

**Out of Hours Work Policy**  
**Gullen Range Wind Farm**

NGRWF-P-0007

March 2017

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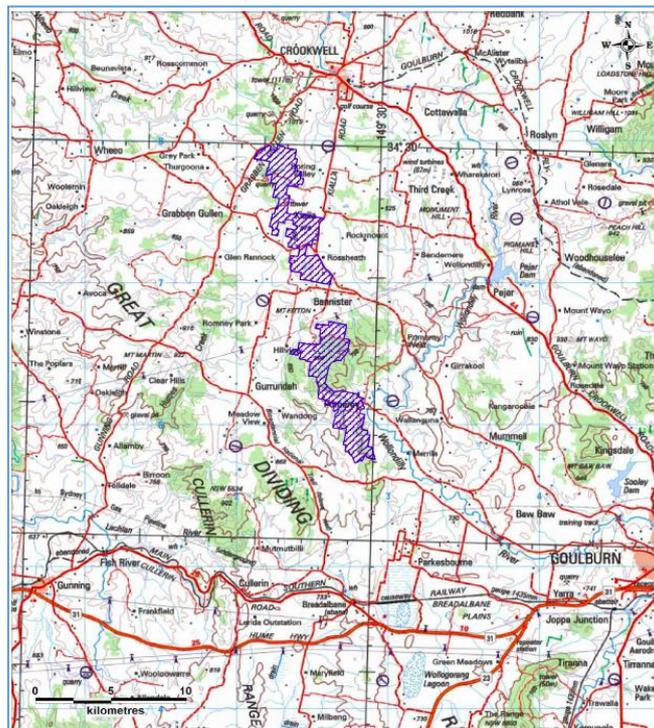
## 1 Purpose

The purpose of this Out of Hours Policy is to set out the processes and procedures necessary to facilitate service and maintenance work being undertaken when necessary outside of core business hours on Gullen Range Wind Farm.

## 2 Gullen Range Wind Farm Project Description

### 2.1 General Overview

Gullen Range Wind Farm (GRWF) is a 73 turbine wind farm located north west of Goulburn. The operations centre for the wind farm is located at Bannister, 6km south of Crookwell. The wind farm covers a distance of 22km from its northern most turbine to southern most turbine. The wind farm became fully operational in December 2014.



**Figure 1:** Gullen Range Wind Farm location.

## 3 Policy Coverage

### 3.1 Legislative Context

The following key documents define the legislative requirements of the Gullen Range Wind Farm during its operational phase:

- Project Approval (ref 07\_0118 Mod 1) as issued by NSW Department of Planning and Environment.
- Environmental Protection Licence.
- Operational Environmental Management Plan (OEMP).

The Project Approval defines 'Operation' of the wind farm as:

*"The point at which turbines approved or at which all turbines of the project constructed at any stage (pursuant to condition 1.8) are practically completed and ready for operation for the purpose of generating electricity".*

The wind farm has been formally in Operation since December 23<sup>rd</sup> 2014.

Although all operational aspects of the above key documents must be complied with, the following specific sections are applicable to this policy:

- Project Approval – Conditions 2.15 through 2.20 which describe operational noise constraints.
- EPL – Conditions L3 which describe operational noise constraints.
- OEMP – Appendix K, Section 4 of the Operational Noise Management Plan (ONMP), which describes hours of work and noise constraints during maintenance activities and has been approved by NSW Department of Planning and Environment under condition 7.5(a) of the Project Approval.

The ONMP (AECOM, 2013) permits out of hours service and maintenance work under Section 4, as described below:

- *"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 undertaken."*

Core business hours for the wind farm are defined in the OEMP and ONMP as:

- Monday to Friday – 7am to 6pm
- Saturday - 8am to 12pm

### 3.2 Scope of this Policy

This Policy is specific to service and maintenance work and is not intended to cover emergency repair work that may need to be undertaken from time to time on the wind farm. The ONMP allows for emergency repair works to be performed outside of normal operating hours but these works are not relevant to this Policy. Emergency repair works are works necessary to:

- Ensure the safe operation of all onsite infrastructure.
- Perform unscheduled minor repairs which are preventing the operation of a turbine.
- Respond to a metrological event, e.g. a storm event, where emergency repair or fault work may be required to be undertaken.
- Respond to a safety or environmental incident where a timely response is required to reduce the risk of harm to persons or the environment.

- Respond to a community complaint requiring immediate action.

This Policy authorises operational phase service and maintenance work to be undertaken outside of the core business hours for the wind farm where these works “...cannot reasonably be completed...” within the core business hours for the wind farm.

Circumstances where service or maintenance works ‘cannot reasonably be completed’ may include:

- High risk service or maintenance work that cannot be safely completed during core business hours.
- Service or maintenance work that cannot be completed during core business hours due to the availability of essential personnel or equipment.
- Service or maintenance work that cannot be completed due to the unavailability of an appropriate weather window to allow the works to be completed safely.
- Service or maintenance work that cannot otherwise be undertaken safely during core business hours.

For the purposes of this Policy, landowners with a ‘noise easement’ over their property (including those without turbines) will be considered an ‘involved’ landowner.

### 3.3 Works Not Authorised by Policy

NGRWF will assess any request by one of its Contractors to perform works as described in this policy.

NGRWF will refuse a contractor’s request to perform such works where:

- The proposed works can be ‘reasonably completed’ during core business hours.
- Where compliance with prescribed operational phase noise limits are uncertain, e.g. where activities beyond the level of activity assessed by Marshall Day Acoustics are proposed.

## 4 Noise Impact Assessment

### 4.1 Baseline Monitoring Undertaken

In order to inform this Policy, Goldwind (Australia) Pty Ltd (GWA) engaged Marshall Day Acoustics to undertake a noise assessment during a rotor replacement on turbine BAN21. GWA is NGRWF’s main maintenance subcontractor servicing the wind farm.

The purpose of undertaking this noise monitoring was to:

- Ensure works complied with legislative requirements (as described in section 3)
- Inform NGRWF as to what notifications under the ONMP needed to be undertaken prior to works

The monitoring report is attached as Appendix 1.

Monitoring activity coincided was undertaken on the 13<sup>th</sup> to 14<sup>th</sup> October 2016. A rotor replacement was selected to form the basis of this noise impact assessment as this type of service and maintenance work presents the greatest potential for noise generation. This is where three blades and a hub are removed (and then replaced) from the nacelle in one assembly using a crane. All other service and

maintenance work required to be undertaken on the wind farm site can reasonably be expected to generate a lower noise profile than rotor replacement works.

The rotor replacement work included the use of:

- 500 tonne crane (AC-500-2).
- 220 tonne crane (GMK 220).
- Manitou forklift.
- Handheld rattle gun (up to 3 used simultaneously).

Monitoring was undertaken at a distance of 50m and 100m (respectively) away from the work site for the duration of works. At the conclusion of works, on the 14<sup>th</sup> of October, a baseline noise sample was subsequently taken 200m away from the work site. The distance of 200m was selected to remove the potential for noise influence from other incidental activities on the wind farm to impact on the noise assessment.

## 4.2 Monitoring Results

Marshall Day identified that the ‘worst case’ noise scenario during these rotor replacement works was the two cranes working at the same time as 3 rattle guns and the Manitou forklift.

Based on the ‘worst case’ scenario calculations, Marshall Day determined that the noise generated during the rotor replacement works would comply with the site noise criteria (as defined in Project Approval condition 2.15 and EPL condition L3.1) provided there is a minimum distance of 600m between the site works and each residential receptor:

*“Calculations have been derived by utilising the worst case (loudest) measured LAeq 10 minute noise levels. These worst case measured levels included two cranes simultaneously working as well as 3 rattle guns and a crane working simultaneously. Based on these worst case scenario calculations we have calculated that noise associated with rotor replacement works will comply with the site noise criteria, provided there is a minimum of 600 metres between the site works and any residential receiver locations...”*

## 4.3 Ability to undertake works

The distance from the nearest non-involved residence to a wind turbine on the Gullen Range wind farm is approximately 1300 metres. As there are no non-involved landowners within 600 metres of a wind turbine location, the Marshall Day monitoring demonstrates that it is feasible to undertake the Out of Hours works described by this Policy within the constraints set by the legislative requirements described in Section 3.

# 5 Notification Requirement

## 5.1 Overview

In accordance with Section 4 of the ONMP, notification of works under this Policy must be made to the following parties:

- Councils

- Upper Lachlan Shire Council; or
- Goulburn Mulwaree Council.
- Potentially Impacted Sensitive Receptors
  - Non-involved landowners in the vicinity of the turbine subject to service and / or maintenance works that may potentially be impacted by noise generated by out of hours service or maintenance work.

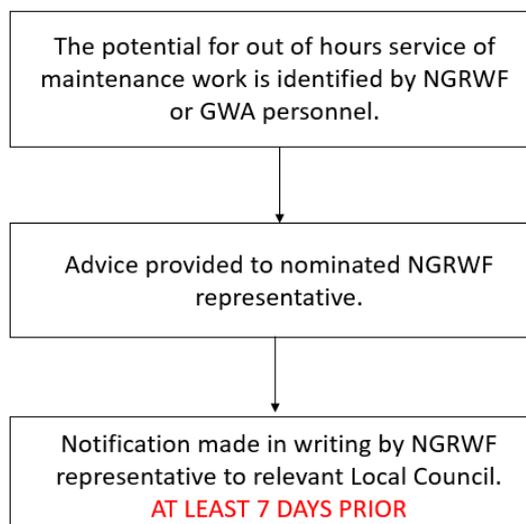
In accordance with Section 4, notification must be made at least one week in advance of the proposed out of hours service and maintenance works.

## 5.2 Determining who needs to be notified

Based on the 600 metre separation identified by Marshall Day Acoustics, there are no potentially impacted sensitive receptors for which formal notification would be required to be made under Section 4 of the ONMP.

## 5.3 Notification Process

In accordance with Section 4 of the ONMP, notification will be made to the relevant local Council. Notification will be undertaken in general accordance with the following procedure:



# 6 Compliance Monitoring

## 6.1 Overview

Prior to notification, NGRWF will request its Contractors confirm that noise from the works proposed are not expected to exceed the scenario modelled by Marshall Day and described in Section 4.

Works which will definitely exceed the noise scenario modelled by Marshall Day will not be allowed to be performed without formal noise monitoring proving compliance.

Where there is uncertainty whether the proposed service or maintenance works have the potential to generate noise greater than the works subject to Marshall Day Acoustics assessment (refer Section 4), the works would be subject to informal monitoring by NGRWF or its Contractor's personnel. Monitoring would typically be undertaken by travelling to a location as close as reasonably practicable to a non-involved sensitive receiver and undertaking an informal survey (such as a listening survey).

Access to private property for the purposes of any monitoring would be undertaken only with the permission of the landowner or occupier.

Where potential non-compliance is identified during noise compliance monitoring, the following actions would be undertaken:

- The General Noise Mitigation Measures outlined within Section 4 of the ONMP will be varied to reduce the noise output and ensure compliance.
- Where variation of the General Noise Mitigation Measures does not reduce the noise to a compliant level, other mitigating actions will be investigated. If it is not possible to reduce the noise to a level that is compliant then works will be suspended until normal hours.

Monitoring utilising the above approaches will typically be undertaken once during the expected period of greatest noise impact. Where potential non-compliance is identified, further monitoring may be undertaken in order to verify whether a reduction in the audible noise profile has occurred. Informal monitoring will be undertaken by the same person(s) to ensure consistency.

## 6.2 Complaints Response

Any complaints received during service and maintenance work undertaken outside of core business hours will be managed in accordance with the NGRWF Complaints Management Procedure. This Procedure is available on the Gullen Range Wind Farm website.

## Appendix 1 – Marshall Day Noise Assessment Report



MARSHALL DAY  
Acoustics 

GULLEN WIND FARM - CRANE NOISE  
ASSESSMENT

Rp 001 20161679SY | 26 October 2016

Project: **GULLEN WIND FARM - CRANE NOISE ASSESSMENT**

Prepared for: **Goldwind Australia Pty Ltd  
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Report No.: **Rp 001 20161679SY**

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## 1.0 INTRODUCTION

Marshall Day Acoustics (MDA) was engaged by Goldwind Australia Pty Ltd (Goldwind) to attend site at the Gullen Range Wind Farm site and conduct noise measurements during rotor replacement works carried out 13 & 14 October 2016.

The purpose of the survey was to obtain sufficient data to establish noise impacts from future works on nearby residential dwellings and boundaries.

## 2.0 ROTOR REPLACEMENT WORKS

Rotor replacement works were carried on BAN21, located at the Gullen Range Wind Farm, adjacent to Range Road. An aerial view of the site and location of cranes carrying out rotor replacement works can be seen in Figure 1 below.

Figure 1: Site aerial view and cranes location



In order to lower the rotor from the turbine a 500 ton crane and a 250 ton crane were used individually and simultaneously as needed.

The purpose of the works carried out on 13<sup>th</sup> October 2016 was to carry out maintenance works on the rotor of wind turbine BAN 21. The machinery used to carry out these works includes the following:

- Crane #1 : AC-500-2 (500 tonne crane)
- Crane #2: GMK 220 (220 tonne crane)
- Manitou forklift
- Handheld rattle gun – up to 3 used simultaneously

### 3.0 NOISE LEVEL MEASUREMENTS

Noise measurements were carried out on site during 13-14 October 2016. Instrumentation comprised 01dB Duo, Class 1 one-third octave band logging systems, calibrated before and after each day of measurements showing no significant signs of drift.

#### 3.1 Noise Measurement during rotor replacement works

Noise levels were measured on site during the rotor replacement operations on 13 & 14 October 2016.

Measurements were carried out simultaneously at two locations during replacement works as shown in Figure 3.2. Logger 1 was located 50 metres east of the cranes and Logger 2 located 100 metres to the north. A summary of the loudest noise events over the two days can be found in Section 3.3. Octave band  $L_{eq}$  noise levels for each noise event can be found in Appendix B.

The primary noise sources were the two cranes, Manitou forklift and the rattle guns when in use. The loudest activities from the cranes occurred each morning while each crane was booming out. The only notable major noise from the Manitou forklift was the reverse beeper when in use.

**Figure 2: Noise measurement locations during rotor replacement operations**



### 3.2 Noise Measurement after rotor replacement works

Noise levels were measured nearby the site after the rotor replacement operations on 14<sup>th</sup> October 2016 to establish a baseline without the impact of the rotor replacement operations.

A 1hr noise level measurement was measured between 1400-1500hrs 14 October at the location, approximately 200 m from the site. While the rotor replacement operation had ceased, the position for this measurement was located at a greater distance from the site to minimise the noise influence from possible other site activities.

The measured  $L_{Aeq}$  ambient noise does however include components from minor site activities and wind turbine operation at this and other adjacent sites.

Figure 3: Ambient noise measurement location



### 3.3 Summary of measurement Results

The results of the noise level surveys are summarised in tables 1 and 2.

**Table 1: Major noise event summary 13th October 2016 - LAeq**

Logger #	Event description	Duration	LAeq
1	Crane 1 boom out	12:45-12:47	52
2	(As above with sheep near noise logger)		54
1	Crane 2 boom out	13:57-13:59	47
2	(As above)		43
1	Crane 1 winch down with man basket & Crane 2 boom out	14:09 – 14:11	59
2			51
1	Rattle gun undoing rotor bolts at top of turbine – both cranes idling	10:35-10:42	52
2	(As above)		47
1	Lowering rotor with both cranes using crane winch	11:17-11:35	53
2	(As above)		46
1	Removing rotor blade at ground level with crane 2, crane 1 idling	12:31-12:37	47
2	(As above)		36
1	Rattle guns working at ground level – up to 3 rattle guns simultaneously	14:01-14:02	68
2	(As above)		48

**Table 2: Ambient noise 14th October 2016 – after rotor replacement operations**

Time	Event description	L <sub>Aeq</sub> -1hr	L <sub>A90</sub> -1hr
14:00-1500	General site activities and turbine operations	55	31

## 4.0 ASSESSMENT & RECOMMENDATIONS

### 4.1 Assessment Criteria

The following noise criteria has been set out in the Gullen Range Wind Farm Operational Environmental Management Plan (OEMP)

- 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 Sunday or public holidays is to minimise noise impacts.
- All works must be carried out in accordance with the Operational Noise Management Plan.

The Gullen Range Wind Farm Operational Environmental Management Plan (OEMP) has set out the following noise criteria:

- 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):
  - A) 35 dB(A); or
  - B) The existing background noise level ( $L_{A90}$  (10-minute)) correlated to the integer wind speed at hub height at the wind farm site by more than 5dB(A).

For the purpose of this assessment we have nominated 35dB(A) (10-minute) as the most stringent criteria in this instance.

#### **4.2 Recommended distances**

Calculations have been derived by utilising the worst case (loudest) measured LAeq 10 minute noise levels. These worst case measured levels included two cranes simultaneously working as well as 3 rattle guns and a crane working simultaneously.

Based on these worst case scenario calculations we have calculated that noise associated with rotor replacement works will comply with the site noise criteria, provided there is a minimum of 600 metres between the site works and any 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). This would also enable works to be carried out during Saturday afternoon and Sunday day time as required.

## APPENDIX A GLOSSARY OF TERMINOLOGY

<b>Ambient noise</b>	The total, encompassing sound.
<b>Frequency</b>	Sound can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. Sound is generally described over the frequency range from 63Hz to 4000Hz (4kHz). This is roughly equal to the range of frequencies on a piano.
<b>Hertz (Hz)</b>	Hertz is the unit of frequency. One hertz is one cycle per second. One thousand hertz is a kilohertz (kHz).
<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.
<b>Residual noise</b>	The total, encompassing sound without the sound of interest.
<b>Sound Pressure Level (<math>L_p</math>)</b>	A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 $\mu$ Pa RMS) and expressed in decibels.
<b>dB</b>	Decibel. The unit of sound level.
<b>A-weighting</b>	The A-weighting approximates the response of the human ear
$L_{Aeq}$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level.  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.
$L_{A90}$	The A-weighted noise level equalled or exceeded for 90% of the measurement period. This is commonly referred to as the background noise level.

## APPENDIX B MEASURED NOISE LEVELS

Octave band measured noise levels are provided in Table B1 below.

**Table B1: Measurement summary**

Logger #	Event description	Duration	Octave Band – dB										
			31.5	63	125	250	500	1k	2k	4k	8k	16k	A
1	Crane 1 boom out	12:45-12:47	64	67	64	51	51	42	39	32	27	23	52
2	As above with sheep		70	66	61	50	45	41	45	49	47	35	54
1	Crane 2 boom out	13:57-13:59	63	60	54	49	44	40	37	29	21	23	47
2			60	57	54	47	38	34	34	25	17	16	43
1	Crane 1 winch down with man basket & Crane 2 boom out	14:09 – 14:11	61	57	73	57	53	48	44	38	27	23	59
2			57	57	64	45	41	40	40	40	33	17	51
1	Rattle gun undoing rotor bolts at top of turbine – both cranes idling	10:35-10:42	65	63	56	49	48	46	47	40	29	23	52
2			57	54	48	39	37	36	44	33	20	16	47
1	Lowering rotor with both cranes using crane winch	11:17-11:35	62	67	60	52	48	45	46	42	32	23	53
2			54	59	54	44	44	37	38	28	19	16	46
1	Removing rotor blade at ground level with crane 2, crane 1 idling	12:31-12:37	63	58	49	44	43	40	40	36	28	23	47
2			52	52	46	35	29	26	26	25	23	16	36
1	Rattle guns working at ground level – up to 3 rattle guns simultaneously	14:01-14:02	51	50	51	52	47	54	61	62	66	43	68
2			49	47	43	40	38	42	44	39	32	16	48