Joule Logic

Renewable Energy and Environment Specialists

Cattle Hill Wind Farm

Post-Commissioning Eagle Utilisation Monitoring Plan (EUMP)

Developed to satisfy the requirements of Condition FF6 of EPN 9715/1 for the Cattle Hill Wind Farm

Date	Revision	Prepared	Reviewed	Approved	Regulator Reviews
31/1/2018	3	Cindy Hull Joule Logic	Sue Marsh Joule Logic	Jeff Bembrick Goldwind Australia	

Disclaimer

Reports produced by Joule Logic Pty Ltd are prepared based on the Client's objective and are based on a specific scope, conditions and limitations, as agreed between Joule Logic and the Client. Information and/or report(s) prepared by Joule Logic may not be suitable for uses other than the original intended objective. No parties other than the Client should use any information and/or report(s) without first conferring with Joule Logic.

Although Joule Logic has taken all necessary steps to ensure that an accurate report has been prepared, the Company accepts no liability for any damages or loss incurred as a result of reliance placed upon the report and its contents.

Copyright

Definitions

In this Post-Commissioning Eagle Utilisation Monitoring Plan, the following definitions apply:

Cattle Hill Wind Farm	Comprising 48 wind turbines and 150 MW capacity
Central Highlands Region	**I**s that described in the EMPCA permit 7925, as the area north of Bothwell, east of Bronte Park and surrounds, south of Liawenee and west of the Great Western Tiers
Commissioning	Means the testing of turbines and is taken to be completed when 90% of the turbines are being operated in the course of normal commercial operations.
DPEMP	Development Proposal and Environmental Management Plan, June 2010
Director	Director of the Tasmanian Environment Protection Authority, holding office under Section 18 of EMPCA and includes a person authorised in writing by the Director to exercise a power or function on the Director's behalf.
DPIPWE	The Tasmanian Department of Primary Industry, Parks, Water and Environment
Eagle	Tasmanian wedge-tailed eagle (*Aquila audax fleayi*) or the white-bellied sea-eagle (*Haliaeetus leucogaster*)
EMPCA	*Environmental Management and Pollution Control Act 1994*
EPA	Tasmanian Environment Protection Authority
The Land	Defined as that situated immediately to the east of Lake Echo and off Bashan Rd, approximately 3km southwest of Waddamana in central Tasmania and includes part or all of the following titles: 135246/1; 29897/1; 29897/3; 29897/5; 248810/1; 135247/1; 135247/2; 29888/4; 29897/6 (as defined in the EPN 7925/1)
The Proponent	Wild Cattle Hill Pty Ltd (ACN 610 777 369)
WTE	Tasmanian wedge-tailed eagle (*Aquila audax fleayi*)
WBSE	White-bellied sea-eagle (*Haliaeetus leucogaster*)

Table of Contents

Tables

Figures

Appendices

1. Introduction

1.1 The Project

The Cattle Hill Wind Farm occupies privately-owned land situated east of Lake Echo in Tasmania's Central Highlands approximately 93 kilometres to the north-west of Hobart (Figure 1). The wind farm consists of 48 wind turbines and associated infrastructure (Figure 2).

The wind farm site is approximately 4,121 ha and is bounded by Lake Echo to the west and grazing and forestry land to the north, east and south. The small unpopulated settlement of Waddamana is located to the north east. The site is currently used for grazing, small forestry operations and hunting and comprises nine lots owned by two land owners.

The project was approved by Tasmanian State Regulators in April 2012 and by the (now) Commonwealth Department of Environment and Energy in December 2014.

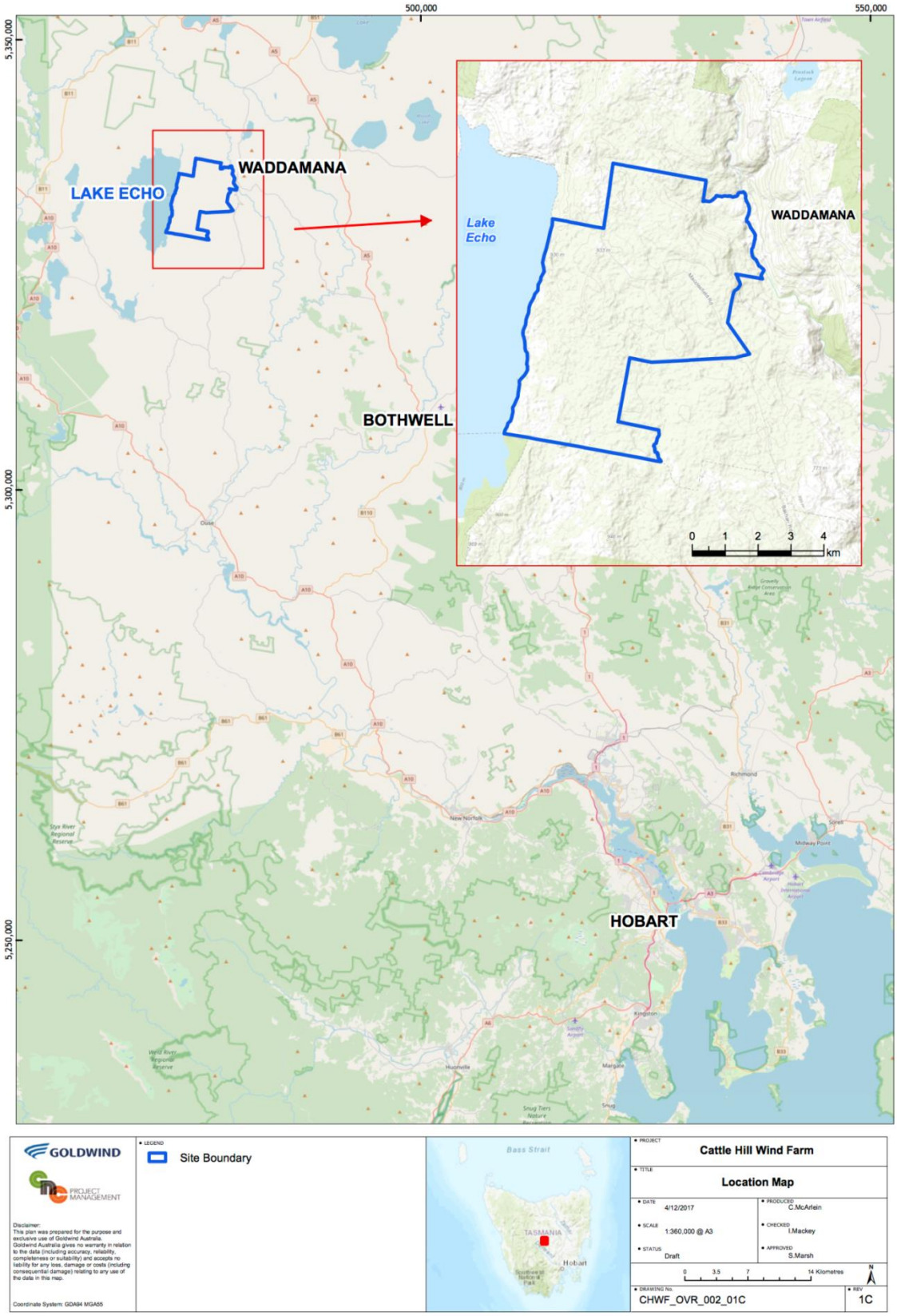

Figure 1: Location of Cattle Hill Wind Farm

Figure 2: Cattle Hill Wind Farm infrastructure

1.2 The proponent

The Proponent for the Cattle Hill Wind Farm is:

Wild Cattle Hill Pty Ltd

ACN 610 777 369

Suite 2, Level 23,

201 Elizabeth Street,

Sydney NSW 2000

1.3 The Person Responsible

The Person Responsible under EPN 9715/1 for Cattle Hill Wind Farm is Wild Cattle Hill Pty Ltd.

1.4 Relevant EPN Condition

The Post-Commissioning Eagle Utilisation Monitoring Plan (EUMP) has been developed to satisfy the requirements of Condition FF6 of EPN 9715/1 for the Cattle Hill Wind Farm. This Condition states:

1. *At least six months prior to the commencement of commissioning activities, or by a date specified in writing by the Director, a Post-Commissioning Eagle Utilisation Monitoring Plan must be submitted to the Director for approval.*
   - *1.1 The Post-Commissioning Eagle Utilisation Monitoring Plan is approved only when the Director indicates in writing that the submitted document adequately addresses the requirements of parts 2 and 3 of this condition to his or her satisfaction.*
   - *1.2 The Director's approval will not be unreasonably withheld or delayed.*

2. The plan must be prepared in accordance with any reasonable guidelines provided by the Director.

3. Without limitation, the plan must include details of the following:

3.1 the survey methodology (which must generate results suitable for comparison to the results of the pre-construction surveys);

3.2 a table containing all of the major commitments made in the plan;

3.3 an implementation timetable for the plan, noting that the monitoring must continued until the Director advises in writing that it may cease; and

3.4 a reporting program to regularly advise the Director of the results of the plan.

4. The person responsible must not operate the wind farm other than in accordance with the approved Post-Commissioning Eagle Utilisation Monitoring Plan.

5. In the event that the Director, by notice in writing to the person responsible, either approves a minor variation to the approved plan or approves a new plan in substitution for the plan originally approved, the person responsible must implement and act in accordance with the varied plan or the new plan, as the case may be.

This plan also satisfies Commitment 67 of Attachment 2 of the EPN which states:

Two years of post-wind-farm commissioning eagle utilisation monitoring will be carried out to validate the pre-construction eagle utilisation assessment, and to determine whether the construction of the wind farm has changed the eagle utilisation patterns at the site.

1.5 Guidelines for the EUMP

The guidelines for the Post-Commissioning Eagle Utilisation Monitoring Plan (EUMP) were endorsed by the Tasmanian EPA (Environment Protection Authority) on 22nd September 2017. They state that the EUMP must contain the following:

- *Introduction, containing the following:*
  - *Brief description of the project and its location.*
  - *The proponent and the Person Responsible.*
  - *The permit condition it satisfies.*
- *Definition of relevant terms.*
- *Objective of the EUMP.*
- *Scope – species covered by the Plan, geographic extent for the Plan.*
- *Management actions to achieve the stated objective. This needs to include:*
  - *Methods (which allow comparisons to the pre-construction surveys);*
  - *Analysis of results, comparing eagle utilisation before the wind farm was constructed to that after commissioning;*
  - *Reporting requirements. Details of how the results of the study will be reported.*
- *Performance indicators. The EUMP will detail the implementation of the actions in a table and the time frames when these will be submitted to the Director or his/her delegate.*
- *Reporting. A commitment to provide all results of the management actions in an Annual Environment report to the Director or his/her delegate, which will be made publicly available.*

2. Objective of the EUMP

The objective of the EUMP is not specified in EPN Condition FF6. The DPEMP states on page 104 that pre-construction eagle utilisation surveys aimed:

- "to provide evidence-based data as inputs for eagle utilisation mapping and collision risk modelling (CRM);

- to compare the results from the utilisation mapping and CRM to a Population Viability Analysis; and
- to ultimately design a wind turbine layout that avoids placing wind turbines in high collision risk areas of the site."

Obviously, these objectives were achieved in the DPEMP, hence the post-commissioning utilisation surveys will have a different objective.

The DPEMP (p. 279 Volume 1 and commitment 67) commits to two years of post-wind farm commissioning eagle utilisation monitoring to "validate the pre-construction eagle utilisation assessment and to determine whether the construction of the wind farm has changed the eagle utilisation patterns at the site". It is not clear what is meant by validating the pre-construction surveys, but studies at other Tasmanian wind farms and overseas have found that eagles continued to use a wind farm site once the turbines were operating, but altered their flight paths in response to them (Hull and Muir 2013 and references therein). This indicates that the eagles were aware of the turbines and adjusted their behaviour in response to them, which is key to minimising their risk of colliding with the turbines (Hull and Muir 2013). Therefore, it is expected that eagles will alter how they use the Cattle Hill site after the wind farm is constructed.

The purpose of post-commissioning eagle utilisation studies would then be to:

- Describe how eagles use the site once the turbines are installed and operating;
- Compare this to the utilisation data collected before the wind farm was constructed; and
- Provide data on the avoidance rate of eagles at the Cattle Hill Wind Farm, if possible.

The avoidance rate of birds, which is a key input to collision risk modelling (see Smales et al. 2013), should be empirically measured from field surveys, but has only been documented for a small number of species (Chamberlain et al. 2006). It has been measured in Tasmanian Wedge-tailed Eagle and White-bellied Sea-eagle at the Bluff Point and Studland Bay Wind Farms (Hull and Muir 2013) and measurements from a new site would be useful to understand the extent to which avoidance behaviour and rates vary across different habitats and sites. This may lead to a greater understanding of collision risk in eagles and assist with future estimates of collision risk at new wind farms.

3. Scope

Relevant species are the Tasmanian Wedge-tailed Eagle *Aquila audax fleayi* (WTE) and the White-bellied Sea-eagle, *Haliaeetus leucogaster* (WBSE).

The geographic extent of the plan is "The Land".

4. Methods

In order to allow a before/after comparison of the data, the same methodology will be used as during pre-construction studies.

Surveys will be conducted at the following times of year:

- Breeding season (for approximately 8 days around mid-November and approximately 3 days mid-December);
- Post breeding (approximately 4 days late February);
- Non-breeding (approximately 5 days early May); and
- Displaying (approximately 6 days mid-August).

The surveys will commence once commissioning of the wind farm is completed and the wind farm is in operational stage (therefore in the first relevant season after the completion of commissioning).

Observations of eagle movements will be made from vantage points used during pre-construction surveys. Other than S4, which is on land that is no longer part of the wind farm, the vantage points S1-S7, shown in Figure 2-1 of Appendix H, Volume 3 of the DPEMP (see Appendix 1) will be used.

As with pre-construction surveys, observations will be conducted on alternate days between the northern and southern observation points, i.e. on day one observations will be conducted in the North division in the morning and in the South division in the afternoon. On the next day, the shifts would change with observations in the South division conducted in the morning and in the North in the afternoon.

Observations will be conducted for a maximum of 8 hours between 8am – 4 pm, as this is when most flights occur (as described in the DPEMP, p. 14 Volume 3).

The following will be documented during observations:

- Species of eagle;
- Age class of eagle (immature, juvenile or adult) if it can be determined;
- Time first observed;
- Height category when the eagle was first observed (see Appendix 2);
- Category of behaviour (soaring, displaying, flying, conflict, see Appendix 2);
- Sector in which behaviour was observed;
- Time at which eagle disappeared from view; and
- Ground track of the flight, which will be digitised into a GIS track (with each flight having an identification field to allow connection with the survey and observation metadata).

Wind speed and direction will be recorded every three hours during the observations.

5. Analysis of results

A review of the data for quality will be undertaken, which will check for:

- Logical consistency;
- Typographical errors;
- Null fields – the percentage of records which are incomplete is noted; and
- Null value distributions – some variables in the database are "paired" to facilitate future analysis.

The analysis of the "cleaned" data (processed after the above checks) will assess the following:

- Any spatial or temporal patterns;
- Any correlations between flights and weather conditions;
- Comparisons of relevant variables between pre-construction and post-commissioning data;
- Comparison of ground tracks between pre-construction and post-commissioning data;
- Comparison of utilisation between pre-construction and post-commissioning data; and
- Assessment of avoidance behaviour and estimation of avoidance rates (pending sufficient flight activity), and whether there is evidence of variability in relation to time of year, time of day or other factors.

6. Duration of the study

The study will run for two years (as committed to in the DPEMP). Once the final report is submitted (which will detail whether the objectives of the study have been achieved), approval will be sought from the Director to cease the study, unless there are scientific reasons for the study to continue.

7. Reporting

The results of each year's surveys will be presented In the Annual Environment Report provided to the Director, which will be made publicly available. A final report describing the outcomes of the survey will be provided to the Director three months after the completion of the final survey.

8. Performance Indicators

Table 1 summarises actions in the EUMP, their implementation and the time frames.

Table 1: Implementation of actions and their time frames in the Post-Commissioning Eagle Utilisation Monitoring Plan

Implementation/Action	How addressed	Time frame
Submission of EUMP six months prior to the commencement of commissioning activities	This plan	EUMP submitted 01/02/2018.
Issue of Guidelines for the EUMP	Guidelines were endorsed by the EPA 22nd September 2017	-
Observations	Section 4	Surveys will commence after full commissioning and will be conducted during the display period, breeding, post-breeding and non-breeding seasons.
Analysis	Section 5	Full analysis will be conducted at the completion of the two years of field surveys.
Reporting	Section 7	Submitted to the Director 3 months after completion of the field surveys.

9. References

Chamberlain, D. E., M. R. Rehfisch, A. D. Fox, M. Desholm, and S. J. Anthony. 2006. The effect of avoidance rates on bird mortality predictions made by wind turbine collision risk models. Ibis 148:198‑202.

Hull, C.L. and Muir, S.C. 2013. Behavior and turbine avoidance rates of eagles at two wind farms in Tasmania, Australia. Wildlife Society Bulletin 37(1): 49-58.

Smales, I., Muir, S., Meredith, C. & Baird, R. 2013. A description of the Biosis model to assess risk of bird collisions with wind turbines. Wildlife Society Bulletin 37 (1): 59‑65.

Appendix 1 Eagle survey points

Figure 2-1 from Appendix H of the DPEMP

Figure 2-1
Site map showing survey points and known eagle nests

Appendix 2 Behaviour categories

Height categories

Flight height categories will be:

- Below 125m
- Above 125m
- Mixed height
- Above 300m

Eagle behaviours

The following definitions will be used (based on that described p. 15, Appendix H, Volume 3 DPEMP):

- Soaring - where birds are riding thermals and updrafts and not flapping their wings
- Flying – birds in direct flight with wing flapping
- Displaying – where birds are exhibiting flight behaviours associated with displaying such as mutual soaring, rolling, talon-grappling and undulating displays (e.g. pot-hook display)
- Conflict – chasing and diving at intruders and fighting