmental obligations
- Continually improve its environmental performance, use resources efficiently, minimise the consumption of energy and water and minimise the generation of waste to the extent practicable
- All GWA managed sites will adopt and ensure the disposal of all waste relating to the site is removed by certified organisations and in accordance with relevant environmental legislation, regulations and good industry practice
- Promote throughout the company a strong environmental ethic as part of its culture.
- Providing visitors, staff and persons contracted by GWA with environmental education, training and resources appropriate to the activities that they will undertake
- Strive for continuous improvement through setting targets, monitoring performance and alignment with our future corporate strategies
- Investigating incidents, implementing preventative actions and sharing the learning's with all applicable parties to prevent reoccurrences
- Consulting and communicating with staff and persons contracted by GWA to continually improve the environmental performance in our workplaces

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- Commit to ongoing sustainable management of environmental impacts within GWA operations
- Commit to actively considering the use of alternative energy sources, and low emissions technology, as they become economically viable
- Share best practices for environmental management across the business

**4. Responsibilities**

Management (the employer, supervisor and/or manager) is responsible for:

- Providing and maintaining information and resources to meet the objectives outlined in this policy
- Providing and maintaining sustainable systems of work, including any information, training and supervision needed to make sure that all employees are aware of their environmental responsibilities
- Facilitating open consultation and communication among stakeholders.

Employees and persons contracted by GWA are responsible for:

- Comply with the requirements of this policy
- Eliminating environmental impacts where able to do so
- Reporting all environmental incidents and hazards
- Complying with any reasonable directions given by management that relates to environmental management
- Conducting routine environmental inspections throughout GWA run sites

**6. Evaluation**

This Policy will be evaluated in accordance with the GWA Management System Continual Improvement and Management System Review process.

**7. Breaches (optional heading)**

Non-compliances arising from a breach against this Policy may result in disciplinary action being taken.

**8. Related information**

Supporting documents: [GWA-CO-MAN-0001 GWA Management System Manual](#)

Signature:



J Titchen  
Managing Director

Effective Date: 19 May 2018

### 3.3 Quality Policy

	[GWA-CO-POL-0010 Quality Policy]	Version 2.0	Effective Date: 09/08/13
			Review Date: 19/5/17

## GWA-CO-POL-0010 QUALITY POLICY

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### 1. Policy statement

Goldwind Australia (GWA) is committed to incorporating a best practice approach into its activities and business operations by meeting or exceeding relevant national and international standards. GWA will continue to identify opportunities for improvement through self-assessment and rectifying any aspects identified in a planned and monitored way.

GWA's aim is to be recognised as a leader in its industry and as such provide products and services at the standards that customers expect and value. This means to be delivered on time, at the right price and equal or better than the agreed quality standard.

To achieve this GWA acknowledges the necessity to adopt quality assurance and continuous improvement processes in all its activities to efficiently and effectively operate its business.

GWA will strive to incorporate innovation and constant improvement of its business processes in order to provide product and services that meets customer satisfaction and applicable legislative requirements.

GWA acknowledges the importance of environmental, health safety and quality as an integral part of managing its business and ensuring customer satisfaction.

### 2. Scope and coverage

This Policy applies to all GWA products and service. GWA is committed to complying with the Quality Standard ISO 9001:2008 Quality Management System, Requirements.

### 3. Objectives

GWA has the following objectives:

- Develop and implement an effective quality management system;
- Achieve and maintain compliance with the relevant quality management standards and other standards, statutory and regulatory requirements relevant to the needs of GWA;
- A commitment to providing customer satisfaction through innovation and constant improvement of its business processes;
- To extend this policy through to our suppliers and contractors and develop relationships which are based on prevention and a continuous improvement in product and services and effective communication;
- To seek relevant certification of its Quality Management System based on the requirements of ISO 9001:2008 Quality Management System, Requirements, as well as consider and incorporate references from other industry specific standards and customer specific requirements;
- Provide an environment where staff can actively participate in quality improvement and apply quality of work to their work activities;
- Identify competency needs and provide appropriate training and professional development of our staff in order to meet those needs;

	[GWA-CO-POL-0010 Quality Policy]	Version 2.0	Effective Date: 09/08/13
			Review Date: 19/5/17

- Review and clearly document policies, procedures and guidelines to confirm that they remain current are to ensure they are available for use and are well understood; and
- Commitment from management through active participation in quality improvement activities and continuous improvement and leadership by example.

*5. Responsibilities*

Role	Responsibilities
Management (the employer, supervisor and/or manager)	<ul style="list-style-type: none"> <li>• Ensuring that this policy is communicated within the organisation;</li> <li>• Providing and maintaining management systems including information, training and supervision needed to make sure that all employees incorporate quality into their work activities; and</li> <li>• Implement this policy and monitor its implementation within the business.</li> </ul>
GWA Employees and persons contracted by GWA	<ul style="list-style-type: none"> <li>• Undertaking their duties in accordance with the requirements of this policy, the GWA Management System Manual and associated quality procedures;</li> <li>• Complying with any reasonable directions given by management that relates to quality management; and</li> <li>• Ensuring that quality records are completed and stored as per the GWA record keeping policy.</li> </ul>

*6. Evaluation*

Quality objectives in this policy and the GWA Management System Manual are measured against annual objectives and target as part of the GWA management system review and improvement process. This policy is reviewed annually to ensure conformance with company views and standards.

*9. Related information*

GWA-CO-MAN-0001 GWA Management System Manual

This Policy replaces GWA-HSE-PRC-0010 Rev B Quality Policy

Signature:



John Titchen  
Managing Director

Effective Date: 19 May 2016



Reference

GWA Policies:

<https://goldwindaus.aseit.net/Static%20Reference%20Documents/Forms/AllItems.aspx>

## 4 Design

HAZCON and/or Gate Check meetings will be organised by the Service Manager and Site Supervisor to ensure that risk assessments are undertaken at the design stage of any new construction works. Persons involved include construction Project Managers, Supervisors, HSEQ advisors and worker representatives. Hazards where possible shall be designed out or mitigated using the hierarchy of control.

Design changes during the construction phase and from O&M modifications are reviewed, assessed, documented, controlled and any resulting HSE hazards communicated to workers.

Human factors are taken into consideration through consultation with the manufacturer and site workers.

The Site Supervisor will ensure that hazards which cannot be designed out are added to the Site Risk Register and controlled to mitigate the risk to workers.

Electrical drawings for WTG, HV and associated assets are available via the GRWF SharePoint Site and in WTG Manuals. A hard copy of the HV Single Line Diagram must be displayed in the HV switch room at all times. The Site Supervisor will ensure that all drawings are kept up to date.



Reference

Diagrams:

[GRWF Diagrams](#)

## 5 Compliance

GWA acknowledges the importance of relevant regulatory requirements and will endeavour to ensure all work tasks and activities undertaken by GWA Workers, consultants, representatives and sub-contractors conform accordingly.

The service and maintenance activities will comply with all relevant legislation and applicable standards, a listing of these are as follows:

Australian Standards	
Standard	Description
AS 1055.1-1997	Acoustics – description and measurement of environmental noise – General procedures
AS/NZS 1269.0:2005	Occupational noise management - Overview and general requirements
AS/NZS 1269.2:2005	Occupational noise management - Noise control management
AS/NZS 1269.3:2005	Occupational noise management - Hearing protector program
AS/NZS 1270:2002	Acoustics - Hearing protectors
AS 1319-1994	Safety signs for the occupational environment
AS/NZS 1337.1:2010	Personal eye protection - Eye and face protectors for occupational applications
AS 1470-1986	Health and safety at work - Principles and practices
AS 1657-2013	Fixed platforms, walkways and ladders – design, construction and installation
AS/NZS 1801:1997	Occupational protective helmets
AS/NZS 1841.1:2007	Portable fire extinguishers – general requirements
AS 1885.1-1990	Measurement of Work health and safety performance - Describing and reporting occupational injuries and disease
AS/NZS 1891.3:1997	Industrial fall-arrest systems and devices - Fall-arrest devices
AS/NZS 1891.1:2007	Industrial fall-arrest systems and devices - Harnesses and ancillary equipment
AS/NZS 1891.2:2001	Industrial fall-arrest systems and devices - Horizontal lifeline and rail systems
AS/NZS 1891.4:2009	Industrial fall-arrest systems and devices - Selection, use and maintenance
AS/NZS 1892.5:2000	Portable ladders - Selection, safe use and care
AS/NZS 2161.1:2000	Occupational protective gloves - Selection, use and maintenance
AS/NZS 2210.1:2010	Safety, protective and occupational footwear - Guide to selection, care and use

Australian Standards	
Standard	Description
AS 2225-1994	Insulating gloves for electrical purposes
AS 2436-2010	Guide to noise control on construction, maintenance and demolition sites
AS/NZS 2865:2009	Confined spaces
AS/NZS 2978:1995	Insulating mats for electrical purposes
AS/NZS 3000:2007	Electrical installations (known as the Australian/New Zealand Wiring Rules)
AS NZS 3000-2007	Electrical Installations Amendment 1 and 2
AS/NZS 3760:2010	In-service safety inspection and testing of electrical equipment
AS/NZS 4801:2001	Work health and safety management systems - Specification with guidance for use
AS/NZS 4836:2011	Safe working on or near low-voltage electrical installations and equipment
AS/NZS ISO 14001:2004	Environmental management systems - Requirements with guidance for use
OHSAS 18001:2007	Occupational Health & Safety Management Systems - Requirements
ISO 31000:2009	Risk Management
AS 1380 - 1998	Fibre Rope Slings, Part 2: Care and use
AS 3775 - 2004	Chain slings – grade T, Part 2: Care and use
AS 1666 - 2009	Wire rope slings, Part 2: Care and use
AS 1438.2 - 1998	Wire coil flat slings, Part 2: Care and use
AS 1353.2 - 1997	Flat synthetic-webbing slings, Part 2: Care and use
AS 2550.1	Cranes, hoists and winches – Safe use
AS 4991 – 2004	Lifting Devices
AS 1851 - Section 1,10 and 11	Maintenance of Fire Protection Systems and Equipment
AS 3676	Portable Fire Extinguisher Guide to Servicing
AS 2444	Portable Fire Extinguisher & Fire Blankets Selection & Location

Table 5: List of Relevant Australian Standards

Relevant Codes of Practice	Tick if applicable
<i>Building Code of Australia</i>	<input checked="" type="checkbox"/>
<i>Confined spaces</i>	<input checked="" type="checkbox"/>
<i>Construction work</i>	<input checked="" type="checkbox"/>
<i>Cranes</i>	<input checked="" type="checkbox"/>
<i>Demolition work</i>	<input type="checkbox"/>
<i>Excavation work</i>	<input checked="" type="checkbox"/>
<i>First aid in the workplace</i>	<input checked="" type="checkbox"/>
<i>Formwork and false work</i>	<input type="checkbox"/>
<i>Hazardous manual tasks</i>	<input checked="" type="checkbox"/>
<i>Housing construction work</i>	<input type="checkbox"/>
<i>How to manage work health and safety risks</i>	<input checked="" type="checkbox"/>
<i>How to safely manage and control asbestos in the workplace</i>	<input type="checkbox"/>
<i>How to safely remove asbestos</i>	<input type="checkbox"/>
<i>Industrial forklifts</i>	<input checked="" type="checkbox"/>
<i>Labelling of workplace hazardous chemicals</i>	<input checked="" type="checkbox"/>
<i>Managing electrical risks at the workplace</i>	<input checked="" type="checkbox"/>
<i>Managing noise and preventing hearing loss at work</i>	<input checked="" type="checkbox"/>
<i>Managing risks of plant in the workplace</i>	<input checked="" type="checkbox"/>
<i>Managing the risks of falls in the workplace</i>	<input checked="" type="checkbox"/>
<i>Managing the work environment and facilities</i>	<input checked="" type="checkbox"/>
<i>Preventing falls in housing construction</i>	<input type="checkbox"/>
<i>Safe design, manufacture, import and supply of plant</i>	<input type="checkbox"/>
<i>Safe design structures</i>	<input type="checkbox"/>
<i>Scaffolding</i>	<input type="checkbox"/>
<i>Tilt-up and pre-cast concrete in building</i>	<input type="checkbox"/>
<i>Traffic management in workplaces</i>	<input checked="" type="checkbox"/>
<i>Welding processes</i>	<input checked="" type="checkbox"/>
<i>Work health and safety consultation, cooperation and coordination</i>	<input checked="" type="checkbox"/>
<i>Working in the vicinity of overhead and underground electrical lines</i>	<input checked="" type="checkbox"/>
<i>Building and Construction Industry</i>	<input checked="" type="checkbox"/>

Table 6: Codes of Practice

Relevant Legislation
National Greenhouse and Energy Reporting Act 2007 No. 175
National Greenhouse and Energy Reporting Regulations 2008 No. 127
Work Health & Safety Act 2011
Work Health & Safety Regulations 2011
Workers Compensation Act 1987
Work Injury Management & Workers Compensation Act 1998
Workers Compensation Regulation 2010
NSW Environment Planning and Assessment Act 1979
Fair Work Act 2009

Table 7: List of relevant legislation

Key Stakeholders (refer to table 4.1 in the <i>Stakeholder and Community Information Plan</i> )
Federal, State and Local Elected Representatives
Federal State and Local Government Authorities
Community Groups and Businesses
Lease and Easement Stakeholder
Directly Affected Landowners
Local Community
Wider Community
Emergency Services and Utility Providers

Table 8: Key Stakeholders

Federal State and Local Government Authorities
NSW Government Department of Planning and Infrastructure
WorkCover NSW
NSW Office of Environmental and Heritage/Environmental Protection Agency
NSW Land and Environment Court
Upper Lachlan Shire Council and Goulburn Mulwaree Council
NSW Office of Water
NSW Roads and Maritime Service
NSW Department of Environment, Climate Change and Water

Federal State and Local Government Authorities
NSW Department of Trade and Investment
NSW Department of Primary Industries
Civil Aviation Safety Authority, Commonwealth Department of Defence and Air Services Australia

Table 9: Federal State and Local Gov Authorities

All standards codes and legislation is available to all workers via the SharePoint libraries on the home page.

All persons other than GWA employees are to request access via the Site Supervisor.

## 6 HSE Objectives and Targets

Site KPI's from the annual GWA Objectives and Targets Plan are reviewed in the Quarterly HSE Report and reviewed with the GWA Senior Management Team.

## 7 Reporting

### 7.1 Reporting an Issue

Issues are recorded on the O&M Issues Register as depicted in Figure 4 below. The register is used by Site Supervisors as a management tool to track and record resolution of site issues. More detailed information may be required on other registers such as the National incident register.

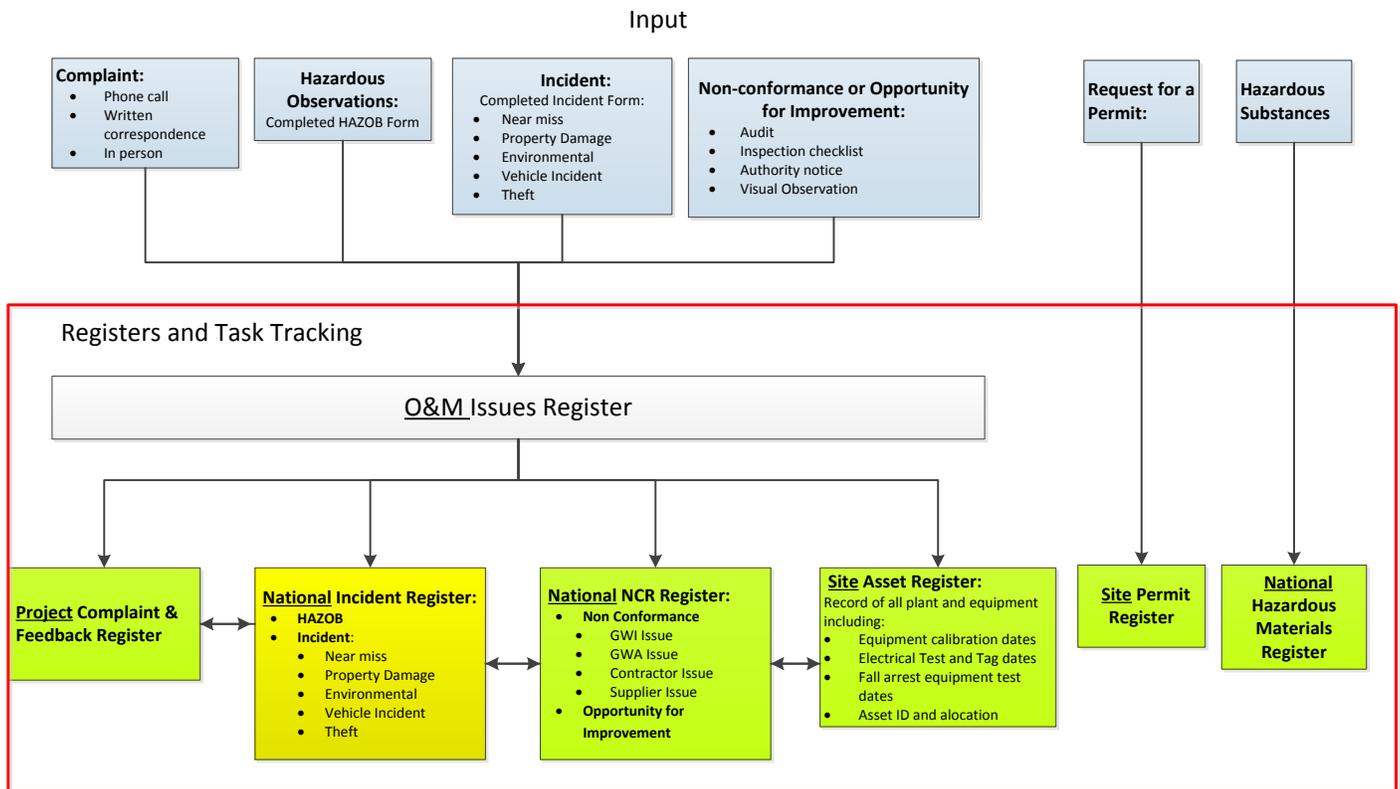


Figure 4: Issues Reporting



Refer to:

- [O&M Issues Register.xlsx](#)

### 7.2 Reporting Hazards

It is the responsibility of all workers, visitors and land owners to report to the GWA Site Supervisor any real or perceived risks to the health, safety and working environment of themselves, their colleagues, or the general public.

Hazards should be immediately reported to the Site Supervisor and recorded using the GWA-HSE-FRM-0004 Hazard Observation (HAZOB) Form.

All reported hazards that cannot immediately be safely eliminated must be entered into the Site Risk Register, assessed and appropriate control measures identified and implemented.

Where detailed identification and analysis is required, including additional information such as drawing and photographs, then the **HSE-TMP-0009 Risk Assessment Report** can be completed.



Reference

Refer to:

- [GWA-HSE-FRM-0004 Hazard Observation \(HAZOB\) Form](#)
- [GWA-HSE-TMP-0009 Risk Assessment Report](#)

### 7.3 Reporting Incidents

All incidents must be reported in accordance with the **HSE-PRC-0019 Incident Reporting and Investigation Procedure**. All notifiable incidents must be reported to WorkCover NSW in accordance with the criteria depicted in 7.4 of this OMP.



Reference

Refer to:

[GWA-HSE-PRC-0019- Incident Reporting and Investigation Procedure.docx](#)

### 7.4 Notifiable Incidents to WorkCover NSW

The Senior HSE Advisor and Department Manager will coordinate reporting of the following WHS incidents to WorkCover NSW:

Serious Injury or Illness (Trigger)	Example
<p>Immediate treatment as an in-patient in a hospital</p>	<p>Admission into a hospital as an in-patient for any duration, even if the stay is not overnight or longer.</p> <p>It does not include:</p> <ul style="list-style-type: none"> <li>• Out-patient treatment provided by the emergency section of a hospital (i.e. not requiring admission as an in-patient) and immediate discharge.</li> <li>• Subsequent corrective surgery such as that required to fix a fractured nose.</li> </ul>

Serious Injury or Illness (Trigger)	Example
Immediate treatment for the amputation of any part of the body	<p>Amputation of a limb such as arm or leg, body part such as hand, foot or the tip of a finger, toe, nose or ear.</p> <p>It does not include:</p> <p>Bruising or minor abrasion or laceration to the skin.</p>
Immediate treatment for a serious head injury	<ul style="list-style-type: none"> <li>• Fractured skull, loss of consciousness, blood clot or bleeding in the brain, damage to the skull to the extent that it is likely to affect organ/face function.</li> <li>• Head injuries resulting in temporary or permanent amnesia.</li> </ul>
Immediate treatment for a serious eye injury	<ul style="list-style-type: none"> <li>• Injury that results in or is likely to result in the loss of the eye or total or partial loss of vision.</li> <li>• Injury that involves an object penetrating the eye (for example metal fragment, wood chip).</li> <li>• Exposure of the eye to a substance which poses a risk of serious eye damage.</li> </ul> <p>It does not include:</p> <p>Eye exposure to a substance that merely causes irritation.</p>
Immediate treatment for a serious burn	<p>A burn requiring intensive care or critical care which could require compression garment or a skin graft.</p> <p>It does not include:</p> <p>A burn that merely requires washing the wound and applying a dressing.</p>
Immediate treatment for the separation of skin from an underlying tissue (such as degloving or scalping)	<p>Separation of skin from an underlying tissue such that tendon, bone or muscles are exposed (de-gloving or scalping).</p>
Immediate treatment for a spinal injury	<p>Injury to the cervical, thoracic, lumbar or sacral vertebrae including the discs and spinal cord.</p>
Immediate treatment for the loss of a bodily function	<p>Loss of consciousness, loss of movement of a limb or loss of the sense of smell, taste, sight or hearing, or loss of function of an internal organ.</p> <p>It does not include:</p> <ul style="list-style-type: none"> <li>• mere fainting, or</li> <li>• a sprain, strain or fracture.</li> </ul>
Immediate treatment for serious lacerations	<ul style="list-style-type: none"> <li>• Serious lacerations that cause muscle, tendon, nerve or blood vessel damage or permanent impairment.</li> <li>• Deep or extensive cuts.</li> <li>• Tears of wounds to the flesh or tissues – this may include stitching to prevent loss of blood and/or other treatment to prevent loss of bodily function and/or infection.</li> </ul>
Medical treatment within 48 hours of exposure to a substance	

Serious Injury or Illness (Trigger)	Example
<p>Any infection to which the carrying out of work is a significant contributing factor, including any infection that is reliably attributable to carrying out work:</p> <ul style="list-style-type: none"> <li>• with micro-organisms</li> <li>• that involves providing treatment or care to a person</li> <li>• that involves contact with human blood or body substances</li> <li>• that involves handling or contact with animals, animal hides, skins, wool or hair, animal carcasses or animal waste products.</li> </ul>	

Table 10: Notifiable Incidents to WorkCover NSW

**Dangerous Incidents (commonly referred to as ‘near misses’)**

Notification is also required of any incident in relation to a workplace that exposes a worker or any other person to a serious risk to a person’s health or safety emanating from an immediate or imminent exposure to:

- An uncontrolled escape, spillage or leakage of a substance
- An uncontrolled implosion, explosion or fire
- An uncontrolled escape of gas or steam
- An uncontrolled escape of a pressurised substance
- Electric shock - examples of electrical shock that are not notifiable:
  - Shock due to static electricity
  - Extra low voltage’ shock (i.e. arising from electrical equipment less than or equal to 50V AC and less than or equal to 120V DC)
  - When defibrillators are used deliberately to shock a person for first aid or medical reasons
  - Examples of electrical shocks that are notifiable
  - Minor shock resulting from direct contact with exposed live electrical parts (other than ‘extra low voltage’) including shock from capacitive discharge
- The fall or release from a height of any plant, substance or thing
- The collapse, overturning, failure or malfunction of, or damage to, any plant that is required to be design or item registered under the work health and safety regulations
- The collapse or partial collapse of a structure
- The collapse or failure of an excavation or of any shoring supporting an excavation

## 7.5 Monthly Service Report

The monthly Service report is compiled by the Site Supervisor by the end of the 5<sup>th</sup> business day of each new month using the ***GWA-GR-TMP-0001 NGRWF Pty LTD WOM Monthly Report Template***.



Reference

Refer to:

[GWA-GR-TMP-0001 NGRWF Pty Ltd WOM Monthly Report Template.docx](#)

## 8 Organisation, Responsibility and Authority

### 8.1 Goldwind Australia Organisation Chart

The Goldwind Australia organisation chart can be found in the following link.



Refer to:

[GWA Organisation Chart](#)

## 8.2 Site Safety Organisation

An initial site safety organisation chart has been prepared which describes key positions and relationships between:

- ✓ GWA and the Service Technicians
- ✓ GWA and specialist sub-contractors
- ✓ GWA and consultants
- ✓ GWA and community groups

Organisation charts, which are maintained by the GWA General Manager - Service, will be reviewed and updated whenever a change occurs.

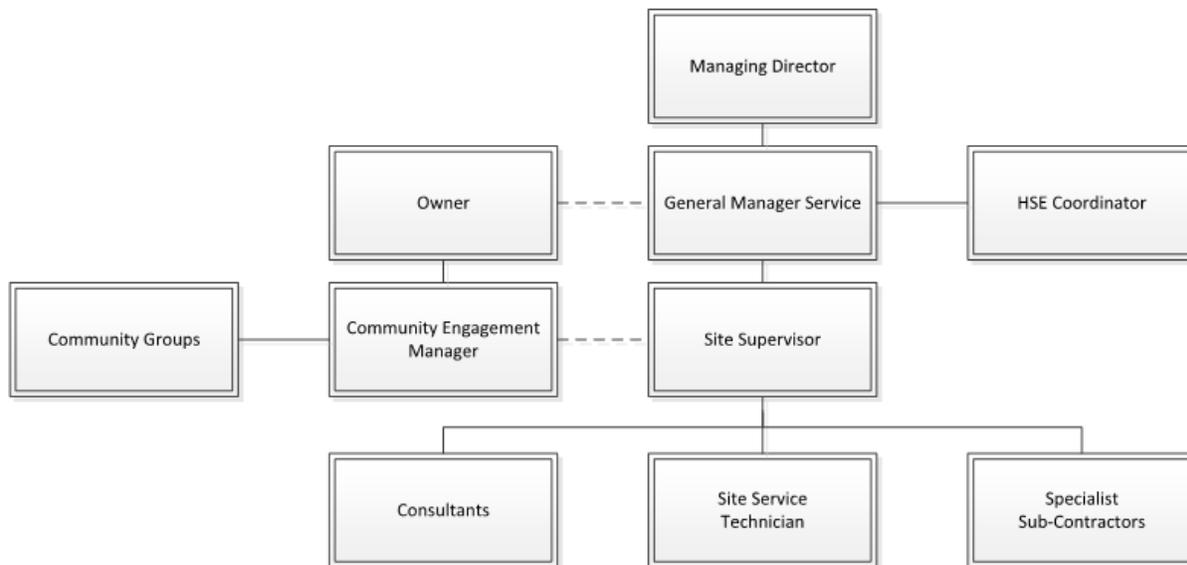


Figure 6: Site Safety Organisation Chart

Roles and Responsibilities are defined in each section of this OMP and associated reference documents.

### 8.3 Generic HSE Roles and Responsibilities

**The GWA Managing Director (MD)** is responsible for:

- The GWA Managing Director is ultimately responsible for the organisation's safety performance and ensuring its continual improvement.
- Ensuring the health, safety and welfare of all GWA employees at work
- Establishing a policy framework that supports a proactive approach to the management of occupational risks
- Ensuring that systems are established within GWA to manage the health, safety and welfare of employees, contractors and other persons working at GWA work sites
- Managing the Safety performance of Department Managers

**General Manager – Service** is responsible for:

- Responsible for HSE at GRWF and throughout the Service Department
- The effectiveness of the GWA Management System operating in all operational sites
- Ensuring that appropriate consultation takes place with employees about health, safety, environmental and injury management
- Allocating Safety responsibilities in the Service Department
- Allocating resources for Safety activities
- Monitoring, reviewing and improving Safety performance

**Site Supervisors** are responsible for:

- Implementing and monitoring the requirements identified in this document
- Ensuring that there is day to day safety consultation, participation and communication with the workforce
- Ensuring that GWA Policies, Procedures and other instructional documents are implemented on site
- Managing the completion and review of Service work method statements/JSEA, work instructions
- Ensuring contractors implement HSEQ requirements in accordance with submitted plans and or work method statements
- Ensuring all plant and equipment is safe to use and the risk of an environmental incident mitigated
- Periodically inspecting employees and contractors to ensure that all workers are abiding with defined conditions of work including site rules
- Investigating and reporting all incidents. Rectifying hazards as soon as possible after they have been identified.

**All workers and other persons attending site** are responsible for:

- Preventing pollution and to ensure the safety of themselves and all other persons that may be affected by their actions
- Carrying out their work in a manner consistent with the GWA policies and this OMP
- Exercising their right to stop or refuse unsafe work/activities

**Other persons attending site** are responsible for:

- Cooperating with any directions and procedures required to maintain the health and safety of themselves and others persons.

**Safety Responsibilities** are met by:

- Demonstrating personal commitment to safety by, for example, discussing safety issues with staff on the job, participating in safety and environmental inspections and following-up on corrective actions
- Allocating responsibilities to specific workers for managing safety systems for hazard identification, risk assessment and control
- Ensuring sufficient resources are available for risk control
- Setting targets, establishing indicators and monitoring performance standards for risk control
- Reviewing and evaluating safety performance at monthly HSE Service meetings

All persons are required to report any deviation from the conditions anticipated in GWA documentation and report accidents or unsafe conditions to the GWA Site Supervisor as per 7.3 of this OMP.

## 9 Training and Competency

Also refer to section 15.1.1 HV Training

### 9.1 Induction Training

Training incorporates:

- Generic induction training
- Site induction training
- Job/task specific training

#### 9.1.1 Generic Induction Training

All GWA employees undergo a corporate induction in accordance with **CO-PRC-0003 Training and Competency Procedure**.

Contractors must ensure that they provide their workers with organisational generic induction training.

#### 9.1.2 Site Induction Training

The Site Supervisor will ensure that all workers, visitors and other stakeholders undertake induction training and provide them with a copy of induction training material before starting work at GRWF.

The Site Supervisor or delegate will be the inductor.

Types of site inductions are:

- Visitor Induction
- Full Site Induction (made up of 3 parts)
  - Part 1: Site Introduction
  - Part 2: Specific Activities
  - Part 3: Wind Turbine Generator
- Land Owner Induction (to be developed)

##### 9.1.2.1 Visitor Induction

Site visitors must complete a visitor induction and be supervised by a person who has completed a Full Site Induction times during the visit.

Visitor induction procedure:

1. Inductor and visitor to review and complete **GWA-HSE-FRM-0036 Visitor Site Induction** form
2. Inductor to record visitor induction on the **GWA-HSE-TMP-0006 Site induction and visitor sheet**
3. Inductor to loan visitor with appropriate PPE (where required)
4. Visitor signs onto the **GWA-HSE-TMP-0012 Project Attendance Register** at the start and end of each visit (refer to section 11.1).

##### 9.1.2.2 Full Site Induction

The Full Site Induction must convey the requirements of the GRWF Operations Management Plan including:

- Site rules
- Relevant HSE policies and procedures
- Emergency management & response including first aid
- Hazard and incident reporting requirements and methods
- Regulatory requirements relevant to the work
- Consultation and communication arrangements.

Full site induction is made up of three parts, the sections are dependant on the activity (however Part 1 is mandatory). Parts 2 & 3 can be delivered independently and shall be determined by the Site Supervisor. Full site induction procedure:

1. The Inductor will ensure that the relevant sections of the **GR-PRE-0002 GRWF Site Induction Training** presentation are reviewed with the inductee in relation to works/activities
2. Inductor to issue the inductee a copy of the **GR-PRE-0002 GRWF Site Induction Training** presentation (on request)
3. Inductor and Inductee must complete and sign a **GWA-HSE-CHE-0001 Full Site Induction Checklist**. Inductor to check all certificates, permits, licences and other training records and take a copy for site records. The **GWA-HSE-REG-0003 Training and Competency Register** may assist the inductor in completing the checklist
4. Inductor adds inductee to **GWA-HSE-TMP-0006 Site induction and visitor sheet**
5. Inductee signs onto the **GWA-HSE-TMP-0012 Project Attendance Register** at the start and end of each day/shift (refer to section 11.1).

Refreshing persons who are not fully engaged at the wind farm in the full site induction will happen:

- Annually
- Following a major version change

### 9.1.3 Job/Task Specific Training

Only suitably qualified and competent personnel may operate certain machinery.

The Site Supervisor shall ensure that all licenses and/or certificates of competency are sighted during site inductions before any work commences.

Contractors must identify in their WHSMP and/or work method statements any job/task specific training required. Copies of training/licences/tickets will be taken by the inductee as part of the full site induction procedure.

Job/task training specifically relating to a GWA role is contained in the employees Position Description and on the **GWA-HSE-REG-0003 Training and Competency Register**.

The General Manager – Service will identify any training gaps during the employee’s corporate induction, record the training required on the **GWA-HSE-FRM-0018 Training Needs Analysis Form** and organise for training to be provided. Where a gap in training could create a safety hazard then the General Manager - Service and Site Supervisor will restrict tasks until the employee has completed relevant training.

Contractors must ensure that worker who have not worked in the construction industry for 2 years must complete Construction Industry (White Card) refresher training prior to working at GRWF.

All workers may be required to prove that they have maintained training competency.

The Site Supervisor will ensure that monthly training sessions are conducted for service employees and GWI Technicians which include:

- A rotation of GWA policies and procedures to ensure they are constantly reviewed and roles and responsibilities understood.
- A review of this OMP and relevant sub plans such as the ERP.

### 9.2 Inspection Training

Training requirements to conduct inspection training of various site equipment:

Item	Training	Who	Refresher
Climbing harnesses and twin tail lanyard	MEM15004B - Perform inspection	RTO	Not required unless competency not maintained
Fire Extinguisher, smoke detector and fire blanket	Inspection and Maintenance of Portable Fire Protection Equipment	RTO or GWA Internal trainer	Not required unless competency not maintained
Avanti WTG Lift, ladder and rail systems		Avanti	2 years
Life lines	MEM15004B - Perform inspection	RTO	Not required unless competency not maintained
Redpro Evacuation Kits	MEM15004B - Perform inspection	RTO	Not required unless competency not maintained
Lifting Chains and Chain Slings, Webbing Slings and Fibre Ropes	Dogging CPCCLDG3001A, Rigging CPCCLRG3001A	RTO	Not required unless competency not maintained
Confined Space Retrieval Systems	Confined Space Entry Course	RTO	Not required unless competency not maintained

Table 11: Climbing Equipment Inspection Training

### 9.3 GWA-HSE-REG-0003 Training and Competency Register

GWA employees are responsible for sending training records to the Service Administrator who will record them on the Training and Competency Register and in the SharePoint HR record.

The Site Supervisor will ensure that employee and contractor training records are reviewed annually and refresher training for employees is planned prior to certificates, licenses/tickets becoming expired.

The Site Supervisor will review the status of site employee Training and Competency Register monthly and report on the status via the Monthly Service Report.



Refer to:

- [CO-PRC-0003 Training and Competency Procedure](#)
- [GWA-HSE-TMP-0006 Site Induction and Visitor Sheet](#)
- [GWA-HSE-TMP-0012 Project Attendance Register](#)
- [GWA-HSE-FRM-0036 Visitor Site Induction](#)
- [GR-PRE-0002 GRWF Site Induction Training](#)
- [GWA-HSE-CHE-0001 Full Site Induction Checklist](#)
- [GWA-HSE-REG-0003 Training and Competency Register](#)
- [GWA-HSE-FRM-0018 Training Needs Analysis Form](#)

## 10 Goods and Services

### 10.1 Purchasing Goods and Services

All purchases over \$1000.00 in value require the raising of a purchase order before the order is submitted to the supplier. Service team members are required to request a purchase order from the Service Administrator.

1. The administrator must be supplied with the:
  - a. Name, address and contact person of the supplier
  - b. The cost code to which the purchase will be assigned to
  - c. The items to be purchased
  - d. The cost of the items
  - e. How many items are required.
2. The purchase order will be assigned a number by the administrator and recorded on the Purchase Order Register.
3. The purchase order will be sent to the General Manager - Service for approval
4. The purchase order will be sent to the supplier to arrange the order.

Items below \$1000.00 in value do not require a purchase order however they require approval from the Site Supervisor.

The Site Supervisor each month will reconcile site invoices/receipts against statements and forward to the Service Administrator in accordance with the ***GWA-CO-POL-0003 Corporate Credit Card Policy*** and ***GWA-CO-PRC-0005 Procurement and Payment Procedure (to be developed)***.

The Site Supervisor is responsible for:

- Obtaining safety information relevant for purchased material, plant and services
- Ensuring safety information is stored in site folders
- Ensuring that workers are aware of and have access to safety information



Reference

Refer to:

[GWA-CO-POL-0003 Corporate Credit Card Policy](#)

GWA-CO-PRC-0005 Procurement and Payment procedure [\(to be developed\)](#)

### 10.2 Contractor Management

Contractors engaged by the GWA Service Department for O&M works will report to the Site Supervisor in line with the purchase order terms and conditions or obligations set out in an agreement.

Contractors and consultants are prequalified through the use of the Cm3 system as per the requirements of the ***GWA-HSE-PRC-0021 Contractors and Consultants Prequalification Procedure***. All prequalified contractors and consultants are listed on the CM3 register and should be chosen to supply goods and services unless advised otherwise by the General Manager - Service.

Prior to attending site, Contractors will be provided with a copy of the Project Specific Requirements Document, Emergency Response Plan and any other relevant sub plans, by the Site Supervisor, in order for contractors to understand site specific HSEQ requirements.

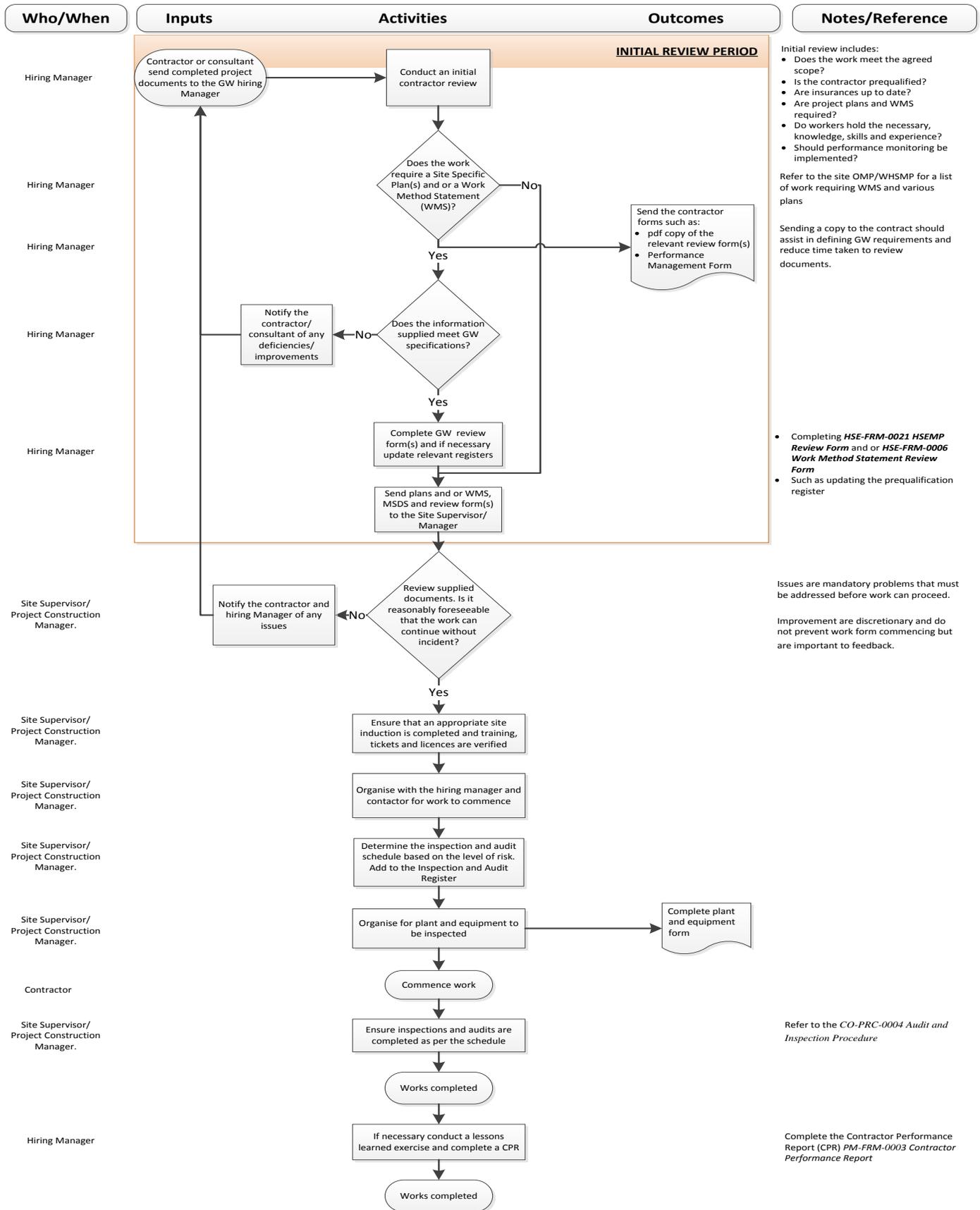


Reference

CM3 System Refer to:

<https://www.cm3.com.au/>

The following process flow diagram applies to managing contractors:



Contractors must supply the GWA hiring manager with approved Work Method Statements and if necessary a WHSMP, relevant to planned works at least 10 days in advance of attending site, in order for documentation to be reviewed and, if necessary, improvements made.

The GWA hiring manager is required to complete a **GWA-HSE-FRM-0021 Contractor HSEMP Review Form** and or **GWA-HSE-FRM-0006 Work Method Statement Review Form** in accordance with their understanding of the activities for which the contractor has been engaged. These should then be reviewed on site, by the Site Supervisor, to consider other site activities and staff availability.

Contractors required to conduct urgent work to prevent an emergency situation may submit SWMS for immediate review as soon as practicable for review.

WHSMP's are required when:

- In accordance with WHS Legislation, for work value exceeding 250,000 (per PCBU)
- For a Principal Contractor on a construction site
- Defined by the GWA Site Supervisor, based on level of HSE risk or previous performance

A list of work method statements must be included in contractors WHSMP.

Contractors who do not have adequate HSE systems in place are required to both comply with relevant sections of this OMP or address and amend deficiencies in their own systems to meet equivalent standards, legislative compliance and site requirements.

Contractors must identify in their WHSMP works performed by subcontractors and how subcontractors will be managed.

Contractors Work Method Statements must include generic and site specific hazards.

Work Method Statements must be made available on site to all workers.

Contractors must involve their workers in HIRAC.

The Site Supervisor will ensure that hazards and controls raised in HAZCON meetings, which cannot be eliminated/controlled out, are added to the Site Risk Register.

Contractors may also be required to develop other site specific plans such a Traffic Management Plan and Noise Management Plan depending on the nature of the work.



Reference

Refer to:

[GWA-HSE-PRC-0003 Developing and Using SWMS and JSEA](#)

[GWA-HSE-FRM-0006 Work Method Statement Review Form](#)

[GWA-HSE-FRM-0021 Contractor HSEMP Review Form](#)

[GWA-HSE-PRC-0021 Contractors and Consultants Prequalification Procedure](#)

### 10.2.1 Evaluating Contractor Performance

Sound supplier performance monitoring and management strategies offer the following opportunities:

- Contribute to effective risk management

- Contribute towards the development of strategic relationships with contractors
- Assist in developing contractor capability
- Assist in the development of supply chain management strategies
- Improve contractor and purchaser performance

Site Supervisor will ensure that when a contract has been completed that an overall evaluation and review is performed prior to closing the contract/project.

The Site Supervisor is required to performance monitor GWA prequalified contractors through the completion of the ***PM-FRM-0003 Contractor Performance Report (to be developed)*** as per the requirements of the ***GWA-HSE-PRC-0021 Contractors and Consultants Prequalification Procedure***.

The Site Supervisor will report on CPR's results in the monthly Service report, send completed CPR's to the Service Administrator then store a copy in site folders.

Contractors are encouraged to participate in performance reviews and can typically improve performance by:

- Reducing the turnover of project management teams
- Devoting more time to site safety issues
- Increasing the number of formal safety meetings with managers, supervisors and workers
- Increasing informal site safety inspections
- Recognising and rewarding good performance
- Increasing discipline to workers with poor safety performances

Contractors need to be made aware by the Site Supervisor that from the outset or engagement that their performance will be assessed and recorded. They must be advised of the performance criteria, how they will be measured, how performance assessments will be recorded and who will have access to such information.

Provide suppliers with opportunities to contribute to the development and implementation of performance management criteria and allow for dispute resolution processes that are fair and just. This mechanism needs to be established before the contract is signed and work commences. Consultation with suppliers in performance assessments is an important element of effective monitoring and management regimes



Refer to:

- ***PM-FRM-0003 Contractor Performance Report (to be developed)***

## 11 Consultation and Communication

WHS consultation arrangements consist of the Site Supervisor representing the site workgroup in WHS issues and interfacing with senior management. These arrangements will be reviewed by the work group every 2 years to ensure they remain appropriate and agreed by workers.

Contractors are expected to make their workers aware of all updated site WHS requirements.

Commitment to Safety should be demonstrated not only as issues arise, but also by involvement in scheduled forums and activities.

GWA will communicate relevant HSEQ information to everyone involved in this project through:

- Site inductions
- Safety meetings and other consultative forums
- Pre-work meetings or daily JSEA prestart talk
- Weekly toolbox talks
- Distributing GWA Safety alerts and guidance material about industry specific hazards/incidents
- Incident reports and outcomes
- Weekly/monthly inspections
- Quarterly reviews of HSE Reports
- Annual appraisal of staff performance
- Following audit outcomes

All workers will have access to a 2 way radio and mobile phone.

Communication channels will be displayed on the HSE notice board in the site office along with key contact details.

### 11.1 Tracking Site Attendance

The Site Supervisor and Job Supervisors must know where workers are at all times. To achieve this all persons attending site must sign in and out using the GWA-HSE-TMP-0012 Project Attendance Register, which is located at the Pommeroy O&M Complex, at the start and finish of each day/shift, and unless authorised by the Site Supervisor to remote sign in and out.

#### 11.1.1 Remote Sign In and Out

Contractors may be authorised to sign in and out of an alternative site entrance providing that the nominated Job Supervisor:

- Uses a copy of the **GWA-HSE-TMP-0012 Project Attendance Register** to capture signing in and out prior to persons entering the site (refer to Note below); and
- Ensures that all persons signing in and out are appropriately inducted onto the site; and
- Captures persons who are relate to his/her work group only and no other persons (all other persons must report to the O&M Complex); and
- Immediately forwards the completed **GWA-HSE-TMP-0012 Project Attendance Register** electronically to the Site Supervisor before continuing to the work location.

This allows the Site Supervisor to communicate any issues and confirm attendance prior to persons fully entering the site.

Changes to site attendance must be immediately communicated to the Site Supervisor using the **GWA-HSE-TMP-0012 Project Attendance Register**.

The Site Supervisor will communicate receipt of the register to confirm acceptance.

Contractors must have written authority by the Site Supervisor to implement remote sign in and out.

**Note:** Job Supervisors must ensure that remote sign in and out is conducted in a safe location taking into consideration:

- Parking of vehicles does not affect local traffic flow or safety
- Vehicles remain on formed roads and do not create new tracks

### 11.2 HSE Notice Boards

HSE notice boards will be established in the main Pommeroy office to display relevant safety information, including:

- GWA Safety Policies
- Safety Alerts and Industry Incidents, Safety Statistics
- Persons in charge
- First aid and fire warden personnel
- Emergency telephone numbers
- Hazardous Area Diagrams, emergency evacuation points, firefighting equipment types and locations, Site boundaries and changes thereto
- GWA safety performance including Positive Performance Indicators

Contractors must identify in their WHSMP location(s) where HSE information will be displayed during site works.



Reference

Safety Alert Library:

<https://goldwindaus.aseit.net/hseg/Safety%20Alerts/Forms/AllItems.aspx>

### 11.3 Toolbox Meetings

The safety consultation and communication arrangements will ensure continuous improvement opportunities and suggestions. The weekly toolbox talk is used as the forum for addressing safety related issues.

Copies of toolbox talks are saved onto share point and kept on file in the site office, if necessary they are circulated to the General Manager - Service and Senior HSE Advisor - Service for any action items.

The Site Supervisor will ensure that weekly toolbox talks are held to share and discuss HSE information such as:

- Review of incidents or hazobs including investigations and status
- Review of information relating to site procedures, roles and responsibilities
- Review of work method statements/JSEA
- Review of employee suggestions
- Review of area inspections
- Presentation of safety statistics
- General site related issues
- Monthly/quarterly reports

Sources of information for tool box talks:

- GWA SharePoint HSEQ Site – contains health safety, environmental and quality information, short cuts and reference material
- GWA SharePoint Safety Alert Library
- GWA SharePoint Static Reference Document Register library – contains corporate documents such as policies, procedures, guidelines, forms etc.
- GWA SharePoint Standards, Specifications and Codes
- GWA SharePoint HSEQ Reference Material
- GWA SharePoint SWMS Store
- Websites such as WorkCover NSW, EPA, Safe Work Australia
- Corporate news via email

The Site Supervisor will ensure that toolbox talks are recorded on the ***GWA-HS-FRM-0016 Toolbox Meeting Minutes Record Sheet***.

Contractors are required to document in a WHSMP who will conduct toolbox talks, when and how.



Refer to:

[GWA-HSE-FRM-0016 Toolbox Meeting Minutes Record Sheet](#)

#### 11.4 Prestart Talks

Prestart talks are conducted by individual work groups to discuss specific activities, processes and recap on SWMS control measures.

Contractors are required to document in a WHSMP who will conduct prestart talks, when and how.



Refer to:

[GWA-HSE-TMP-0002 Job Safety Environmental Analysis](#)

### **11.5 Landholder and Local Property Owner Communications**

The Site Supervisor will ensure that landowners and impacted property owners are regularly updated on site activities that could impact on their safety or create an environmental issue. Such activities could include:

- Impending delivery of large sections of plant necessitating restrictions to road or track use
- Work to be undertaken near stock or crops where landowners may need to attend
- Installation or removal of gates, fencing, cattle grids and the like
- Other activities that arise from time to time that could impact the safety of these stakeholders.

## 12 Hazards and Risk Management

Risk will be managed on site will be managed in accordance with the **GWA-HSE-PRC-0017 Risk Management Procedure**.

It is a core responsibility of the Senior HSE Advisor - Service to provide support and assist personnel involved in hazard identification and control to have the appropriate resources, experience and competency to perform the task effectively.

Risk management includes identifying hazards for the design, commissioning, operation, modification and decommissioning phase.

Risk management processes on site will include:

- Preparation and maintenance of a site Risk Register
- HAZOP and HAZCON – refer to GWA MS Manual, Section 4.7.1
- Work Method Statements
- Job Safety Analysis - which ensure that hazards, risks and control measures have not changes since the development of a Work Method Statement
- Toolbox talks
- Prestart meetings
- Hazard reporting
- Use of a Permit to Work system
- Use of Personal Protective Equipment, where appropriate



Reference

Refer to:

[GWA-HSE-PRC-0017 Risk Management Procedure](#)

Hazard and Operability Study - HAZOP studies are normally performed once the design is fixed, which allows the Site Supervisor and contractors to provide meaningful answers with regard to how the plant will operate.

Hazard Constructability Review - HAZCON studies are normally performed early in the project once all the key contractor tasks and associated plant information is available. The output from a successful HAZCON study will be a good identification of potential hazards that will result in safeguards being put in place at an early stage of the construction process.

The GRWF Site Supervisor will participate in the risk assessment process including HAZOP and HAZCON workshops adopted by the Contractor as appropriate.

### 12.1 Site Risk Register

A Site Risk Register will be developed by the Service Team using the **HSE-TMP-0011 HSE Risk Register Template** prior to the commencement of works in the Operation phase of the project.

A copy of the register is accessible on site at all times. The register will provide a detailed list of all identified site HSE hazards and applicable control measures.

Managers and Supervisors involved in the development of the Risk Register shall be trained in relevant procedures.

Triggers that cause a review of the Risk Register include:

- Identification of new hazards
- A modification or elimination of existing hazard(s)
- Inspection or audit outcome
- An incident investigation
- New contractors attending site

This review will be initiated by the Site Supervisor and involve all workers. When reviewing hazards activities adjacent to the site will be considered where there may be a risk to workers.

Residual risks calculated and recorded in the Site Risk Register are evaluated for tolerability in accordance with the **GWA-HSE-PRC-0017 Risk Management Procedure**.



Refer to:

[GR-REG-0001 GRWF HSE Risk Register](#)

## 12.2 Safe Work Method Statement (WMS) and JSEA

A Safe Work Method Statement must be developed for high risk construction work activity. Work Method Statements may also be developed for any additional high risk work as defined by the GWA Department Manager or Site Supervisor and for all work performed by contractors.

GWA Safe Work Method Statements shall be developed and used in accordance with **HSE-PRC-0003 Developing and Using SWMS and JSE**.

Work Method Statements supplied by contractors will be reviewed by the Site Supervisor using the **HSE-FRM-0006 Work Method Statement Review Form** prior to the commencement of work.

GWA WMS's are developed for:

- [GWA National Service SWMS](#)
- [GWA National High Torqueing SWMS](#)

The Site Supervisor will ensure that GWA and contractors SWMS are available on site.

The Site Supervisor will conduct periodic inspections in accordance with KPI's to ensure work is carried out in compliance with Safe Work Method Statements using the **GWA-HSE-CHE-0016 WHS Site Inspection Checklist**.

Workers using SWMS's must retain a copy at the work area for easy reference.



Reference

Refer to:-

SWMS Store:

- [Active \(Approved\) SWMS](#)
- [GWA-HSE-PRC-0003 Developing and Using SWMS and JSEA](#)
- [GWA-CHE-HSE-0016 WHS Site Inspection Checklist](#)

### 12.3 Work Instructions

A Work Instruction (WI) is used to:

- Support the implementation of various procedures and work permits
- Identify steps for the safe use/operation of a piece of equipment
- Clarify safety protocols for high risk commissioning, service or repair work

WI's are designed to be quick and easy to read and are to be displayed in the vicinity of plant of equipment, thus making it easy for an operator to review. WI's include PPE requirements, operating steps, start, stop and emergency stop features and emergency procedures.

This however does not diminish the requirement to assess the current conditions where the work is being undertaken.

The Site Supervisor is responsible for ensuring that WI's are developed in the absence of an existing appropriate Procedure.



Reference

WI's stored in: [Static Reference Document Register.](#)WI Template: [GWA-HSE-TMP-0010 WI Template](#)

### 12.4 Permit system

Specific high risk activities on site will be controlled by means of a permit to work system, in accordance with the ***GWA-HSE-PRC-0024 Permit to Work Procedure.***

The Site Supervisor will ensure that the site permit system is implemented and that appropriate permit issuers are nominated and trained in permit issuing procedures.

The permit system will control the following activities:

- Hot works
- Restricted Area Access Permit
- Trenching & Excavation Permit
- Confined space entry
- Electrical switching (HV and LV)

Completed permits must be submitted to the Site Supervisor for review and approval.

Contractors must plan plant movements on site with the Site Supervisor so that the need for an Essential Energy permit for traversing a power line can be determined.

Contractors are responsible for obtaining any relevant permits prior to conducting works.

Permit records shall be filed and retained on site for 2 years, HV permits are also stored on Share Point.



Refer to:

[GWA-HSE-PRC-0024 Permit to Work Procedure](#)

## 13 Control of Documents and Records

Site documents are controlled in accordance with **CO-PRC-0001 Control of Documents Procedure** and **CO-PRC-0002 Control of Records Procedure**.

All GWA Management System documents are to be easily accessible by employees using the SharePoint portal. If necessary contractors can request access to relevant GWA documents through the Site Supervisor. Accessing documents in static reference libraries ensure that current up to date versions of each and every document are available to users.

Any person intending to use any uncontrolled (printed) copy of a document must check the Static Reference Document Register prior to use to ensure the copy is the current version.

The Site Supervisor will ensure that the hard copies of reference documents which kept on site are updated when emailed updates are received.

All GWA employees are required to assist the Site Supervisor in storing records in the correct location in accordance with the **CO-PRC-0002 Control of Records Procedure, Appendix A – Site Folder Index Guide**.

### 13.1 Completing Time sheets

Time sheets must be completed in accordance with the **GWA-OM-PRC-0001 Service Timesheet and Cost Code Procedure**.



Refer to:

[CO-PRC-0001 Control of Documents Procedure](#)

[CO-PRC-0002 Control of Records Procedure](#)

[GWA-OM-PRC-0001 Service Timesheet and Cost Code Procedure](#)

## 14 Working at Heights

A safe work method statement must be prepared prior to commencement of any work where a person may potentially fall from one level to another where it is reasonably likely to cause injury to the worker or other person.

This includes a risk of persons falling into enclosures or containers. Where there is no alternative but to have a person working at heights, suitable barriers and/or fall arrest systems are to be provided.

Where a fall restraint or a fixed or portable ladder is to be used by personnel, the activity is to be carried out consistent with legislative requirements and relevant Australian Standards such as AS/NZ 1892 Portable Ladders and AS/NZ 1891 relating to fall-arrest systems and devices.

The **GWA-HSE-PRO-0022 Climbing Wind Turbine Procedure** applies to any person who intends to climb a wind turbine (which is under the control of GWA) above or below the entry level platform.

Tools carried during WTG climbing must be securely tethered to the worker using bungee cords or stored inside a site approved gear bag.

### 14.1 Ladder Safety

Ladder safety includes:

- Inspected for faults before use
- Using ladders according to the manufacturer's instructions
- Using AS compliant ladders
- Choosing the correct ladder for the task
- Where possible tethering the ladder to a suitable structure to prevent slippage
- Only allowing one person at a time on a ladder
- Performing all work from a ladder while facing the ladder
- Never step above the third-top rung on a ladder (the top step on a step-ladder count as the top rung).
- Make sure you have three points of contact at all times.
- Not setting up ladders on scaffolds, forklifts or elevated work platforms to gain extra height



Refer to:

[GWA-HSE-PRC-0022 Climbing Wind Turbine Procedure](#)

[Safe selection of portable ladders](#)

## 14.2 Working in the Nacelle and Hub in 2.5MW WTG

Access to electrical cabinets in the GW2500 Nacelle requires one of the two entry/exit hatches to be closed in order to open electrical cabinet doors. Workers must ensure that only one electrical cabinet is opened at a time thus allowing one side of the entry/exit hatch to remain available in the event of an emergency.



Reference

Refer to:

- [O&M Manuals](#)

## 14.3 Working in Basement

### 14.3.1 GW1500 Turbine

#### Basement hatch configuration:

- Single sliding hatch to the basement located at the rear of the turbine.
- The GW1500 design incorporates a barrier and gate surrounding the hatch.

#### Access Procedure:

1. Prior to working in the basement the turbine must be placed in visit/repair mode (taken out of operation); the Kiosk LV circuit breaker isolated and locked out/tagged out prior to accessing the basement area.
2. With the barrier gate closed, slide open the basement hatch.
3. Attach the Avanti slider to the Avanti ladsafe and to harness.
4. Open the gate and climb onto the basement ladder.
5. Close barrier gate.
6. Descend into basement.
7. Ascend ladder in reverse order.

Where possible a spotter should be stationed on the entry level platform to monitor at persons in the basement and the turbine entrance.

### 14.3.2 GW2500 Turbine

#### Basement hatch configuration:

- Two sliding hatches on the entry level platform consisting of:
  - Hinged hatch located at the rear of the turbine. Basement ladder extends above the entry level platform. No fixed barrier.
  - Hinged hatch at the front of the entry level platform. No fixed barrier

#### Rear Hatch Access Procedure:

1. Prior to working the basement the turbine must be placed in visit/repair mode (taken out of operation). Depending on the nature of works, the Kiosk LV circuit breaker may need to be isolated and locked out/tagged out prior to accessing the basement area. This will be defined in a Work Method Statement or JSEA.
2. Attach twin tail lanyard to nearby Avanti anchor point.

3. Person in the vicinity of the hatch to also attach twin tail lanyard to anchor point.
4. Open the hatch, climb onto the basement ladder and attach Avanti slider.
5. Detach twin tail lanyard.
6. Descend into basement.
7. Detach Avanti slider.
8. Ascend ladder in reverse order.

**Front Hatch Access Procedure:**

1. Prior to working the basement the turbine must be placed in visit/repair mode (taken out of operation). Depending on the nature of works, the Kiosk LV circuit breaker may need to be isolated and locked out/tagged out prior to accessing the basement area. This will be defined in a Work Method Statement or JSEA.
2. Secure access to the entry level platform using yellow safety chain.
3. Persons in the vicinity of the hatch to attach personal life line to the designated anchor point.
4. Open the hatch, climb onto the basement ladder and attach Avanti slider.
5. Detach personal life line and attach to designated attachment point.
6. Descend into basement.
7. Detach Avanti slider.
8. Ascend ladder in reverse order.

A spotter should be stationed on the entry level platform to monitor at persons in the basement and the turbine entrance. Spotters must be attached to a personal life line or twin tail lanyard at all times when a basement hatch is open.

#### 14.4 Falling Objects

Measures must be taken to protect against the risk of falling objects. Control measures include:

- Storing and stacking materials safely
- Using permit to work systems
- Limiting persons climbing from carrying items on their person
- Placing equipment in rated gear/lifting bags when using the service crane
- Establishing exclusions zones around overhead works such as crane works and in drop zones under the service crane
- Persons climbing not to climb underneath or above each other. Climb from hatch to hatch
- Wearing hard hats/climbing helmets/bump caps

Where this is not possible, a risk assessment using the Hazob Form must be undertaken and appropriate control measures implemented to manage the risk of injuries from falling objects.

#### 14.5 Suspended Loads

At no time may any person position themselves underneath the drop zone of any suspended load without an approval from the Department Manager.

## 14.6 Slips, Trips and Falls

Hazards associated with slips, trips and falls by will be managed by:

- Using inspection checklist to monitor and review control of risks relating to slips, trips and falls
- Checking and for hazards that could cause someone to slip, trip or fall by visually checking your work area before work activities
- Ensuring workers keep site offices and WTG work areas as tidy as possible
- Walking on hard standing and avoiding walking through long grass and uneven ground.

## 15 High and Low Voltage Electrical Procedures

Also refer to LOTO procedures in Section 16.6 Isolation of Plant and Equipment.

### 15.1 HV Electrical Work

High voltage operations must be carried out in accordance with the **OM-PRC-0002 Wind Farm National HV Safety Procedure**. The HV authority shall authorise GRWF HV Operators whose details will be displayed on the site contact list. A consolidated Operating Diagram for GRWF is located in the SharePoint Windfarm Site in the Static Reference Document Library and on the wall of the HV Switch Room. This document is kept up to date by the Site Supervisor.



Refer to:

- [OM-PRC-0002 Wind Farm National HV Safety Procedures](#)
- Consolidated HV Operating Diagram [E9239-E-5901-02\\_0](#)

#### 15.1.1 HV Training

The HV Authority will ensure that HV Operators complete HV training according to the requirements of the National HV Safety Procedures which outline the requirements for the safe operations of the Gullen Range 330/33kV Substation and Wind farm Network and its associated protection and control system. The training shall be conducted by a third party Registered Training Organisation (RTO). Refresher HV training shall occur on an annual basis to the relevant personnel.

### 15.2 LV Electrical Work

Any LV electrical work performed on any electrical installation or electrical plant on site shall be carried out by a NSW Licensed Electrician in accordance with:

- AS 3000 Wiring Rules
- NSW low voltage electrical work code of practice 2007
- OM-PRC-0002 Wind Farm National HV Safety Procedures – Section 15 Low Voltage Apparatus

All portable electrical equipment shall be inspected and tested in accordance with **GWA-HSE-PRC-0005 Testing and Tagging of Electrical Equipment**.



Refer to:

- [GWA-HSE-PRC-0005 Testing and Tagging of Electrical Equipment](#)
- [NSW low voltage electrical work code of practice 2007](#)
- [AS NZS 3000-2000 Wiring Rules](#)
- [AS NZS 3000-2007 Electrical Installations Amendment 1 and 2](#)

### 15.3 Work near overhead or underground essential services

Workers must maintain safe working distances from overhead or underground services in accordance with the ***Code of Practice for Work near Overhead Power lines 2006***.

#### 15.3.1 For work near overhead power lines up to and including 132,000kV:

- Work is not permitted within 3 metres of overhead power lines
- Contractors shall coordinate with the Site Supervisor to ensure that written authority from the electrical supply authority is obtained prior to work within the “no go” (exclusion) zone
- If using plant or equipment near overhead power lines, contractors must dedicate a competent safety observer to be present during all activities
- Liaise with relevant transmission line operator prior to activity that has potential for an incident to discuss and confirm control measures



Reference

Refer to:

[NSW work near overhead power lines code of practice 2006](#)

## 16 Plant and Equipment

To ensure all plant used complies with the requirements of the WHS Regulations:

- The Site Supervisor will ensure that all plant and equipment is recorded on the site Plant and Equipment Register
- Contractors are required to manage a similar register for their own plant and equipment which will be referenced on the GWA Site Plant and Equipment Register. A current copy of contractors registers must be provided to the Site Supervisor by a person nominated in the contractors WHSMP
- Contractors plant movements must be planned in consultation with the Site Supervisor to ensure the safe movement of traffic and worker segregation on and off site
- Only use plant and equipment for the purpose for which it was designed
- Use warning devices all health and safety features provided in the correct way
- Guarding must be permanently fixed and is not permitted to be removed
- No person other than the operator may ride on the plant unless the person is provided with a level of protection that is equivalent to that provided to the operator
- Plant risk assessments and service log books are required prior to plant being brought onto site. These records will be reviewed by the Site Supervisor during plant inspections
- All earthmoving equipment must be fitted with compliant ROPS/FOPS where required by legislation, a risk assessment is conducted to determine the need for ROPS/FOPS for all other each moving equipment and seatbelts provided. These records will be reviewed by the Site Supervisor during plant inspections using the **GWA-HSE-FRM-0032-Plant Inspection Form**.
- All plant which is used on site must be maintained in accordance with the manufacturer's instructions. The maintenance schedule for each item, and details of all maintenance undertaken, shall be recorded in the GWA Site Plant and Equipment Register

Contractors must ensure that:

- Plant has a warning device such as warning lights and where appropriate reversing beepers
- All plant that lifts or suspends loads is specifically designed to lift or suspend that load. Contractors must complete a lifting survey prior to each lift.



Reference

Refer to:

[GWA-HSE-FRM-0032 Plant Inspection Form](#)

## 16.1 Maintenance Tools

Hand tools required for the maintenance to the site are provided. Tools for the maintenance to the WTG's, including high torque tools, are also provided which are as per specified in the relevant operations and maintenance manual.

Specialist tools which are necessary for the operation of balance of plant equipment are also provided as are tools necessary to complete the maintenance to the balance of plant as specified within the Asset Management Agreement.

Where necessary, tools are calibrated in accordance with manufacturer's specifications and the asset Management Plan, by an approved third party service provider. The Site Supervisor will ensure that calibration records are maintained and stored on site.

Tools requiring calibration include:

- High Torqueing equipment
- Climbing and lifting equipment
- Emergency response equipment
- Air and noise monitoring equipment
- HV PPE
- Electrical testing equipment

## 16.2 Hand operated and power tool use

We will manage hazards of hand operated and power tool use by:

- Regularly checking all tools to ensure they are in a safe working order
- Communicating any issues identified with power tools to workers through a toolbox meeting.

Before using power tools, workers must ensure:

- Electrical connections are secure
- Electricity supply is through an RCD
- Safety guards are in position
- The machine is switched off before activating the electricity supply
- Appropriate PPE is used as required by:
  - Manufacturer's instructions
  - SWMS/JSA/Work Instructions
  - Site signage
  - As instructed specifically by the Site Supervisor



Reference

Refer to:

[Safe use of angle grinders](#)

### 16.3 Traffic Management Plan

Contractors must develop a Traffic management Plan for works on and off site including arrangements for:

- The number of trucks to be used
- The type of trucks to be used
- The number of oversized loads requiring permits
- Time of entry to site and off-site
- Clear indications of restrictions for working on site
- Understanding of school bus runs, details of how this is to be managed
- Method of loading and unloading, lifting plans
- Methodology of communicating with the two local councils
- Contact numbers
- Methodology of managing a breakdown on local roads
- A map (route) for oversize load
- A map (route) for normal semi-trailer loads
- A map (route) for normal 4x4 construction traffic

### 16.4 Driving Rules

- Vehicle safety extends to traveling to and from site. Workers must:
  - Be vigilant for wildlife at dawn, dusk, after a dry spell, during fog (refer to safety alerts)
  - Practice defensive driving techniques. Respect other road users. Reduce speed when faced with oncoming traffic, especially on narrow roads, without line delineation or when approaching heavy vehicles
  - Reduce speed when faced with poor road surface conditions such as loose surface material or where pot holes are apparent (report poor road surface to the principal contractor)
- Drivers must be appropriately licenced and obey site rules
- Drivers must obey speed limits and other traffic management plans on and off site
- Vehicles must be suitable for site and contain a first aid kit, fire extinguisher and AED
- Vehicles are to be parked on hard stands or sealed roads and not on grassy areas. This is to prevent a possible grass fire and harm to the environment
- Apply wheel chocks if it is necessary to park on steep slopes
- Reduce speed and be vigilant at road junctions
- Site vehicles are periodically checked in line with the Asset Management Plan. Vehicle checks are recorded on the **GWA-HSE-CHE-0014 Vehicle Condition Checklist**
- Where possible park vehicles on flat surfaces and always apply the park (hand) break and leave in gear with the engine off

- All vehicles (with the exception of delivery vehicles) must be fit for purpose and fitted with 2 way radio, fire extinguisher, first aid kit, spare water and clothing
- Vehicle and mobile plant operators may only use mobile phones in transit if correctly using a hands-free kit (i.e. ear piece or phone cradle) approved by the Site Supervisor
- The use of mobile phones is strictly prohibited while refueling vehicles and other plant



Reference

Refer to:

- [GWA-HSE-POL-0005 Vehicle Policy](#)
- [GWA-HSE-CHE-0014 Vehicle Condition Checklist](#)

### 16.5 Service Vehicle Features

The service team is supplied with a fully equipped 4WD dual cab diesel powered utility complete with all terrain tyres, rotating amber light on headboard, Hayman Reese towbar, complete with internal lighting, exterior halogen floodlighting.

### 16.6 Isolation of Plant & Equipment.

Lock out, isolation and tagging procedures in a workplace are designed to protect people and property from risks arising from machinery or equipment which has been taken out of service for repair, maintenance or inspection.

Locks and/or danger tags are attached to isolation devices signify that persons are currently engaged in work on the plant, and that it is likely that those persons will be injured if the isolating devices are not maintained in the safe position.

In accordance with **GWA-HSE-PRC-0009 Lock Out Tag Out Procedure** for isolation of plant and equipment, all workers must ensure that locks and/or danger tags are used while equipment and machinery is being repaired or serviced including WTG's.

Wind turbines must be locked to prevent mechanical moving parts becoming a hazard and unlocked as wind speeds increase to prevent damage to mechanical parts. The procedure for locking and unlocking the rotor is defined in the relevant GWI WTG manual.

Small defective equipment such as extension lead, sling ladders etc. must be removed from the work site and quarantined to prevent unintended use. The GRWF quarantine area is the signposted shipping container in the main O&M compound. All items in this container are regarded as out of service/defective and as such must not be used whilst tagged.

Locks and tags are available at the O&M site office and in the HV switch room.

The Site Supervisor must be notified of all defective plant and equipment and will ensure that the site Plant and Equipment Register is updated.

Contractors are to identify LOTO procedures relating to their works in a Site Specific WHS Management Plan including roles and responsibilities.



Refer to:

[GWA-HSE-PRC-0009 Lock Out Tag Out Procedure](#)

### 16.7 Inspecting, Testing and Servicing of Plant & Equipment

- The Site Supervisor will ensure that a plant assessment is completed by for each item of plant, prior to use on site, using the **GWA-HSE-FRM-0032-Plant Inspection Form**
- All plant and equipment must be visually inspected daily prior to each use. Where appropriate, details of inspections shall be recorded in plant/service log books
- Any defects discovered must be reported to the GWA Site Supervisor and recorded in the log book and the Plant and Equipment Register
- Defective plant and equipment must be tagged with an “Out of Service” tag and immediately withdrawn from service. The equipment shall not be returned to service until serviceability has been confirmed.
- All portable electrical equipment must be tested and tagged in accordance with procedure: **GWA-HSE-PRC-0005 Testing and Tagging of Electrical Equipment**.
- Contractors must define in their WHS Management Plan what plant requires ROPS/FOPS, who will inspect them and when
- A complete list of item requiring inspections or servicing is defined in the site CMMS Task list



Refer to:

- [GWA-HSE-FRM-0032 Plant Inspection Form](#)
- [GWA-HSE-PRC-0005 Testing and Tagging of Electrical Equipment](#)

### 16.8 Climbing and lifting Equipment

Types of climbing and lifting equipment:

- Lifting Chains
- Webbing Slings
- Harnesses and twin tail lanyards
- Confined Space Entry Retrieval Systems
- Fibre Ropes (including Tag Lines and Life Lines)
- Emergency Rescue Equipment (Red Pro)
- WTG Lift, ladder and rail systems

All climbing equipment including WTG lifts and ladders, Avanti Rail systems, life lines and anchor points must be inspected and maintained by a competent person who has completed relevant training in accordance with Section 9.2.

All climbing and lifting equipment is recorded on the site Plant and Equipment Register.

#### 16.8.1 Inspect and Test of Avanti Lift

All Avanti Lifts in each WTG shall be serviced at 6 monthly intervals.

The inspection and maintenance shall be carried out by personnel who have been trained and certified by Avanti in carrying out Service and Maintenance to Avanti Lifts.

Use of Avanti lifts is strictly limited and may only proceed if the following criteria is adhered to:

- a service to the lift has been conducted within the last 6 months;
- there are no issues identified with the lift;
- prior to each use of the lift, operating persons must conduct a pre-operation inspection;
- check and record the total number of operation hours of the lift,
- The traction hoist and fall arrest device must be overhauled at an authorised workshop and furnished with a new certificate for every 250 hours of operation.

If any issue is found during the inspection, the lift must be tagged “out of use” and reported to GWA Supervisor, follow section 10(b) of the Avanti manual.

Any issue must be rectified before the lift can be placed back into operation.

The inspection and test must be carried out every 6 months as per the Avanti Operation Manual, workers shall also conduct the daily pre-operation inspection:

Daily and 6 monthly inspections shall be conducted as per Avanti manual:

- Daily inspection includes visual and mechanical test of the traction hoist; and
- Inspection and maintenance by Avanti trained service technicians will be conducted every 6 months, using Avanti supplied equipment.

Pull tests are performed during the 6 monthly inspections.

### 16.8.2 Inspecting, Testing and Servicing of Climbing and Lifting Equipment

Climbing and lifting equipment standards.

Item	Inspection Frequency	Standard
Climbing harnesses and twin tail lanyard	6 monthly	Manufacturer's instructions and AS 1891.1 Industrial Fall Arrest Systems and Devices.
Avanti WTG Lift, ladder and rail systems	Annual	Manufacturer's instructions and AS 1891.1 Industrial Fall Arrest Systems and Devices.
Fire Extinguisher, smoke detector and fire blanket	6 monthly	<ul style="list-style-type: none"> <li>• Manufacturer's instructions and AS 1851 - Section 1, 10 and 11.</li> <li>• AS 3676 – Portable Fire Extinguisher Guide to Servicing</li> <li>• AS 2444 – Portable Fire Extinguisher &amp; Fire Blankets Selection &amp; Location</li> <li>• Building Code Australia</li> </ul>
Miller Falcon - Life lines	Annual	Manufacturer's instructions and AS 1891.1 Industrial Fall Arrest Systems and Devices.
Redpro Evacuation Kits	Annual	Manufacturer's instructions and AS 1891.1 Industrial Fall Arrest Systems and Devices.
Flat and Round synthetic lifting slings	Annual or 3 month for intensive	Manufacturer's instructions and AS 4497 Section 1 & 2. Round Slings—Synthetic Fibre or AS 1353 Section 1 & 2 Flat Synthetic Webbing Slings
Winches, Blocks and Hoists	Annual or 3 month for intensive	Manufacturer's instructions and AS 2550.1 Cranes, hoists and winches – Safe use.
Webbing slings	Annual or 3 month for intensive	Manufacturer's instructions and AS 1353.2-1997 Flat synthetic-webbing slings
Confined Space Entry Retrieval Systems	6 monthly	Manufacturer's instructions AS 1891.1 Industrial Fall Arrest Systems and Devices.

Table 12: Climbing and Lifting Equipment Standards

#### In-service Inspections

A visual inspection prior to each use. This implies that prior to each lift, the user has a good look over the equipment (sling, hook, lifting points) to ensure that there is no significant damage or wear, and that the Working Load Limit (WLL) tag or markings are fitted and legible. At this point, if any defects are noted, the equipment should be withdrawn from service, and inspected by a competent person who can make a decision on whether to use, repair or discard the equipment.

## Periodic Inspections

Periodic inspections refer to a more careful and detailed inspection, where the equipment is cleaned, and inspected in an adequately lit location by an inspector who has been both trained and has verifiably good vision (this is specifically discussed in the Chain Sling standard). Inspections also need to be adequately documented and supplied to the GWA Site Supervisor.

## New items

All new lifting equipment must be inspected prior to use. This is to assist in identifying any manufacturing faults or damage during transit.

An individual record must be developed for each new item and details of the new item must be entered into the Site Plant and Equipment Register.

## 16.9 Lifting Equipment Supplied to Contractors

GWA may issue lifting equipment such as specialist WTG slings to contractors.

Contractors are responsible for:

- Conducting an inspection of supplied lifting equipment pre and post use to check for signs of damage by suitable competent person(s)
- Implementing quality and safety practices to maintaining supplied lifting equipment in good condition
- Reporting any damaged slings to the Site Supervisor
- Monitor expiry dates of lifting equipment under their control
- Providing GWA lifting equipment for periodic inspection testing
- Replacing damaged Goldwind Lifting Equipment on a like for like basis
- Quarantining damaged and expired lifting equipment to prevent unintended use



Reference

Refer to:

- [Soft-sling-fails-during-lift\\_Alert\\_vs3](#)

## 16.10 Personal Protective Equipment (PPE)

Minimum site PPE requirements include:

- Closed safety footwear
- Suitable clothing covering arms and legs
- High visibility vest/clothing

The Site Supervisor will ensure that site service employees and visitors on site are provide with the correct PPE.

GWA employees are issued PPE relating to their work during their induction. Requests for replacement or new PPE should be directed to the Site Supervisor.

Contractors are required to:

- Document in SWMS/JSEA the PPE required for each activity
- Provide their workers with suitable PPE
- Provide workers with training in inspection, safe use and maintenance of PPE

Any persons providing PPE must ensure that:

- PPE is suitable for the nature of the work and any hazard associated with the work
- PPE issued should conform to legislative requirements and the relevant Australian Standards
- PPE must be stored correctly, worn correctly, be maintained (as per manufacturer's specifications) ensuring hygiene is maintained
- PPE must be in good working order and within the designated inspection date
- Personnel must be adequately trained in the correct use, maintenance and storage of their PPE.
- PPE is a suitable size and fit and reasonably comfortable for the worker who is to use or wear it

Any persons provided with PPE must:

- Use high visibility safety vests when working around plant (including site vehicles) and equipment and in the event of a vehicle breakdown (when travelling to and from site).
- Follow all instructions to wear and use PPE including those defined on signage and in documentation
- Report and misuse, abuse or damaged PPE (and quarantine to prevent further use)
- Monitor expiry dates/retest dates where applicable prior to use
- Lead by example in wearing PPE and assisting others to comply with the above requirements

### **16.11 Inspections on GWA Issued PPE**

- All persons are responsible for inspecting PPE prior to and after use
- Defective PPE must not be used but instead quarantined and if necessary to prevent unintended use tagged "Out of Service"
- The Site Supervisor must be notified of defective PPE

### **16.12 Excavation work**

Anyone undertaking excavation work must not start work unless they have:

- Been issued a excavation permit to work.
- A Vicinity Approach / HV permit issued where required
- Assured of the absence of and location of underground services that may be affected by their works, before starting work (dial before you dig)
- Implemented control measures to avoid direct or inadvertent contact with underground services
- Pot-hole dug (by hand) to expose existing services before any mechanical excavation near the services

Any issues must be immediately reported to the Site Supervisor.

Work Method Statements are required for all excavation work regardless of depth and revised with the Site Supervisor prior to the commencement of activities. Workers must be familiar with and implement the control measures in the WMS.

### 16.13 Using the Site Forklift

Forklift operators must be trained and hold a relevant license. They also must be competent at operating the fork lift in the environments in which they are required to work

Before lifting a load, the weight, size, shape and composition of a load should be considered, along with the terrain that the forklift will be travelling over. Loads must only be lifted, carried and stored in a manner that ensures stability at all times.

Prestart checks must be conducted on the forklift using the log book.

When carrying loads, avoid sudden or heavy braking that could cause the load to slide forwards

Slip on attachments should be secured to prevent accidental disengagement from the supporting tines. Do not sling loads from tines, as there may be a risk of the sling sliding off the tines. If necessary (and allowed by the manufacturer), use a jib or other specifically designed attachment to carry underslung loads

Operators should position spotters when others are present or if in the vicinity of items that the forklift may collide with.

Forklifts have numerous blind spots, especially if the carried load obstructs forward view. Operators should ensure other persons are excluded from the area or, where this is not reasonable practicable, remain in view at all times. Workers in the vicinity of operating forklifts should position themselves to be visible by the driver and remain clear of the travel path.

When parked up forklifts must be left in a state that does not create a risk to the health or safety of any person. When parked up the forklift shall be:

- Parked on level ground with the load removed
- Parked in a way that does not block the flow of other traffic
- Have the park brake applied
- Fully lower the fork arms and tilted slightly forward so that the tips of the fork arms touch the ground
- Leave the drive controls in neutral
- Shut off the fuel line e.g. LPG or power and lock the start control in the 'off' position, and
- When left unattended, remove the ignition key or ensure the start control is locked off to prevent unauthorised people from using the forklift.

### 16.14 Vehicle Recovery Procedure

In the event that a vehicle becoming bogged in soft ground, recovery of any vehicle on site must be performed in accordance with the ***GWA-HSE-PRC-0013 Vehicle Recovery Procedure***.



Refer to:

[GWA-HSE-PRC-0013 Vehicle Recovery Procedure](#)

General Guide for industrial lift trucks

Forklifts Information Sheet for Owners and Operators

## 17 Site Layout and Facilities

### 17.1 Public Safety

Appropriate measures are in place for the protection of third parties in the proximity of the site.

These include but are not limited to:

- Warning and restricted entry notices prominently displayed
- Fenced off areas
- Locked and secure premises
- Grass/scrub areas around perimeter fencing maintained at low levels
- Site practice to control or remove slip/trip hazards in and around the compounds; and
- Installations located well inside fenced areas

### 17.2 Signage

The Service team will periodically monitor and maintain site signage during the O&M phase.

Contractors are required to control work areas with appropriate signage including:

- Prevention of unauthorised access
- Safely direct traffic, workers and general public
- Communicate radio channels.

The Site Supervisor will ensure that site entry signage at all times displays:

- Name of the site
- Site office location
- After hours contact for deliveries or emergencies
- PPE requirements
- An email address, postal address and 24hour phone line for complaints

### 17.3 Site Layout and Facilities

All workers are required to sign into the O&M attendance register or other registers approved by the GWA Site Supervisor.

#### 17.3.1 Remote Lone Work

Isolated work is not permitted at GRWF. All workers are required as a minimum to work in pairs and to maintain effective communication with the Supervisors/Managers. All working parties must have access to a hand held 2-way radio, vehicle CB and mobile phone which must be tested before leaving the site compound and when arriving to the work area. Communication between persons away from the site office is essential in the event of an emergency and in maintaining the efficiency of activities.

#### 17.3.2 Amenities

Appropriate measures will be developed and implemented by Site Supervisor and HSE Support to manage any workplace hygiene matters that may arise or reasonably expected to arise in relation to the operation and maintenance of the GWA assets including:

- Toilets and amenities will be provided in the O&M Main Office
- Contractors will need to make their own arrangements for additional amenities and drinking water close to their work location. This must be documented in the contractors WHSMP.
- All workers are to have implemented good hygiene standards and clean up after themselves
- Offices shall be free from slips trips and falls and
  - Have adequate lighting
  - Contain suitable workstations and shelving
  - Be clean, dry and temperature controlled (to facilitate hot and cold conditions)
- GWA will supply lunch rooms and fridges. Fridges will be cleaned out periodically to prevent a build-up of old food. Contract cleaners will be used to assist in keeping floors, locker rooms and toilets in GWA offices clean.

#### 17.4 Wash Down Area

Designated wash down areas are identified in site inductions and are to be used for the cleaning of all plant and equipment including site vehicles.

#### 17.5 Waste Management

Recycling facilities are set up on site and suitable collection methods to ensure separation and management of landfill (general rubbish), products which can be recycled and products which must be disposed of in specific bins provided. Collection services are identified on the main office notice board.

#### 17.6 Property Access Protocol

Landowner relations are influenced by workers behaviour and following property access protocol. To ensure that all interactions are positive and access to private property successfully managed, all workers must follow the ***Stakeholder and Community Information Plan, Appendix C – Property Access Protocol***.



Reference

Refer to:

[KMH-2012 093-WO-Stakeholder and Community Involvement Plan-VerB](#)

## 17.7 Noise and Air Pollution

### 17.7.1 Noise Management

General Noise Management includes the following measures:

- Activities will be restricted to normal site hours
- Noise barriers and other protection will be installed in consultation with the Site Supervisor where there is a risk of effecting the safety of others
- Noise is considered then choosing plant and equipment
- PPE for noise protection will be issued and worn when working around plant
- GWA will maintain a log of noise complaints
- All persons suspecting an increase in wind turbine noise must immediately inform the Site Supervisor and if necessary shut down the turbine so that an investigation can commence and any issues rectified as soon as possible after identification
- Vehicle noise emissions to a reasonable level
- All site vehicles and plant shall be fitted with properly maintained engine exhaust mufflers
- Where reasonable and feasible, audible movement warning alarms fitted to site vehicles (reverse beepers) will be removed/disconnected, as long as this does not create a safety hazard
- Maintenance and service activities will generally be limited to the hours of 7am to 6pm Monday to Friday, and 8am to 12pm Saturday, except in the case of emergency repair works or works that cannot reasonably be completed within the above hours
- Where works outside the above hours are proposed and noise from equipment such as cranes or power tools may impact on surrounding receivers, the potentially impacted receivers shall be notified of the proposed works at least one week in advance, except in the case of emergency repair works. Council will also be notified and consultation with the public will be undertaken
- Where audible movement warning alarms (e.g. reverse beepers) are fitted to vehicles and used on site, they shall be of the broadband type, not a tonal beeper
- The equipment, processes, and scheduling of maintenance works will be determined with consideration to minimising noise emissions and noise impacts to surrounding dwellings. JSEAs (Job Safety and Environmental Analysis) will be used to detail the prescriptive mitigation measures to be implemented for specific activities. ESAMs (Environmental and Social Assessment and Management) will be used to identify any potentially affected noise sensitive receivers
- Noise from radios/music will be kept to a reasonable level during maintenance works
- Any noise complaints shall be managed in accordance with the **Noise Complaints Management Procedure (see Section 9.0 in the Noise Compliance Plan)** and will complement the measures defined in the OEMP



Reference

Refer to:

[Gullen Range Operational Noise Management and Noise Compliance Plan R3](#)

### 17.8 Preventing Air Pollution

GWA recognises that suppressing and controlling the amount of dust and light soil in the air is important to prevent ecological damage, reduce dust related health problems and preserve wear and tear on nearby equipment. To achieve this:

- GWA vehicles will be driven at the designated site speed limit of 40km/h to avoid dust production from site roads
- All vehicles transporting waste or other materials that may produce odours or dust covered during transportation and plant performing road repairs may require water suppression to minimise dust production.

## 18 Environmental Control

*Also refer to Section 27 – Audits and Inspections*

GWA Service Department has evaluated Environmental aspects which need to be considered when undertaking routine Operation and Maintenance at GRWF. Following the evaluation a number of control measures have been developed, these measures are included within **Appendix E - Environmental Aspect Check sheet**.

Any particular activity which may pose a risk to the environment shall be continually monitored during the site Operation and Maintenance.

Some other aspects of the environment are also measured and recorded through the monthly reporting procedure, these measures include:

- Site induction and environmental training for site workers and representatives;
- Waste removal (removed by licensed organisations) to designated locations;
- Environmental complaints;
- Environmental incidents; and
- Bird/Bat fatalities.

Current Environmentally Sensitive Areas and Compensatory Habitats are identified in **Appendix G - Environmentally Endangered Communities and Compensatory Habitat Package**. Over time these communities may change and reassessment may be required.

### 18.1 Flora

All Operation and Maintenance activities will be undertaken in accordance with the OEMP.

Environmentally Endangered Communities (EEC) are present on site and any activity off a hard stand or road may have an effect. Operation and Maintenance activities will be restricted to designated roads, access track and hardstands in order to minimise the impact to the environment. All plant and vehicles must not deviate from existing roads under any circumstance without prior written approval from the Asset Manager.

Contractors are responsible for identifying and controlling new construction works in any environmentally Sensitive Areas. Contractors must identify in Site Specific Plans if there is risk of encroachment into these areas and how protection of flora and fauna will be maintained.

The appropriate Owner Representative will be contacted in the instance where weeds or grasses become overgrown and therefore limit access to the site.

Contractors must ensure that earth moving plant and equipment being brought in from other areas is decontaminated to maintain weed control.

Any flora incidents (damage to vegetation) must be reported to the Site Supervisor and registered on the **GWA-HSE-REG-0011 Accident-Incident Register**. Copies of all incidents will be sent to the Owner/Principal.

## 18.2 Fauna

All site personnel, when driving vehicles, operating machinery or undertaking site activities, will be instructed to be vigilant at all times and to take care of the local animals including wildlife. It is expected that grazing animals will be free to roam the site and therefore extra care will be taken to protect their safety and the safety of site personnel. Kangaroos may be present in the surrounding areas and therefore all personnel are reminded to be especially vigilant at dawn and dusk when these animals are more prevalent.

Any fauna incidents (including bird and bat incidents) will be reported to the Site Supervisor and registered on the ***GWA-HSE-REG-0011 Accident-Incident Register***. Copies of all incidents will be sent to the Owner/Principal.

Land owners will be notified by the Site Supervisor of any incidents involving stock or any sighting of animal carcasses. The Land owner or Asset Manager shall arrange for swift carcass removal. Early intervention assists to minimise the attraction of scavengers such as large raptors to areas near the turbines.

Refer to the ***Bird and Bat Management Plan (GUL\_BBMP\_Final V4 1)*** for monitoring and survey program implementation.



Reference

Refer to:

[GUL\\_BBMP\\_Final V4 1](#)

## 19 Incident Management

### 19.1 Bush Fire Management

A Bushfire Risk Management Plan has been prepared to comply with NSW Land and Environment Court consent conditions. The plan is designed to ensure consultation and communication with the local RFB and the development of a Bushfire Risk Management Plan.



Reference

Refer to:

[Bushfire Risk Management Plan](#)

### 19.2 Emergency Preparedness

In addition to the Bush Fire Management Plan, GWA has developed a GRWF Emergency Response Plan to address site emergency preparedness and response to all foreseeable emergency incidents.



Reference

Refer to:

[GR-PLN-0035 GRWF Emergency Response Plan](#)

### 19.3 First Aid

Each GWA Service vehicle and the main site office contain a first aid kits and defibrillator. Additionally, a first aid kit will be maintained in the entry level platform and Nacelle of each WTG.

The Site Supervisor will ensure that all first aid kits are inspected every 6 months by a first aid trained member of the service team and replenished as required.

The names of nominated first aid trained people will be displayed on the site notice board.

A first aid log (kept with the first aid kit) will be used to record all first aid treatment provided.

Each kit will contain a checklist to ensure that items are maintained.



Reference

Refer to:

[GWA-HSE-CHE-0010 First Aid Assessment and Action Plan](#)

#### 19.4 Injury Management and Rehabilitation

Injury management shall be undertaken in accordance with the ***GWA-HSE-POL-0009 Injury Management and Rehabilitation Policy***.



Refer to:

[GWA-HSE-POL-0009 Injury Management and Rehabilitation Policy](#)

#### 19.5 Incident Investigation

All incidents will be investigated to determine root cause(s) and identify corrective actions to ensure the likelihood of a recurrence is minimised. Investigations will be conducted in accordance with the GWA Near Miss, Incident and Accident Reporting Procedure. The General Manager - Service will advise the Site Supervisor if Investigation Statements are required by particular workers.



Refer to:

[GWA-HSE-PRC-0019 Incident Reporting and Investigation Procedure](#)

## 20 Quality Control

### 20.1 Product Identification and Tracking

All WTG and associated assets are identified during construction with part numbers tracked from the point of manufacture to completion of ITP's. Each wind turbine has a Quality folder which includes ITPs ITCs and approvals form part of the hand over process during the O&M gate check. These records are reviewed by the Service Department and then kept on site against each asset for continuous monitoring of quality during the life of the asset.

Parts arriving on site are inspected to ensure that the correct part have been received against the agreed specification.

The Site Supervisor will ensure that these Wind Turbine folders are kept readily accessible for future reference during the WOM contract.

The Site Supervisor will ensure that records of quantities of materials purchased and stored on site are maintained and an annual audit on stock performed and supplied to the General Manager - Service.

### 20.2 Spare Parts

The Gullen Range Wind Farm contains a specific range of spare parts which are required to enable the site to meet the Warranty Operations and Maintenance performance guarantee (the Availability Guarantee).

WTG spare parts are supplied by Goldwind International - Parent Company to GWA. The spare parts provided are determined by Goldwind International in consideration the the global WTG fleet ststistics. In order to maintain the levels of WTG spare parts required, GWA follow the requirements of the **GR-OM-PRC-0001 GRWF Spare Parts Procedure**.

Spare parts relating to the Balance of Plant are purchased locally and managed through the list of site inventory.



Reference

Refer to:

[GR-OM-PRC-0001 GRWF Spare Parts Procedure](#)

### 20.3 Pre-Start Review

All new plant and equipment installed during the O&M phase will be inspected and commissioned in accordance with manufacturer's specifications by suitably qualified and experienced workers. Work Method Statements and/or JSEA must be developed and approved prior to conducting commissioning activities.

### 20.4 Non-Conforming Product and Services

Any non-conforming products or services must be isolated/quarantined and labelled to prevent unintended use until either client concession approved or rectification is verified. The **GWA-QM-PRC-**

**0001 Non-Conforming Products and Services** procedure seeks to describe the necessary processes that ensure this is achieved.

The Site Supervisor will ensure that site non-conformances and opportunities for improvement are logged onto the GRWF site NCR Register. For NCR's to be closed supporting evidence of the action must be provided to the Site Supervisor who will assess the evidence and close the NCR if the matter is dealt with correctly. Should the non-conformance action not be suitable, then an explanation as to why it is not suitable will be communicated back to the representative. The non-conformance will remain open until such time that it is dealt with in the correct manner and the NCR form completed.



Refer to:

[GWA-CO-PRC-0006 Non-Conforming Products and Services](#)

[GWA-CO-FRM-0003 Non-conformance Report Form](#)

[GWI NCR Feedback Report](#)

## 20.5 Management of Change

Changes to processes must first be documented, reviewed and approved by authorised persons such as:

- Deviations from the WTG Operation and Servicing manuals must first be approved by GWI
- Workers must not deviate from GWA policies, procedures, guidelines and other instructional documents. In the event of an immediate safety or environmental issue workers must stop work and consult with the Site Supervisor.
- The Senior HSE Advisor will keep the Site Supervisor up to date with legal requirements, new standards and HSEQ industry best practices
- Contractor variations must be approved by the Department Manager

Risks associated to change must be recorded in meeting and if unable to eliminate then recorded in the Site Risk Register (refer to the use of Hazcon meetings in Section 4 - *Design*).

The Site Supervisor will ensure that any changes are communicated to all workers on site through the use of training sessions, toolbox talks or prestart meetings (refer to Section 11 – *Consultation and Communication*).

## 21 Right of Entry

Right of Entry will be processed in accordance with the ***Right of Entry Procedure (to be developed)***.



Reference

Refer to:

***Right of Entry Procedure (to be developed)***

## 22 Complaints Handling Procedures

All GRWF complaints will be addressed in accordance with the ***Stakeholder and Community Information Plan***.

Steps for dealing with immediate situations:

1. Show the person you are listening and let the person explain their issue
2. Be sure not to show feelings towards the situation
3. Politely explain that you are not the correct person to report issue to and refer the person to the email address, phone number or postal address for complaints
4. Ask the person for their contact details so that the Site Supervisor can be notified however explain that the correct process is for them to log the complaint themselves
5. Document details of the discussion and immediately in notebooks and notify the Site Supervisor with:
  - a. Person's name
  - b. Contact details
  - c. Discussion details – brief description of the matter

The Business Service Manager will be notified of registered complaints on the same day of receiving the complaint and will arrange for the Site Supervisor to assist in investigation and resolution where possible.



Reference

Refer to:

[KMH-2012 093-WO-Stakeholder and Community Involvement Plan-VerB](#)

## 23 Dispute Resolution

### 23.1 Community Complaints

In accordance with the ***Stakeholder and Community Information Plan*** the General Manager - Service has 45 days to try and resolve the community complaints with all parties. If the dispute is not resolved within the time allowed for internal dispute resolution, then the Owner will contact an external mediator or Environmental Representative to mediate.

Workers are able to dispute a work capacity decision via the insurer. If unresolved then the worker may escalate the decision to WorkCover NSW and then a WorkCover Independent Review Officer.

### 23.2 Complaints about Workplace Safety

Steps for resolving Safety Issues include:

- Report the issue verbally to your Supervisor or Manager
- Report the issue through the workplace Hazob reporting procedure
- Raising the issue with the Site Supervisor/HSR
- Negotiation with management through union representatives

If none of these courses of action are appropriate or successful, you can contact WorkCover on 13 10 50 or by email.

GWA favours early mediation rather than confrontation as a means of resolving industrial disputes.

## 24 Disciplinary Procedures

If anyone does not comply with the requirements of this Plan, the General Manager - Service or delegate may implement the following disciplinary actions:

- **First violation:** verbal warning/advise worker of non-conformance;
- **Second violation:** written notification/advise worker of non-conformance
- **Third violation:** issue written warning

For a serious breach of safety, workers can be immediately dismissed or removed from the site without notice by the Site Supervisor.

## 25 Handling Storage Packaging and Delivery

### 25.1 Manual Handling

All Service employees receive Manual Handling training with refresher training delivered 3 yearly.

A risk assessment shall be conducted of any manual handling activities that could pose a significant risk to health and the outcomes of the assessment recorded on the site Risk Register. Lifting equipment will be used to carry all heavy loads.

The Site Supervisor will ensure that site personnel are aware of all manual handling risks as part of the Site Induction and ensure that lifting equipment is made available for use, where required.

Hazards associated with manual handling will be documented in the

- Site Risk Register
- In Work Method Statements/JSEA

Control measures will include on or more of the following:

- Re-design tasks to eliminate or reduce the need of for manual handling;
- Plan the lift to ensure the shortest and least frequency of moves;
- Obtain assistance from another person when lifting loads;
- Avoid twisting stretching over reaching and high frequency movements;
- Use mechanical lifting devices; and
- Use correct lifting techniques.

### 25.2 Hazardous Substances

A Register of Hazardous Substances and associated Safety Data Sheets (SDS) are maintained on site.

All hazardous substances shall be handled, stored, transported, and used in accordance with manufactures requirements.

The Site Supervisor will ensure that a current Safety Data Sheet (SDS) (less than 5 years old) is obtained for hazardous substances supplied to, or used on site, and recorded on the site Hazardous Substance Register. SDS's are stored in the O&M site office and are readily accessible to any person on site. Use and location of SDS's is included in the site induction.

Contractors must identify all hazardous substances in WHSMP or WMS's and review the use of hazardous substances with the Site Supervisor prior to bring them on site.

The GWA Site Supervisor and contractors must ensure that all their personnel are adequately trained in the correct use and the necessary precautions of the substance(s) they will be using.

Importers of substances must ensure that the SDS follows Australia Requirements.

All hazardous substances must be:

- Clearly labelled and stored in suitably sealed containers
- When substances are transferred to a second container, the second container will be clearly labelled with the name and safety risk (e.g. flammable, toxic etc.)
- Decanted in the bunded container in the O&M complex

- Neutralised, contained and suitably disposed of if spilt (if safe to do so). A general emergency spill kit is located in the GWA site Office

All containers of hazardous substances and dangerous goods must be clearly labelled with the name of the substance and the dangerous goods class, where practicable.

Empty containers must be disposed of correctly to eliminate pollution. A list of waste removal companies and/or site waste bins can be obtained from the Site Supervisor.

The Site Supervisor will ensure that he bunded container fluid level is checked every quarter using the Environmental Aspects check sheet (Appendix E) and appropriate waste removal services are engaged to empty any spilt products in the bunded container, to prevent build up and overflow.

Workers must immediately notify the Site Supervisor of any dangerous chemical spilt in the bunded container to ensure speedy removal and prevent other persons entering an area with dangerous fumes/spilt liquids. In the event of a dangerous spill the Site Supervisor will ensure that bunded container is quarantined to prevent access using LOTO.



Site MSDS Register:

[GRWF MSDS Register](#)

SDS can be obtained from the supplier, manufacturer or via a free information website: <https://www.msds.com>

### 25.3 Deliveries and Collections

Delivery drivers temporarily on site delivering plant, materials or supplies, are not required to undertake full site induction training, however must only remain on site for as long as is reasonable to make the delivery. If the same delivery drivers are likely to make frequent site deliveries, then it is recommended that they undertake a full site induction as evidence that you have the necessary safety knowledge and awareness to move unaccompanied around a site.

Suppliers must plan deliveries with the Site Supervisor to ensure that:

- Deliveries are made to the correct location
- A Service employee is available to verify the product meets specifications and accept delivery
- Forklifts and other means of unloading are available at the drop off point.
- Weather conditions are appropriate for delivery

Service employees are justified in turning away deliveries that may cause an unsafe scenario such as:

- A forklift or other mechanical means of unloading breaking down causing a worker to consider manually lifting off an item
- A product/part delivered that has no safe means of being unloaded

Service employees picking up parts must ensure that a suitable work vehicle or trailer is used including:

- Where possible eliminating manual lifting or use mechanical lifters
- Position parts to ensure a low centre of gravity

- Weights of parts and GVM of work vehicles/trailers
- Plan how heavy part will be removed at site
- Consider hiring a suitable trailer where necessary
- Approved slings and tie downs appropriate for the load are used

Under no circumstances should private vehicles or trailers be used to carry parts to site.

Parts must not be placed in seating areas as they can become flying objecting in the event of an incident.

## 26 Monitoring and Measurement

### 26.1 Medical Examinations

All Service Department employees will undergo a pre-employment or pre-transfer medical to verify that they are fit and able to perform the range of duties required by their new role.

Pre-employment medicals shall be organised by the General Manager - Service and undertaken by a registered medical practitioner against GWA developed medical checks pertaining to the type of work and environmental condition likely to be experienced by the employee.

### 26.2 Fitness for Work

Health assessments include:

- Pre-placement assessment
- Examinations on recommencing work following a period of absence
- On leaving employment
- Periodic specific examinations during employment

The aim of the health assessment is to evaluate a person's physical and mental capacity to carry out the tasks inherent in a job within the working environment. Assessments help to ensure that the job does not cause or aggravate any existing disease or injury and that the characteristics of any disease or disability will not cause harm to others, including fellow employees, other workers and members of the public, through inappropriate actions by the employee.

GWA has developed a relationship with Clinton Street Medical Centre in Goulburn whereby medical practitioners have been involved in the review and development of job demand questionnaires and assessment forms. For this reason GWA will refer workers to this medical centre however workers are entitled to use their own medical practitioner who understand the previous medical history. Details of all local medical centres can be found on the O&M office notice board.

Service employees will be subject to a medical examination every 2 years including a vision and hearing test which must be recorded on the ***GWA-HSE-FRM-0005 Vision and Hearing Test Report Form***, for the purpose of monitoring health against a pre-employment baseline.



Reference

Refer to:

[GWA-HSE-FRM-0005 Vision and Hearing Test Report Form](#)

### 26.3 Health Monitoring

It is envisaged that work at GRWF does not involve working with hazardous substances listed on the ***Hazardous-chemicals-requiring-health-monitoring*** guide including:

- Acrylonitrile
- Arsenic (inorganic)
- Asbestos

- Benzene
- Cadmium
- Chromium (inorganic)
- Creosote
- Crystalline Silica
- Isocyanates
- Lead (inorganic)
- Mercury (inorganic)
- 4,4'-methylene bis(2-chloroaniline) [moca]
- Organophosphate pesticides
- Polycyclic aromatic hydrocarbons (pah)
- Pentachlorophenol (pcp)
- Thallium
- Vinyl Chloride

Contractors are required to notify the Site Supervisor of potential work involving any of these chemicals. The Senior HSE Advisor, in consultation with the workers and management, will review:

- Worker base line physical assessment from a registered medical practitioner
- Safety Data Sheet/Manufacturers information
- Completed risk assessment relating to the chemical
- PPE and equipment used in conjunction with the chemical.

GWA will ensure that health monitoring is provided to an employee if the employee is carrying out ongoing work at a workplace using, handling, generating or storing hazardous chemicals and there is a significant risk to the employee's health because of exposure to a hazardous chemical. In the event of an exposure an employee will be required to participate in an externally developed health surveillance program. In this circumstance health monitoring shall be undertaken in accordance with the ***Hazardous-chemicals-requiring-health-monitoring*** guide.

All contractors must identify in their WHSMP and provide health monitoring to their workers and subcontractors who use hazardous chemicals.



Reference

Refer to:

[Hazardous-chemicals-requiring-health-monitoring](#)

## 26.4 Drug and Alcohol

All workers shall work in accordance with ***GWA-HSE-POL-0003 Alcohol and Drugs in Employment*** Policy and ***HSE-PRC-0004 Alcohol and Drug Procedure*** which is communicated to all workers during the site induction.

- Prohibited drugs and alcohol will not be consumed or distributed on site

- All persons shall be fit for work and acknowledge that random drug and alcohol testing is part of the site entry conditions – this means that all workers will be made available during random testing
- Worker will notify the site supervisor of prescription medication prior to commencing work or new medication commenced with the last 48 hours

All persons who are required to climb a WTG must identify prescription drugs when completing the pre-climb medical disclosure form. It is the responsibility of persons completing this form to ensure that it remains up to date.



Refer to:

[GWA-HSE-POL-0003 Alcohol and Drugs in Employment](#)

[GWA-HSE-PRC-0004 Alcohol and Drug Procedure](#)

## 26.5 Workplace Hygiene

Workplace Hygiene practices including the anticipation, recognition, evaluation and control of health hazards in the working environment shall be assessed with the objective of protecting worker health and wellbeing and safeguarding the community at large.

Appropriate measures will be developed and implemented by Site Supervisor and Senior HSE Advisor to manage any workplace hygiene matters that may arise or reasonably expected to arise in relation to the GWA activities in the construction, operation and maintenance of the GWA assets.

## 26.6 Fatigue

The **GWA-CO-POL-0004 Fatigue Management Policy** and **GWA-HSE-PRC-0008 Fatigue Management Procedure** applies to all GWA employees; especially those whose work involves shift work, extended hours and on-call. Contractors must prevent fatigue in their workers a document controls in WMS/JSA or in WHSMP.

This will involve the provision of adequate shelter, dehydration awareness, access to drinking water and specific site clothing requirements.

Workers are responsible for taking sufficient drinking water for the weather conditions, duration of work and level of activities. Stores of bottled water are located in the main Pommeroy compound and in Service vehicles.



Refer to:

[GWA-HSE-POL0004 Fatigue Management Policy](#)

[GWA-HSE-PRC-0008 Fatigue Management Procedure](#)

## 26.7 Harassment and Bullying

Harassment and bullying will not be tolerated under any circumstances.

All GWA employees must abide by the ***GWA-HSE-POL-0007 Harassment and Bullying Policy*** to prevent such incidents and in the event of their occurrence, minimise their impact on all workers.

Harassment or bullying from workers or local residents must be immediately reported to the Site Supervisor.



Refer to:

[GWA-HSE-POL-0007 Harassment and Bullying Policy](#)

## 26.8 Severe Weather

Monitoring weather conditions and procedures in the event of lightning and extreme temperatures are contained in the ***HSE-PRC-0016 Severe Weather Procedure***. The site has implemented third party software (wetherzone) which monitors lightning activity in the region. The Severe weather procedure shall include details and procedures in the use of this software.



Refer to:

**HSE-PRC-0016 Severe Weather Procedure (to be developed)**

## 26.9 Ongoing Environmental Monitoring

Periodic monitoring of sediment controls, draining systems, hardstand and road infrastructure should be performed by the service team during routine works and especially:

- After heavy rain
- After major construction works

Any issues must be immediately reported to the Site Supervisor.

## 27 Audits and Site Inspections

Also refer to Section 16.7 - *Inspecting, Testing and Servicing of Plant & Equipment*

### 27.1 O&M Audits

Audits are a detailed evaluation on organisational systems and processes.

Audits at GRWF are undertaken to determine adequacy and fit for purpose of HSEQ systems in accordance with:

- State and Federal Legislative Requirements
- The OMP
- Customer requirements

The aim of auditing is to verify:

- Overall management of HSEQ and its implementation against documented requirements in this OMP and associated documents
- Systems critical to safe operation of the site

Audits are conducted in accordance with **GWA-CO-PRC-0004 Audit Procedure** using **GWA-HSE-CHE-0015 O&M HSEQ Audit Checklist**

GRWF HSE Audits are conducted in accordance with **Appendix A – GRWF Audits and Inspection Schedule**



Reference

Refer to:

[CO-PRC-0004 Audit and Inspection Procedure](#)

[GWA-HSE-CHE-0015 OandM HSEQ Audit Checklist](#)

### 27.2 O&M Inspections

Regular periodic inspections help to determine if any previously unidentified hazards exist, if new hazards have been created or to support good working behaviours.

Planned Inspections include:

- WHS and Environmental Aspects
- Manager HSE Inspections

Ad hoc inspections may be required:

- If a Hazob, Incident Investigation report warrants an inspection
- As part of an audit
- Ad hoc inspections to ensure that site/office processes are being implemented and maintained

Where appropriate, workers may be requested to join an inspection.

### 27.2.1 WHS and Environmental Aspects

Designed to inspect WHS across the site including offices and facilities.

The Site Supervisor will ensure that the **GWA-HSE-CHE-0016 WHS Site Inspection Checklist** and **GR-CHE-0001 GR OEMP Routine Maintenance Environmental Checklist** is completed quarterly for GWA work areas and sent to the General Manager - Service for review.



Refer to:

[GWA-HSE-CHE-0016 WHS Site Inspection Checklist](#)

[GR-CHE-0001 GR OEMP Routine Maintenance Environmental Checklist](#)

### 27.2.2 Manager HSE Safety Walks

Designed to review the overall effectiveness of site process.

Manager Safety Walks are conducted every 6 months by the General Manager - Service using the **GWA-HSE-CHE-0020 Safety Walk Checklist**.



Refer to:

[GWA-HSE-CHE-0020 Safety Walk Checklist](#)

## 27.3 Contractor Audits and Inspections

An annual **GWA-CO-TMP-0005 Audit and Inspection Schedule** is developed and managed by the Site Supervisor for the purpose of ongoing scheduling of contractor audits and inspections. This schedule resides on site and is updated by the Site Supervisor as contractors roll on and off.

The frequency of contractor audits and inspection is determined by the Site Supervisor based on the level of HSE risk and in accordance with the **GWA-CO-PRC-0004 Audit Procedure**.

The purpose of contractor inspections is to ensure that workers, specific work areas and plant and equipment meet site requirements and Work Method Statement controls

The Site Supervisor will ensure that contractors work areas are inspected using the **GWA-HSE-CHE-0016 WHS Site Inspection Checklist** in accordance with the **GWA-CO-TMP-0005 Audit and Inspection Schedule**.

This schedule is monitored during Manager Inspections and annual O&M Audits.



Refer to:

- [GWA-HSE-CHE-0016 WHS Site Inspection Checklist](#)
- [GWA-CO-TMP-0005 Audit and Inspection Schedule](#)

## 28 Review

### 28.1 Review of OMP and associated plans

GWA Management is committed to regularly review the OMP and associated plans to ensure its continuing suitability, adequacy and effectiveness.

The OMP will be reviewed by GWA Management on an annual basis. The intention of the review is to discuss the effectiveness of the plan as a way to ensure it is continually improved. Review dates during the term of the WOM period are listed in **Appendix A – Audits and Inspection Schedule**.

During the review process, Management will take into consideration improvements received from:

- Workers
- Other persons such as visitor, landowner, Owner, Owner representatives and general community feedback
- Audit and inspection findings
- Incident investigations
- Industry best practice and legislative compliance
- GWA policies and business strategy
- Any information received from other wind farms or throughout the industry as a whole.

Site KPI's are reviewed as part of the HSEQ quarterly report to determine if the annual objectives and targets are on track to be achieved.

#### **Roles and Responsibilities:**

Business Services Manager:

- Conduct an annual management review of the OMP with the Senior HSE Advisor
- Approve OMP
- If required organise for external approval of OMP sub plans

Senior HSE Advisor

- Manage action items as a result of the management review

Site Supervisor:

- Conduct a pre-management review of the OMP on site with the Service team and feedback improvement to the Business Service Manager
- Assist in complete action items as a result of the management review.

## 29 Appendices

Appendix A	GRWF Audit and Inspection Schedule
Appendix B	Site Security Plan
Appendix C	Service Maintenance Plan
Appendix D	Routine Maintenance Environmental Checklist
Appendix E	Environmentally Endangered Communities and Compensatory Habitat Package

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### Have your Say!



The GWA Management System aims to continually improve and as such we welcome your feedback, ideas, suggestions and constructive comments.

Have your say by emailing: [hse.support@goldwindaustralia.com](mailto:hse.support@goldwindaustralia.com)

# Appendix A

## GRWF Audit and Inspection Schedule

## GWA Audit and Inspection Schedule

Type	Responsible	Freq	Planned Date
Environment Aspects Checklist - Appendix F	J King	Quarterly	1/02/2015
CHE-0016 WHS Site Inspection Checklist	J King	Quarterly	2/02/2015
Environment Aspects Checklist - Appendix F	J King	Quarterly	1/05/2015
CHE-0016 WHS Site Inspection Checklist	J King	Quarterly	2/05/2015
Manager HSE Site Inspection	R Brady	6 mthly	1/06/2015
HV Authorised Review	R Brady	Annual	30/07/2015
Site WHS Audit	R Brady	Annual	30/07/2015
Site Environmental Audit	J King	Annual	30/07/2015
Environment Aspects Checklist - Appendix F	J King	Quarterly	1/08/2015
CHE-0016 WHS Site Inspection Checklist	J King	Quarterly	2/08/2015
Environment Aspects Checklist - Appendix F	J King	Quarterly	1/11/2015
CHE-0016 WHS Site Inspection Checklist	J King	Quarterly	1/11/2015
OMP & Subplan Internal Review	R Brady	Annual	2/11/2015
OMP & Subplan Management Review	R Brady	Annual	2/11/2015
Environment Aspects Checklist - Appendix F	J King	Quarterly	1/02/2016
CHE-0016 WHS Site Inspection Checklist	J King	Quarterly	1/02/2016
Environment Aspects Checklist - Appendix F	J King	Quarterly	1/05/2016
CHE-0016 WHS Site Inspection Checklist	J King	Quarterly	2/05/2016
Manager HSE Site Inspection	R Brady	6 mthly	1/06/2016
HV Authorised Review	R Brady	Annual	30/07/2016
Site WHS Audit	R Brady	Annual	30/07/2016
Site Environmental Audit	J King	Annual	30/07/2016
Environment Aspects Checklist - Appendix F	J King	Quarterly	1/08/2016
CHE-0016 WHS Site Inspection Checklist	J King	Quarterly	2/08/2016
Environment Aspects Checklist - Appendix F	J King	Quarterly	1/11/2016
CHE-0016 WHS Site Inspection Checklist	J King	Quarterly	1/11/2016
OMP & Subplan Internal Review	R Brady	Annual	2/11/2016
OMP & Subplan Management Review	R Brady	Annual	2/11/2016
Environment Aspects Checklist - Appendix F	J King	Quarterly	1/02/2017
CHE-0016 WHS Site Inspection Checklist	J King	Quarterly	1/02/2017
Environment Aspects Checklist - Appendix F	J King	Quarterly	1/05/2017
CHE-0016 WHS Site Inspection Checklist	J King	Quarterly	2/05/2017
Manager HSE Site Inspection	R Brady	6 mthly	1/06/2017
HV Authorised Review	R Brady	Annual	30/07/2017
Site WHS Audit	R Brady	Annual	30/07/2017
Site Environmental Audit	J King	Annual	30/07/2017
Environment Aspects Checklist - Appendix F	J King	Quarterly	1/08/2017
CHE-0016 WHS Site Inspection Checklist	J King	Quarterly	2/08/2017
Environment Aspects Checklist - Appendix F	J King	Quarterly	1/11/2017
CHE-0016 WHS Site Inspection Checklist	J King	Quarterly	1/11/2017
OMP & Subplan Internal Review	R Brady	Annual	2/11/2017

# Appendix B

## Site Security Plan

### 1. Identification and Analysing Potential Vulnerabilities

Specific threats include:

- Access and damage into main site office
- Access and damage to warehouse and storage containers
- Access and damage to HV switch yard and switch room
- Access and damage into a Kiosk transformer
- Access and damage into a Wind Turbine
- Access and damage to MET mast

Access to wind turbines and kiosk transformers may be more attractive due to their isolation and relatively easy access. Wind Turbines and kiosks are vulnerable to attack due to the openness of farm land surrounding them.

The effects of an incident could include:

- Damage to property
- Creating an unsafe work area
- Fire or explosion
- Environmental pollution

### 2. Site Security Measures

Measures to be taken to ensure the site is secure include, but are not limited to:

- Provision and maintenance of site signage & fencing, as appropriate
- Security key system and main gate access
- Fenced HV and O&M areas
- Periodic monitoring of all turbines and boundary fencing to check for security
- Locked HV switch rooms and service buildings
- Clear process for entry to the car park
- Clear process for authorising access to the site
- Clear process for first time visitors to the site
- Clear process for site deliveries

Workers are expected to:

- keep the site secure by:
  - Abiding by site hours
  - By closing or locking gates (leaving gates as they are found)
  - Locking plant and equipment when not in use
  - Locking O&M buildings prior to leaving the compound
  - Notifying the Site Supervisor of any site security breaches or concerns
- Abide by all site signage
- Follow instructions in site inductions
- Follow security direction given of the Site Supervisor.

### Main Gate

GWA will, so far as reasonably practicable, secure the site by locking gates to the site outside normal hours of operation.

Access to the main site complex is controlled using the Main Gate Security System. Persons requiring access must contact one of the persons on the gate list or swipe a pass card to enter.



### **Security Key System**

Access to the site, facility, buildings, wind turbines and associated assets is controlled via key access.

The Site Supervisor is the only person authorised by the General Manager - Service to duplicate and authorise distribution of keys.

The Site Supervisor will ensure that all keys issued are recorded on the Service Key Register.

Spare keys must be locked inside the Site Supervisors cabinet and a record of key numbers recorded.

Lost or stolen keys must be immediately reported to the Site Supervisor who may organise for a new locks to be fitted and if necessary new keys cut.

### **3. Protecting Documents, Computer Software and Hardware**

Service employees are required to lock office computers prior to leaving the office to prevent unauthorised access. Passwords should be changed every 3 months and should be a combination of upper and lower case and numbers. Passwords must not be documented in the site office where they may be discovered.

#### **4. Software must be stored in the Site Supervisors locked cabinet. Reporting Security Threats and Breaches**

Any suspicious activity must be immediately reported to the Site Supervisor.

Any person caught breaching security must be reported to the NSW police (call 000) and to the Site Supervisor.

The Site Supervisor will notify the General Manager - Service immediately of any security threats and breaches.

Damaged plant and equipment must not be moved or touched so that police have the opportunity to examine the scene.

The scene must be secured and controlled to prevent persons becoming injured by damaged plant and equipment.

Damaged plant and equipment must be analysed by the Service team to identify if immediate isolation and LOTO is required to prevent further damage and safety issues.

### **5. Reviewing Security Plans**

This security plan will be reviewed and audited annually by the Senior HSE Advisor/HSE Coordinator - Service and senior management to ensure it remain effective and efficient. Review will be conducted during the OMP review and audits conducted in accordance with the annual HSE site audit.

# Appendix C

## Service Maintenance Plan

The Service Maintenance Plan can be found at the following location:



Reference

[GR-PLN-0024 Service Maintenance Plan](#)

# Appendix D

## GR-CHE-0001 GR OEMP Routine Maintenance Environmental Checklist

### GR-CHE-0001 GR OEMP Routine Maintenance Environmental Checklist

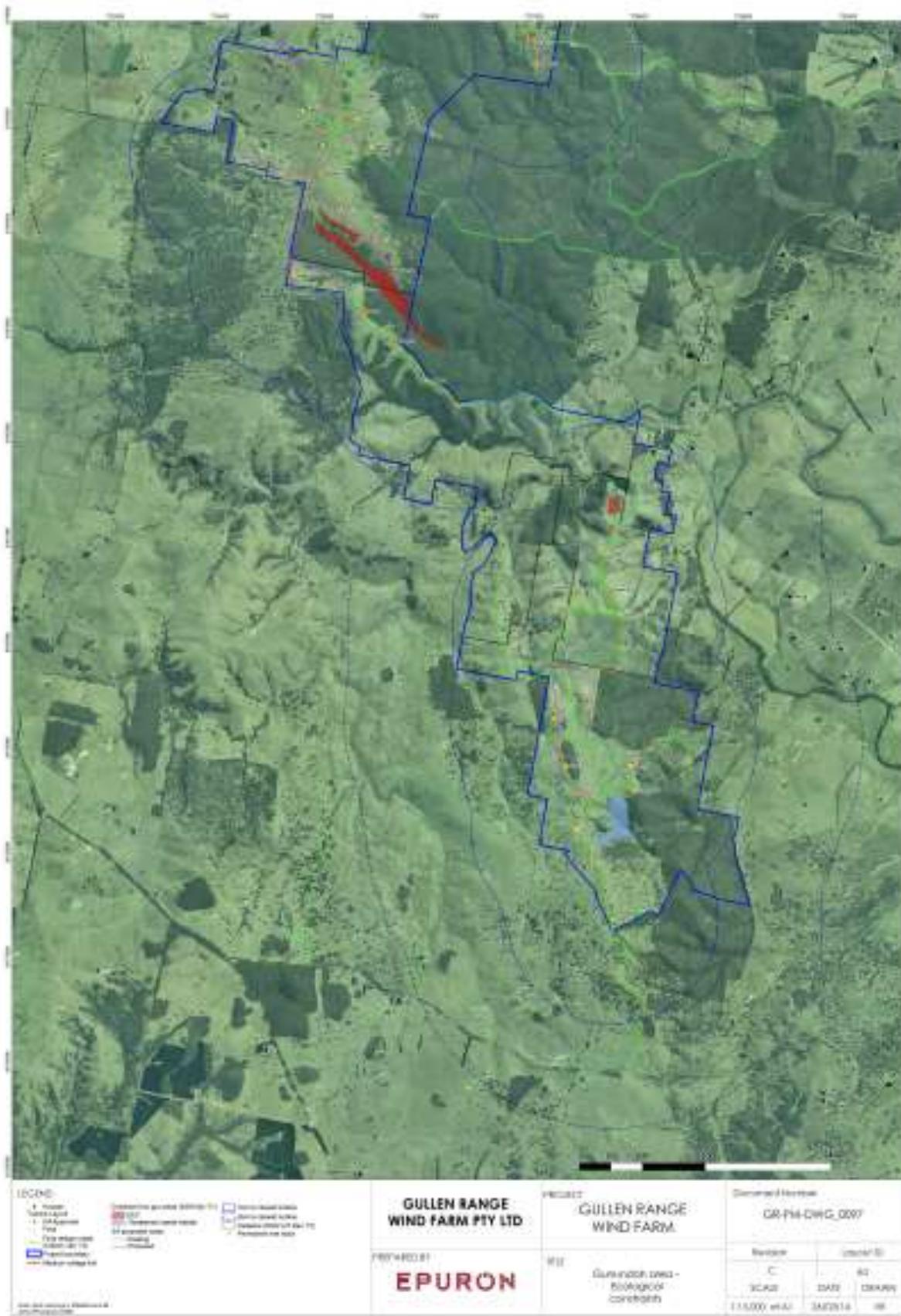
Location/Site:		
Question	Answer (Yes, No, NA) and action required or comments.	Date completed
<b>GENERAL</b>		
Are works being conducted within "normal" working hours?		
<b>ERSED</b>		
Are catch drains and road drains in good condition (i.e. not scouring, rock checks in place)? Is any maintenance required such as additional rock checks?		
Is there evidence of erosion at the Wind Farm within the operational		
Are unacceptable levels of dust being generated from works? <i>* If so, consider mitigation measures such as a water cart or postponing works until weather is more favourable.</i>		
<b>WASTE &amp; HAZARDOUS MATERIALS</b>		
Are fuel/oil/chemicals stored appropriately on site (bundling)?		
Are any spills evidence? <i>*If yes, clean up immediately and report to Operations Manager</i>		
Are spill kits available on site during works?		
Has generated waste been removed from site and waste disposal records kept?		
<b>FLORA &amp; FAUNA</b>		
Is the extent of existing noxious weeds being contained?		
Are there any birds or bat carcasses located at the Wind Farm? <i>*If so, take a photo of the carcass and place the carcass in a plastic bag and leave it at the nearest compound. Remember to wear gloves. Please phone the Operations Manager to arrange for pick up ASAP</i>		
Has any vegetation clearing been undertaken? <i>*If yes, report to Operations Manager</i>		
Have any new noxious weeds emerged within the operational boundary?		
<b>COMMUNITY</b>		
Have there been any complaints during routine maintenance works?		
Notes:		
Name:	Signature:	Date:

# Appendix E

## Environmentally Endangered Communities and Compensatory Habitat Package







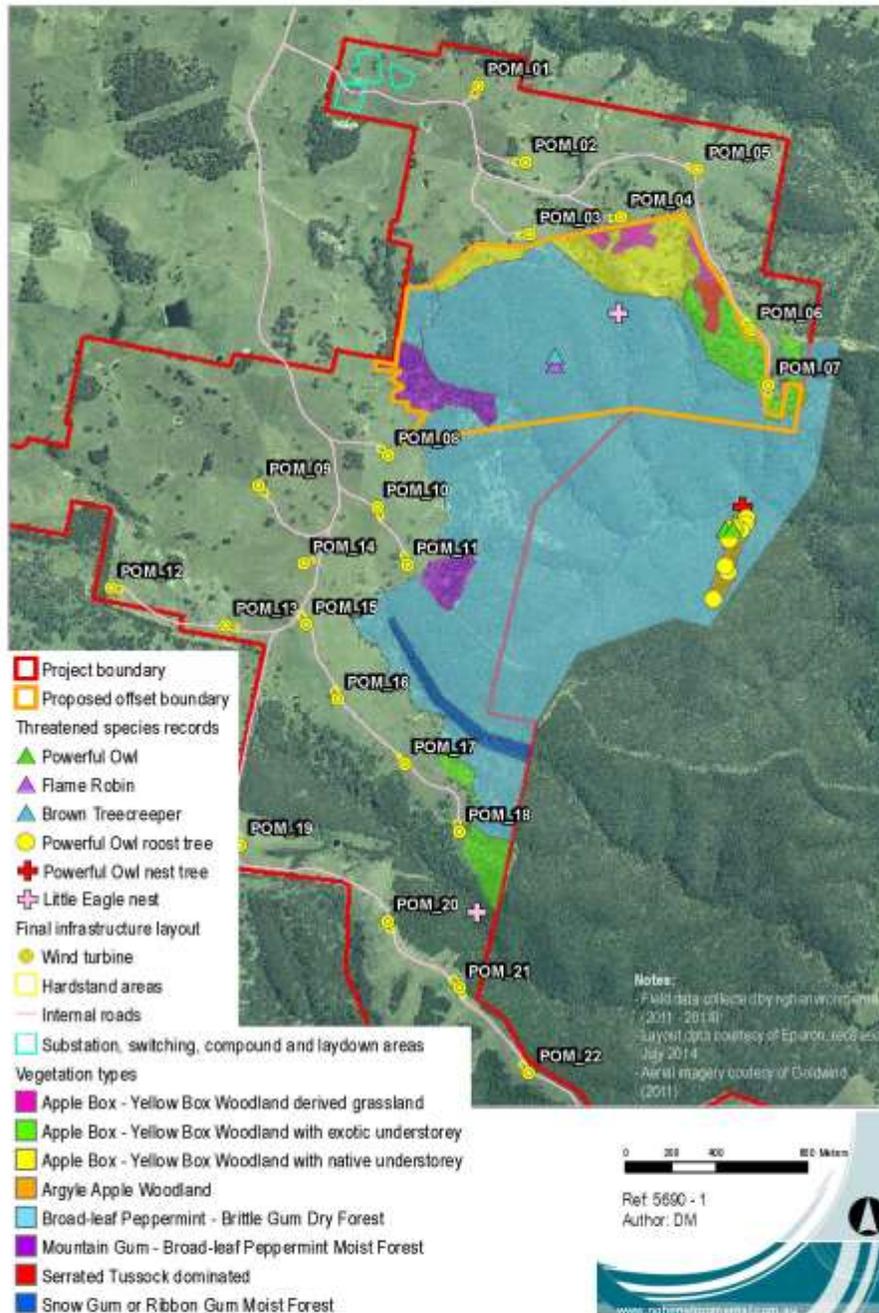


Figure 4-1 Vegetation types within the designated offset area and proposed offset site