

Musselroe Wind Farm Annual Environmental Review 2020-21

30 September 2021



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1. General Manager's Statement

This is the 12th Annual Environmental Review (AER), including the 2013, 2016 and 2019 Public Environment Reports, published for the Musselroe Wind Farm (MRWF). The AER has been prepared according to condition G5 of the Environment Protection Notice (EPN) for the project (EPN 8657/2). According to G5, an Annual Environmental Review, that is also publicly available (www.woolnorthrenewables.com.au), must be submitted to the Director of the Environment Protection Authority (EPA) within 3 months of the end of the reporting period each year.

I acknowledge and endorse this report.

A handwritten signature in black ink, consisting of a stylized 'S' followed by a long horizontal stroke that curves upwards at the end.

Stephen Ross
General Manager
Woolnorth Renewables

2. This report

This AER covers the period 1 July 2020 – 30 June 2021 and is provided to fulfil condition G5 of the MRWF EPN (8657/2) and relevant conditions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) approval number 2002/683. The report also provides a summary of additional work undertaken at the site to address any environmental issues and/or to improve environmental values of the site. Table 1 contains details of the sections within this report and the specific purpose of each section.

Table 1. Sections contained within this report and details of reporting requirements met under Condition G5 of the EPN.

Sections of this report	Compliance details
1. Statement from General Manager of Woolnorth Wind Farm Holding Pty Ltd	In response to 1.1
2. This report	General information
3. Introduction 3.1 Background 3.2 MRWF	General information
4. General Environmental Management 4.1 Public complaints	In response to 1.2
4.2 Details of environment-related procedural or process changes	In response to 1.3
4.3 Summary of the amounts (tonnes or litres) of both solid and liquid wastes produced and treatment methods implemented. Initiatives or programs planned to avoid, minimise, re-use, or recycle such wastes	In response to 1.4
4.4 Non-trivial environmental incidents	In response to 1.5
4.5 Monitoring data and record keeping required by these conditions	In response to 1.6
4.6 Identification of breaches of limits	In response to 1.7
5. Other Environmental Actions and issues 5.1 Eagle Management 5.2 Collision Mitigation 5.3 Eagle nests	In response to 1.8
6. Environmental Management Plans	
7. State Environmental Management Plans	In response to 1.9 and 1.6
8. Commonwealth Environmental Management Plans	In response to 1.6; Information for the Commonwealth Department of Agriculture, Water and the Environment (DAWE).
9. State and commonwealth Approved	In response to 1.9 and 1.6
10. Community consultation and communication undertaken	In response to 1.10
11. Glossary	General inclusion
12. References	General inclusion

3. Introduction

3.1 Background

Musselroe Wind Farm is located in far north-east Tasmania (Figure 1) and is owned by Musselroe Wind Farm Pty Ltd (MRWF), a subsidiary of Woolnorth Wind Farm Holding Pty Ltd (now trading as Woolnorth Renewables). Woolnorth Renewables (WNR) is a joint venture between Hydro Tasmania and Shenhua Clean Energy Holdings (formed in 2012). WNR acquired the MRWF project in February 2013 and has been operating the site since it was commissioned in October 2013.

WNR manages the MRWF including compliance with its obligations under the EPN and EPBC approval conditions. The regulatory compliance obligations of MRWF are the focus of this report.

3.2 Musselroe Wind Farm Overview

The MRWF consists of:

- 56 Vestas (3MW) wind turbines.
- Underground 33kV power collection system.
- An electrical substation, control room and associated buildings.
- Roads, fences and other associated infrastructure.
- A 110kV single circuit transmission line (49km in length, Figure 2), connecting the wind farm to the national electricity grid at the Derby substation.

Construction of the wind farm commenced in March 2009 and completion of the wind farm was contractually executed on 9 October 2013. For the purposes of several EPN requirements bound by the term 'commissioning/ed', 1 July 2013 is used (as 55 of the 56 wind turbines were operating by that time).

MRWF has been issued a Municipal Planning Scheme Permit (PLN/03-0161 & PLN/08-0714), an EPN (8675/2, replacing conditions attached to PLN/03-0161) and an EPBC approval (2002/683). These regulatory instruments are administered by the Dorset Council, the EPA and DAWE respectively. Attached to these legal instruments are environmental conditions with which MRWF must comply. The preparation of this AER is a requirement of the EPN. Environmental Management Plans that have been approved in accordance with the EPN and EPBC Approval also outline reporting commitments and requirements. This report contains the relevant reporting requirements for the MRWF and the associated 110kV transmission line.

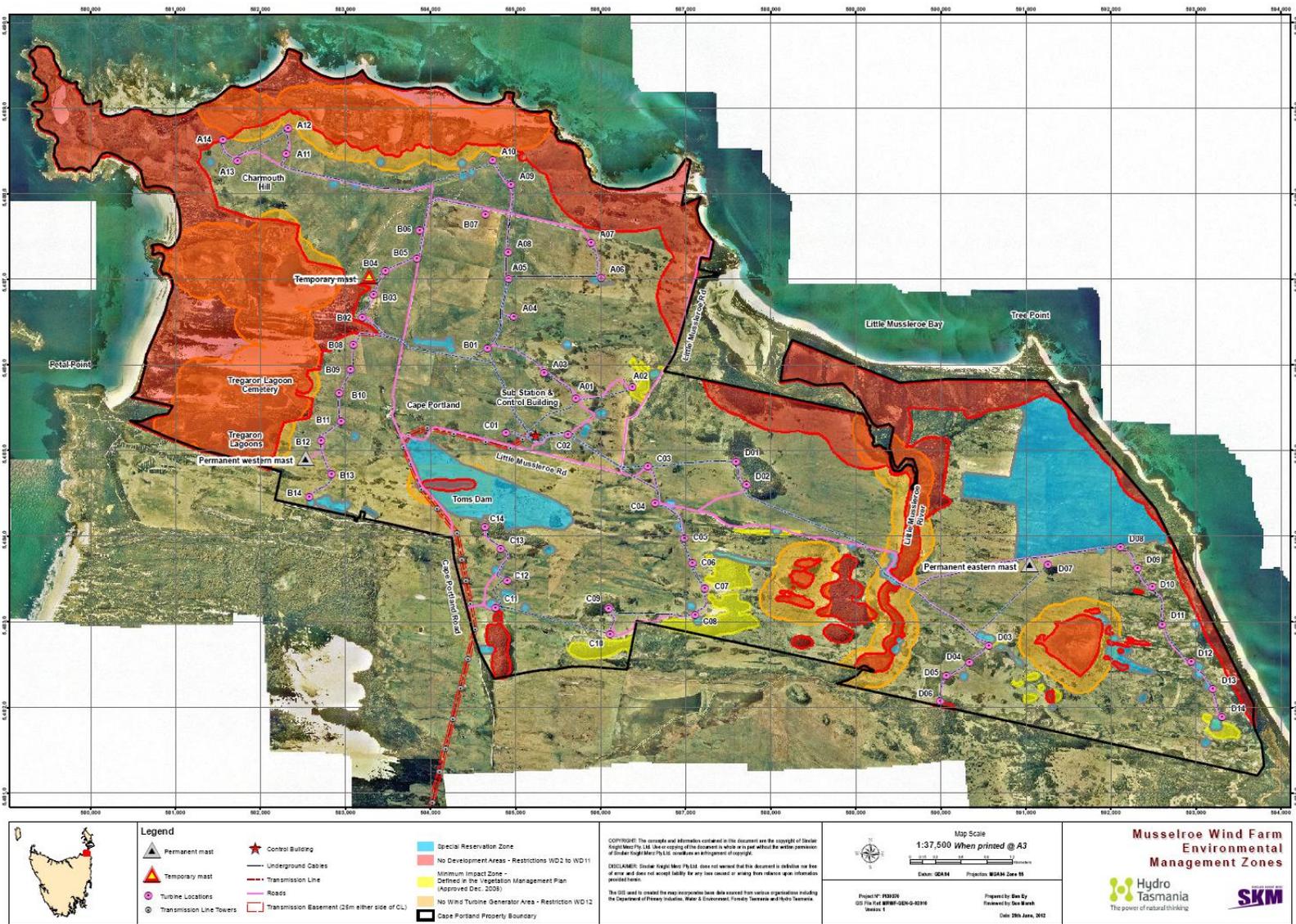


Figure 1. Musselroe Wind Farm layout

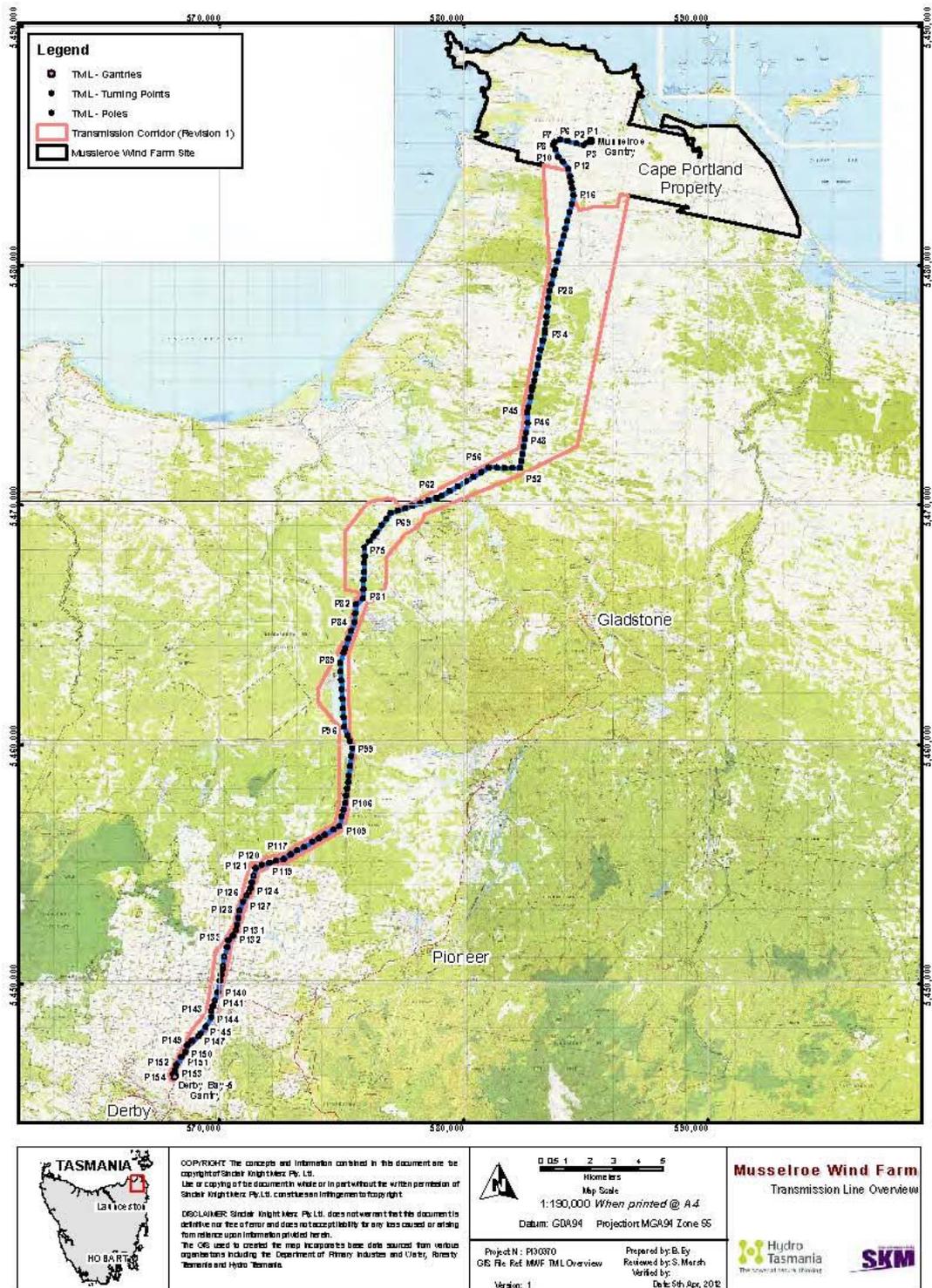


Figure 2. Musselroe Wind Farm to Derby Transmission Line Route, owned and operated by Woolnorth Renewables

4. General Environmental Management

4.1 Public Complaints

There were no public complaints in relation to environmental or other matters received by WNR during the 2020-21 reporting period.

4.2 Environmental Procedure or process changes

As highlighted in previous AERs (2017/18) the suite of State approved environmental management plans for the project were reviewed, consolidated into a single Plan ('State Environmental Management Plan 2016') and were subsequently approved by the EPA in July 2017. This State Environmental Management Plan was updated again in February 2020 in response to a request from the EPA to vary the Plan specifically relating to condition FF7 (1) (Wedge-tailed Eagle Offset Plan). Other minor amendments were made, however there were no other significant updates to the document.

In response to a higher than anticipated number of wedge-tailed eagle (WTE) mortalities, an observer-based wind turbine shutdown program was initiated in late 2019. The observers have access to the software that controls the operation of the turbines. Observers shutdown turbines if there is a perceived risk to a wedge-tailed eagle (see Section 5.2.1). This program was maintained throughout the 2020-21 reporting period.

As a longer-term strategy for managing eagle collisions, an avian specific radar was installed at the site. The Robin Radar Max system was commissioned and operational by October 2020 and has been in a testing and trial phase since. Further details on the system are provided in section 5.2.3.

4.3 Solid and liquid wastes

Solid and liquid wastes are divided into the following waste streams; general rubbish, hydrocarbon waste (liquid and solid) and coolant waste. The quantity of each of these streams produced during the reporting period is shown in Table 2.

Table 2. Solid and liquid waste generated from the MRWF during the reporting period.

Waste Stream	Quantity
General rubbish (m ³)	20
Steel (tonne)	0
Hydrocarbon liquid (L)	9296
Hydrocarbon solid (m ³)	18
Filters (m ³)	13.5
Co-mingled recycling (m ³)	5
Cardboard and paper (m ³)	1.5

Waste streams and volumes are regularly monitored and where possible materials are recycled rather than being disposed of as general waste. Waste volumes were similar to

previous reporting periods. Hydrocarbon liquid waste volumes were down on last year but still relatively high. All liquid hydrocarbon was recycled. A licenced contractor disposes of all waste, including waste classified as hazardous.

4.4 Non-Trivial Environmental Incidents and Non-Compliances

4.4.1 Environmental Incidents

There were seven non-trivial environmental incidents identified at the MRWF during the 2020-21 reporting period. These incidents were:

1. Wedge-tailed eagle collision, July 2020
2. Wedge-tailed eagle collision, August 2020
3. Wedge-tailed eagle collision, October 2020
4. Wedge-tailed eagle collision, October 2020
5. Wedge-tailed eagle collision, October 2020
6. Wedge-tailed eagle collision, December 2020
7. White-bellied sea-eagle collision, January 2021

Other bird and bat collisions were recorded as incidents during the reporting period and managed according to the EPN and the approved Bird and Bat Mortality Monitoring Plan (see section 7.4.1) and the equivalent DAWE approved plan. Other 'trivial' environmental incidents were documented and managed by WNR.

4.4.2 Incident follow-up, mitigation and preventative measures

The WTE and WBSE incidents were managed according to the requirements outlined in the EPN and other approved management plans for the reporting of threatened species. Reporting of the incidents occurred within the required time frames. Corrective actions and offsets are required (see Sections 7, 8.2.3 and 8.3).

In response to the number of WTE collisions in 2019, Wildspot Consulting was engaged to commence a WTE observation and turbine shutdown program. Further information on this program is provided in Section 5.2.1.

As a broad response to the number of eagle mortalities in previous reporting periods, the EPA and WNR agreed on conducting an Eagle Impact Review (EIR) to assist in determining whether the wind farm mortalities are impacting on the local wedge-tailed eagle populations in the Musselroe/Cape Portland region. The current status of the EIR is discussed in Section 5.2.5.

During the reporting period WNR also completed the installation and commissioning a Robin Radar MAX system for the exclusive purpose of implementing an automated wind turbine shutdown system. A full report on this project is included in Section 5.2.3. Woolnorth continued to review other technologies that may assist in the mitigation of eagle mortalities at its wind farms. An update is included in this report in Section 5.2.4.

4.4.3 Non-compliance

During the reporting period there were no non-compliances identified with the EPN or other approval conditions. Internal and external audits conducted during the reporting period evaluated and examined compliance with EPN and other approval conditions with the objective of validating compliance.

4.5 Monitoring data and record keeping

Monitoring and records of various parameters and activities are maintained by MRWF. These include (but are not limited to):

- Energy consumption and generation.
- Waste (including movements and disposal of controlled waste).
- Audits and emergency exercises.
- Incidents and non-compliances.
- Chemical inventory.
- Training and competencies (including inductions).
- Database of EPN and Approval conditions.
- Weed management activities.
- Records of wind turbine bird mortality survey effort.
- Records of any dead birds found on the land (as defined in EPN 8657/2).

4.6 Identification of breaches of limits

There were no breaches of limits identified during the reporting period.

5. Other Environmental Actions and Issues

5.1 Eagle Management

WTE and WBSE mortalities at MRWF are recognised by WNR as a significant environmental and business concern. Woolnorth, as an experienced wind farm operator, understands the complexity of the issue, the difficulties in understanding it and the various aspects and pitfalls of trying to establish mitigation solutions that have, or are likely to have, tangible and successful outcomes. Various technologies and mitigation options have been tested or implemented by WNR at MRWF and also at the company's other assets, Bluff Point and Studland Bay Wind Farms

Since the wind farm was commissioned in mid-2013 several measures have been developed and implemented and these have been described in previous reports. Many of the measures remain in place. During this reporting period several new strategies were developed and like previous years these range from possible direct collision prevention measures to indirect collision mitigation through to general site-based research. Measures and actions relevant to the 2020/21 reporting period are described below.

5.2 Collision Mitigation

5.2.1 Wedge-tailed eagle Observation and Turbine Shutdown Program

In response to the higher-than-expected number of WTE mortalities in 2019 Wildspot Consulting were engaged to provide bird observers at MRWF in November 2019. The primary function of these observers is to shut down wind turbines when a WTE (or white-bellied sea eagle, WBSE) is perceived to be at risk due to its proximity to a turbine. This program has been maintained through the 2020-21 reporting period.

On a daily basis, two to four observers are stationed at vantage points around the site and are equipped with radio communication. The centrally located observer has direct access to the software that controls the wind turbines. If an eagle is deemed to be at risk, the relevant turbine/s are shutdown until the eagle is clear from the area.

While detailed analysis of the eagle observation and turbine shutdown data has not yet been conducted, since commencement of the program in November 2019, there have been approximately 400 WTE flights observed every month (Figure 3), with a strong relationship seen between the number of birds and the number of turbine shutdowns. The gradual increase in the number of flights that is evident in Figure 3 is largely due to the build-up in the observer effort i.e. number of observers and number of hours in a day.

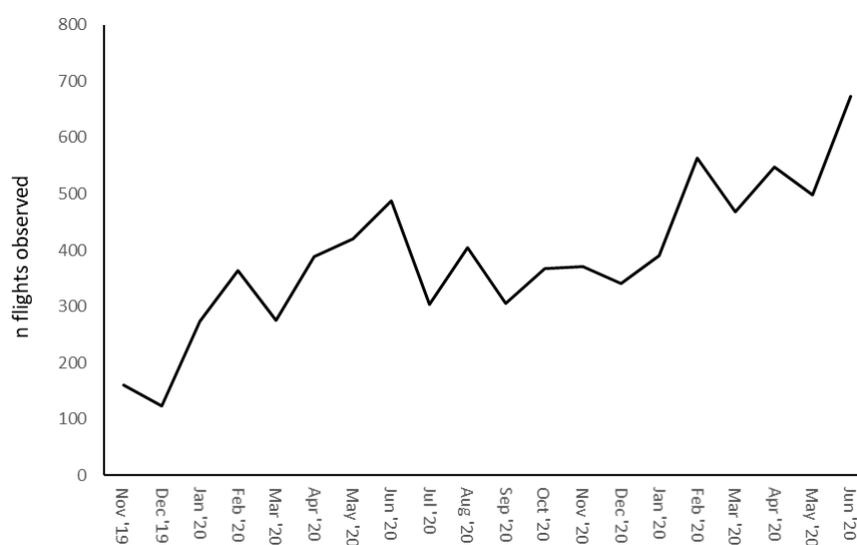


Figure 3. Number of wedge-tailed eagle flights observed from the start of the observer-based shutdown program in November 2019 through to the end of the 2020-21 reporting period.

5.2.2 GPS tracked eagles

For several years WNR have been working with Tasmania eagle specialists and researchers. WNR have both supported research projects through offsets but also, where possible, been engaged in other collaborative ways. Through these collaborations, in mid-2019, WNR supported researchers to attach a GPS tracking device to an immature/mature male WTE at

the MRWF site. Following the successful attachment of the first device, in early 2020, WNR again supported researchers to place GPS trackers on another 4 adult eagles as a part of a larger Tasmanian wide project. These 4 adults were either considered resident (n.3) to the MRWF site or local (n.1) to the site. Each eagle was considered a part of a breeding pair with a unique territory on the wind farm site, this being confirmed through site observations.

WNR supported the project through direct financial support, procurement of specialist project equipment (net launcher, GPS trackers) and through the setting up of site-based stations where the eagles were captured.

Since the establishment of the project and the fitting of the trackers, all five adult birds continue to occupy their original territories successfully as adult breeding pairs (see section 5.3 for details on breeding observations). These territories have morphed over time and current data suggest that there may be 6 territories overlapping the wind farm site (see Figure 4). The data generated from this work (6 second GPS location when in flight, 15 minutes when perched) has been the subject of several targeted interrogations, in order to glean any information about behaviours and flight characteristics. The data have also been very valuable to the verification and commissioning of the installed Robin Radar system (see section 5.2.3).

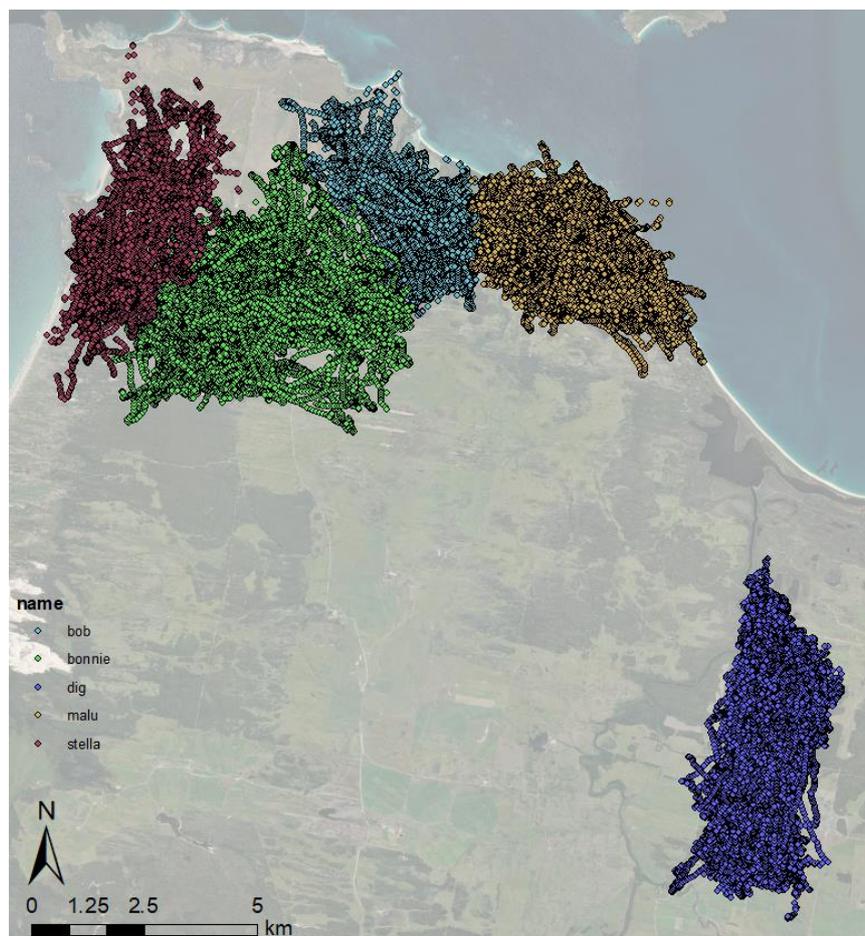


Figure 4. Example of the spatial data generated from the GPS tracked adult wedge-tailed eagles on and adjacent to the Musselroe Wind Farm (approx. 30 days).

5.2.3 Robin Radar project

As outlined in the 2016-19 Public Environment Report (PER), a detailed evaluation of technologies occurred in 2018/19. The Robin Radar MAX system was identified by WNR as the most appropriate technology to reduce the risk of eagle collisions with wind turbines at the Musselroe Wind Farm site. The system comprises of a phased array radar which is designed specifically to detect birds over a broad area. The radar also has a custom and configurable software program (shutdown module) integrated with the wind farm control system to curtail/shut down appropriate turbines.

Woolnorth Renewables executed a contract in November 2019 with Western Advance (agents for Robin Radar in Australia) for the procurement and installation of a Robin Radar MAX radar system. The objectives of the project being to implement a successful and commercially viable solution to mitigate and reduce the risk of eagle mortalities on the wind farm.

Physical site works were conducted during the first half of 2020, including

- various pre-construction surveys
- construction of a road and hardstand area
- installation of foundations to support the sea container used to mount the radar and house ancillary equipment
- installation of a 240V power supply
- installation of an optic fibre cable
- installation of solar system to cover periods of power outages
- installation of servers
- installation of a sea container

The radar was installed in late August 2020 and commissioned in September. Testing continued through to October until which point the unit was considered operational. Figure 5 show the location of the radar at MRWF, and Figure 6 shows the physical installation as at the end of the reporting period.



Figure 5. Location of the radar on the Musselroe Wind Farm site



Figure 6. Installation and commissioning of the Robin Radar system was completed in October 2020. This included the back-up solar power supply and the lightning conductor mast in the background.

In parallel with this work, WNR engaged Vestas (the OEM) to complete the integration of the Vestas SCADA system to the radar system, ultimately to allow control logic to pause individual turbines in the wind farm based on recommendations from the radar system. This work was completed and tested during the reporting period.

Field validation work was conducted in October and November 2020, following a methodology provided by Robin Radar. At this point, however, WNR halted the validation work due to several concerns regarding the radar performance. These included:

- Track quality - a high incidence of track 'break-up/break-down'
- Coverage - specific areas of no or limited detection, lack of detection, high portion of missing flights of target birds (eagles)
- False positives - generation of false targets
- Classification – radar underestimating the size of birds (e.g. large birds being classified as medium birds)

Robin Radar commenced a series of investigations into the performance concerns raised by WNR. The initial action undertaken was a series of defined drone flights. The first objective of the drone flights was to enable methodical testing of the hardware to ensure all parts of the radar were functioning correctly. The second objective was to repeat the drone flights following parameter changes to test the effectiveness of the changes. Raw radar data for both sets of flights were recorded for later analysis. The drone testing confirmed that all hardware

was operating correctly and that the parameter changes, thought to be beneficial, were of limited to no value (specifically in response to the performance issues raised).

Following the drone testing and since December 2020, there have been a series of investigations conducted and operational changes made to improve the performance of the radar system. These changes have improved the performance of the system. At the end of the reporting period the following summarises the current system performance (and issues).

Coverage:

- The radar, although centrally located, does not provide coverage of all wind turbines as the pre-installation coverage models illustrated. The coverage is impacted by high clutter areas and distance. High clutter¹ areas were not forecast or predicted in the preliminary design discussions and the theoretical range of the radar for large bird targets is a 10km radius from the radar position. The furthest turbine from the radar is slightly over 7km. The image below is a coverage diagram produced in March 2021.

Figure 7 below shows:

- Areas of low coverage in the vicinity of wind turbines to the far south east
- Areas of low coverage around wind turbines in the far north west
- Areas of low/patchy coverage around a series of turbines in the west of the wind farm

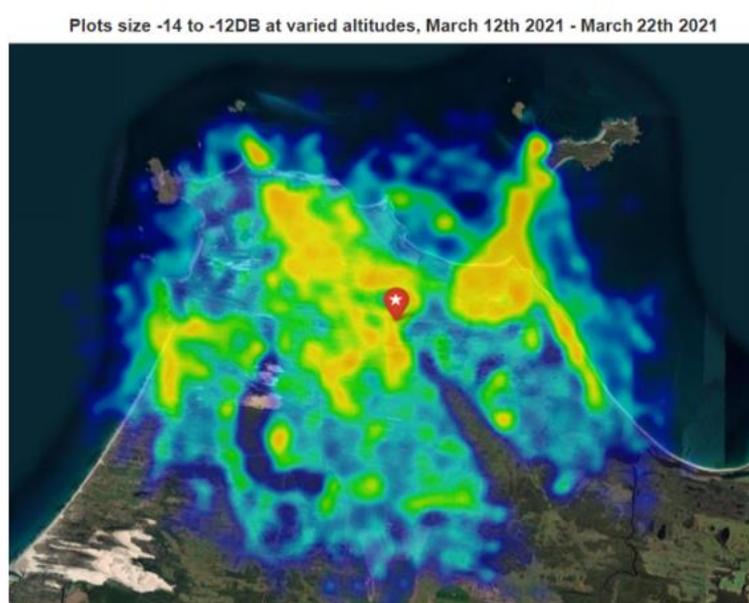


Figure 7. Coverage diagram for the period March 12-22, 2021 – all birds (high utilisation areas shown in yellow scaling to areas of no utilisation or coverage shown with no colour shading).

- Other conclusions drawn by Robin Radar regarding coverage:
 - For wind turbines in the immediate vicinity of the radar, high clutter is created by these turbines creating an area of low coverage behind and around them.

¹ From Wiki - Clutter is a term used for unwanted echoes in electronic systems, particularly in reference to radars. Such echoes are typically returned from ground, sea, rain, animals/insects, chaff and atmospheric turbulences, and can cause serious performance issues with radar systems.

- A direct correlation between ground slope and clutter intensity is observed.

Classification:

- An initial concern raised by WNR was that validated eagle tracks were predominantly determined as medium sized birds by the radar. It was viewed as concern because one of the key parameters for the wind turbine shutdown automation is bird size.
- The radar distinguishes birds based on size classes – measuring radar cross sectional area (RCSA). Operational data confirmed eagles were measured by the radar across a wide RCSA range, with the median RCSA in the medium size class range
- Robin Radar have adjusted the RCSA classification to two categories. See Figure 8.
- There is now evidence that all eagle flights detected by the radar are classified in the same size class. The downside is a significant number of other birds are recognised by the radar in the same size class.

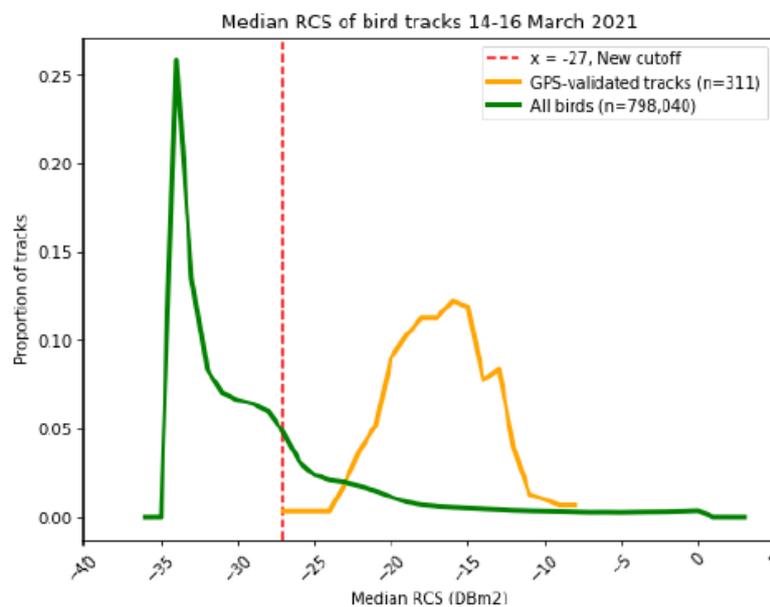


Figure 8. Median RCSA for all birds and the GPS tracked eagles.

Track quality:

- It is evident that a large number of tracks close to wind turbines are generated by the turbines themselves. This issue has currently been dealt with by increasing the size of the non-detection zone around each turbine. This requires further refinement.
- Track break-up is an issue that is still being examined. It would appear from the data that improvements have been made. Turbine clutter may be part of the problem, as described above.
- The issue needs further assessment as the break-up of a track of interest (at a critical stage e.g. around or in a wind turbine shutdown buffer/alarm area) increases the risk of the system not operating effectively.
- Figure 9 below demonstrates the issue of track break up. In this particular example a known flight (GPS tracked bird) is tracked by the radar as three separate tracks.



Figure 9. GPS track shown in dotted lines, compared with a broken radar track shown in solid lines (three separate tracks).

Correlating radar tracks with GPS tracked eagle flights:

As outlined in the section 5.2.2 above, four resident eagles have GPS trackers to monitor their movements. This movement data has been used to validate and confirm the accuracy and detection capabilities of the radar. This correlation exercise has provided an important insight into the capabilities of the system. Note that all correlation or matching assessment were completed on a manageable subset of the data (up to 6 days).

Radar position accuracy

Through comparing the GPS tracked eagle locations with (correlated) radar tracks, the average 2D offset is 25m. The radar is therefore considered to be suitably accurate.

Detection Probability

By comparing the GPS track data with the radar track data, it is possible to assess what the radar system does not detect. For this assessment, the GPS track data was filtered to ensure that only flights that the radar could have seen were included. The assessment was also completed by comparing data points rather than complete tracks (tracks being made up of many data points).

Figure 10 below shows the spatial extent of the assessment (grey areas being GPS tracks)



Figure 10. Spatial extent of the assessment of GPS track plots versus radar track plots (grey areas being GPS tracks).

The results from this assessment revealed that overall, and on average, the correlation of radar plots to GPS plots was around 60%. This relatively mid-range percentage of matching being the result of areas of low matching and areas of higher matching. Figure 11 below provides an example of the assessment based on distance from the radar (noting – 6km range was the limit of assessment, red plots were deemed not applicable or usable, orange are matched plots, blue indicated GPS plots not matched).

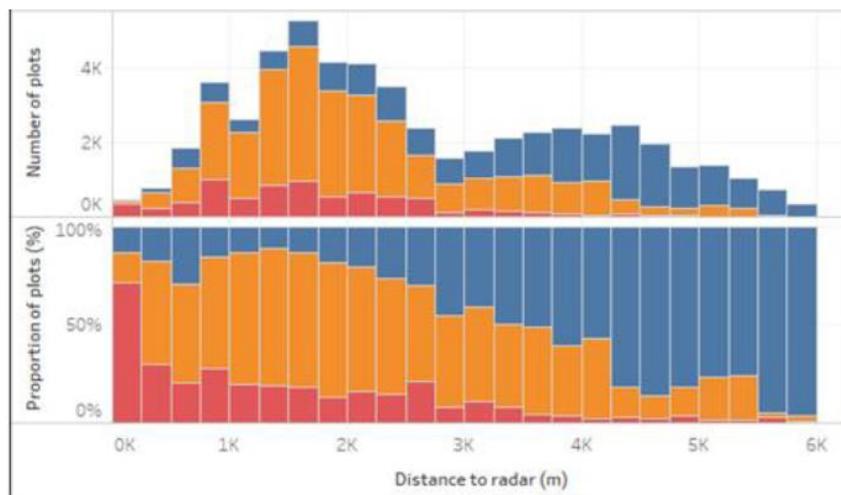


Figure 11. Assessment of GPS and Radar plot matching based on distance from the Radar (6km range was the limit of assessment, red plots were deemed not applicable or usable, orange are matched plots, blue indicated GPS plots not matched).

It can generally be concluded, based on the overall assessment:

- There is a uniform proportion of matched ($\approx 45\%$) and missed plots ($\approx 30\%$) with altitude.
- The proportion of matched plots decreases with distance from the radar, with a converse increase in missed plots with distance from the radar.
- There is evidence that the proportion of matched plots is $\approx 75\%$ out to 2km, beyond 3.8km the proportion of matched plots drops away.
- Matched and missed plots are spatially grouped or dispersed with areas of good, reasonable, poor, no coverage.

Wind turbine shutdown:

The ultimate purpose of the radar is to reliably detect eagles that are considered at risk of collision, and automatically curtail or shutdown wind turbines, and then restart them when the risk is no longer present (the eagle is no longer present in the risk area). For the system to function effectively, the radar and 'shutdown program/module' setting need to be optimised. Using a region of the wind farm where the radar detection capabilities is the greatest, a series of assessments were conducted using a training dataset and three alternative shutdown settings. Each assessment looked at whether the settings 'catch' the GPS tracked eagles. The results are considered very preliminary but can be summarised as:

- Size setting only - High proportion of tracked eagles detected but extremely high number of non-eagle targets detected as eagles, high wind turbine shutdown count and time.
- Setting 1 - Low proportion of tracked eagles detected, lower number of non-eagle targets detected as eagles, reasonable wind turbine shutdown count and time.
- Setting 2 - An early optimised model, detecting 80% of tracked eagle targets, lower number of non-eagle targets detected as eagles, marginally acceptable shutdown count, but an unacceptable shutdown time.

Overall Project Summary:

At the end of the reporting period, a significant amount of work had been completed (as outlined above). Progress towards the system becoming fully automated however remains some time away. It is clear however, based on the current results, that for the system to be a complete (whole of wind farm) and an effective mitigation or risk reduction solution, a second radar would be required (and the current one moved). There are however a range of uncertainties that require further assessment before a second radar would be deployed. Key uncertainties include improving the detection capability, reducing the detection of non-eagle targets and optimising the shutdown settings. These uncertainties are clearly intertwined but will be the focus of the next phase of work.

5.2.4 Technological investigations

Following the detailed appraisal of technologies in the 2018/19 reporting period and the decision to proceed with radar technology (as outlined in Section 5.2.3), the appraisal of technologies for understanding eagle collision risk, collision factors and potential mitigation options has continued, including through this current period. While considerable research

continues to be conducted in the area, few strategic or technological advances appear to have been presented in the last year. Research and discussion continue to focus on the areas of collision detection, prevention and off-site mitigation (i.e. offsets). The breadth of research was best displayed in the recent wind and Wildlife Conference held in December 2020 (<https://wwrm2020.brand.live/WindWildlifeResearchMeeting>).

In regard to collision detection i.e. the identification of either the collision event or the carcass on the ground, optimisation of camera systems positioned at the base of turbines, or on blade systems continues to occur (Albertani et al. 2021, Clocker et al. 2021). This is due to increasing interest in offshore wind turbines where post-collision carcasses cannot be identified, but also the cost and lack of precision involved with using human detection. For onshore turbines, the use of detection dogs are being increasingly analysed and deployed because of their greater precision, particularly where bats are a concern (Smallwood and Bell 2020).

The commercial technologies that offer collision prevention strategies appear to remain unchanged, these being Robin Radar, Identiflight and DTBird. Identiflight continues to gain recognition as the most effective of the three, both locally (from Cattle Hill Wind Farm Reporting) and in international commentary (Lang 2021, Lee 2021). It also continues to be the only technology that has results reported in peer reviewed journals (McClure et al. 2018, McClure et al. 2021, see May et al. for commissioned report on DTBird).

Some interesting discussion is being published in relation to off-site mitigation strategies. An article published on the American Wild and Wildlife website titled “Soaring High: Helping to Conserve Eagle Populations” highlights that the only approved mitigation (or offset) strategies for wind farm impacts on eagles in North America is the retrofitting of power poles to assist in preventing electrocutions. Currently, road kill collections are also being proposed to the US Fish and Wildlife Service as another approved strategy. This strategy has been developed through production of an efficacy model. Interestingly, nest protection is currently not recognised as a formal means of mitigating eagle deaths from wind turbine collisions.

5.2.5 Eagle Impact Review

The EPA and WNR agreed on conducting an Eagle Impact Review (EIR) to assist in determining whether the wind farm mortalities are impacting on the local WTE populations in the Musselroe/Cape Portland region. Woolnorth proposed five projects to provide streams of information to assist and the EPA endorsed these projects. See Table 3 for a summary of the EIR projects and their current status. It is important to highlight that most of the projects are collecting data/metrics that could, however, be considerably impacted by other landscape influences for which we cannot measure or fully understand. Therefore, our ability to clearly and unequivocally determine the impact of wind farm eagle mortalities will be difficult.

Table 3. Eagle impact review (EIR) projects and status

Project title and description	Status at the end of the reporting period
<p>Eagle observation study – single study A repeat of the two eagle movement studies conducted at the site.</p> <p>The study will contribute to the EIR by determining a current rate of utilisation for comparison with previous periods of observation (and corresponding rates of utilisation).</p>	<p>This study has been completed.</p>
<p>Where, where, wedgie (http://naturetrackers.com.au/) – multi-year study <i>Where, where, wedgie</i> is a state-wide eagle observation study. WNR participated in the study by placing observers in the Musselroe/Gladstone regions to collect eagle data.</p> <p>This study will contribute to the EIR by providing data for a regional level comparison of eagle data (e.g. count of observations, count of individuals) collected in the Musselroe/Gladstone Region with other regions in Tasmania.</p>	<p>WNR supported the observation effort in 2021. Three years of data have been collected and WNR will continue to discuss the possibility of comparative analysis with the program statistician.</p>
<p>Wedge-tailed eagle nest checks – multi-year study This study will assess the nest activity and breeding success of up to 15 known eagle nest sites in an approximate 30km radius from the wind farm site.</p> <p>This study will contribute to the EIR by providing regional level nest activity and breeding success data for comparison with state-wide data.</p>	<p>All known nest sites in the study area have been checked (post breeding season) across 4 years 17/18, 18/19, 19/20 and 20/21. WNR will finalise the data collected and present any findings.</p>
<p>Genetic assessment of collision victims and nest ‘cast-off’ material. – multi-year study All collision victims have been sampled for DNA. Off-cast material collected from nest sites such as excreta, feathers, egg shell, pellets can sometimes yield DNA. Using DNA finger printing the collision victims will be compared with DNA extracted from ‘off-cast’ material from nests and other sources to develop an assessment of relatedness and population structure on the wind farm.</p> <p>This study will contribute to the EIR by providing details on the origin of the collision victims (e.g. local vs itinerant).</p>	<p>In conjunction with the nest checks, off-cast material continues to be collected. Samples from wind farm collision victims as well as traffic collisions and power pole electrocutions from the local area have also been sampled by the University of Tasmania and lodged with TMAG.</p> <p>While the current plan is to continue to analyse samples as they build up using the well-established microsatellite markers, if successful, a recent ARC Linkage grant will be used to develop a Single Nucleotide Polymorphism system (SNPs) for greater power (i.e. number of markers) and resolution (amplification of smaller pieces and lower quality DNA).</p>
<p>Assessment of individuals through remote stations on the wind farm.</p>	<p>The camera systems were designed, procured and trial units deployed on the wind farm site. A summary</p>

Following the techniques of Driscoll and Koronkiewicz (2016), cameras located at fixed stations will be used to collect basic eagle characteristics (count, species, age, time of day) and possibly identify individuals based on plumage or other unique features.

This study will contribute to the EIR by providing site level data on the age and number of individuals using the wind farm site. If successful, off site installations may provide a comparative data set.

report was provided in the 2018/19 AER. The trial was completed in 2020. The results are yet to be compiled. A separate report is planned.

5.3 Eagle nests at MRWF

During this reporting period, there has been an increase in our understanding of the nesting dynamics on and (immediately) off the site. A number of new nests were identified in 2020 through the satellite tracking work being conducted (see Section 5.2.2) and the observer-based shutdown program (see Section 5.2.1). Observation records have been added to the Natural Values Atlas. Following their identification, on-ground checks of the nests in 2021, outside the breeding season, found that a number of these and older nests were in disrepair or had fallen out of the trees. These nests are unlikely to be rebuilt or utilised in the future, but will continue to be monitored in case they are rebuilt. These nests are #2699, #2322, #2465 and #2323, #2058 (fallen in previous reporting period), and #2835 (see Figure 12). The active nests on the site included #2836 which is thought to be new and was active with WTE in the approach to the 2021/22 breeding season. Nests #2466 (WBSE), #2535 (WBSE) and #2838 (WTE) appeared to have been active through the 2020-21 season and leading in to the 2021-22 season.

Nest #2466 continued to be monitored with a discrete wildlife camera which has been maintained and in place since its installation in 2019. Two other nest sites were monitored in the same way, however these nest sites have all been lost due to tree failure (despite being active during the periods of monitoring). Figure 13 provides an example of the images being received.

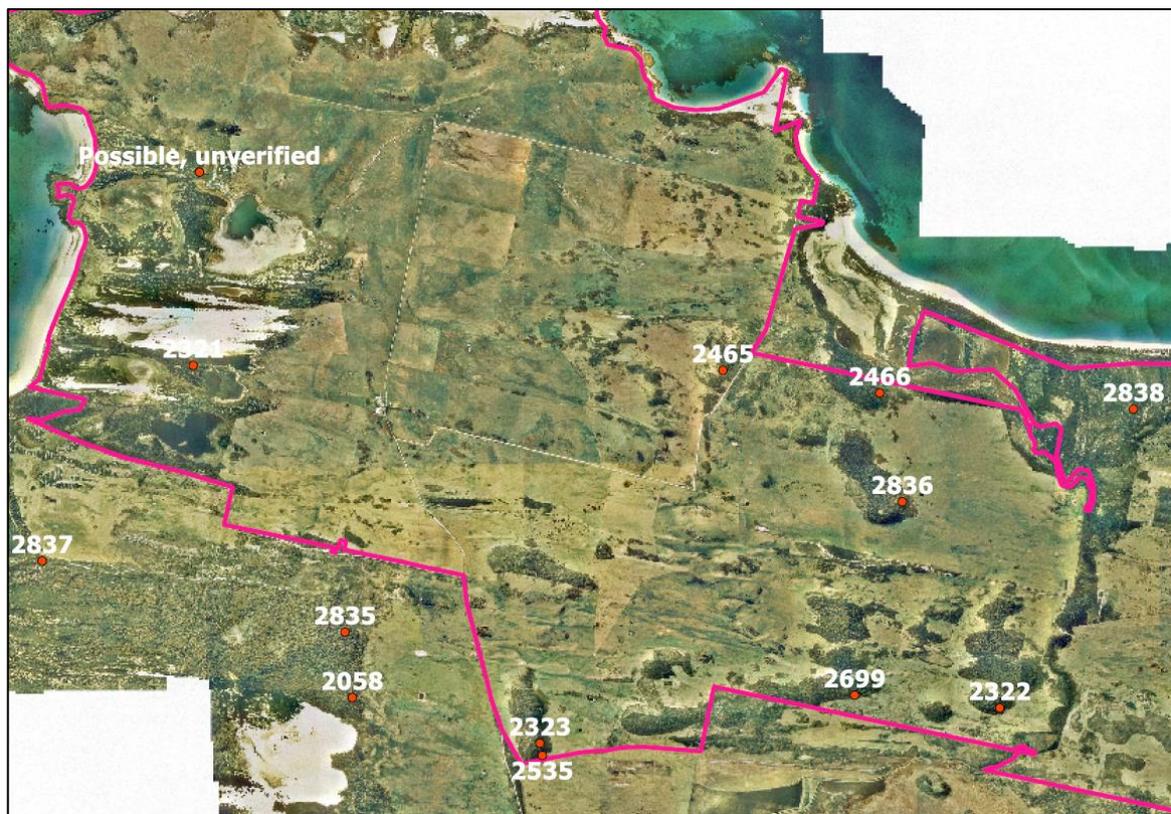


Figure 12. Wedge-tailed eagle and white-bellied sea-eagle nests across the property, with their Nest Id number corresponding to the record in the Natural Values Atlas.



Figure 13. Wildlife camera photo of the white-bellied sea-eagles at Nest #2466. This nest was previously a WTE nest site (in early years).

5.4 Other actions and issues

Road kill removal program

The road kill removal program (along the Cape Portland Road), which has been maintained for a number of years, was continued through the 2020-21 reporting period. The project was originally initiated due to a number of WTE being killed in the area as a result of vehicle collisions, and numerous observations of WTE feeding on road kill. Woolnorth are not aware of any WTE mortalities on Cape Portland Rd since the inception of this program.

The initiative involves a dedicated technician (whilst travelling to and from MRWF) relocating road kill to safer areas such as the non-road side of an adjacent farm fence or to the edge of the bush line. Fifty to 70 carcasses are typically removed each month, some of which are observed to have eagles feeding on them at the time of discovery.

Ecological burning

An ecological burning plan was approved by DPIPWE this year, following considerable consultation and research by Pinion Advisory, on behalf of Musselroe Wind Farm. Small burns and preparatory works have started at different sites across the property, in close consultation with Aboriginal elders and burn technicians. The priority for the plan is the longevity of threatened native orchid populations in the area, to maximisation of biological values across the property and reinstate traditional burning once prevalent in this landscape.

Other collaborations

In addition, a number of collaborative relationships have been developed with organisations such as the Save the Tasmanian Devil Program, Wombats Rescue Tasmania, Dorset Coastcare Working Group, Threatened Plants Tasmania, Field Naturalists Society, Tasmanian Museum

and Art Gallery with the Tasmanian Herbarium, Threatened Species Unit (Flora), the University of Tasmania and DPIPWE officers studying feral cats, forester kangaroos and wombats. In all cases WNR supports these agencies and organisations by facilitating land access, through to in-kind and financial support.

6. Environmental Management Plans

All necessary Environmental Management Plans (EMPs) for MRWF were prepared and approved prior to commissioning of the wind farm, as required by the approval conditions, permit and/or EPN. As highlighted above (section 4.2), in November 2016 the suite of State approved environmental management plans for the project were reviewed, consolidated into a single Plan ('State Environmental Management Plan 2016') and later approved by the EPA in July 2017. The review and consolidation of the Plans, primarily focussed on removing the information and commitments relating to the planning, construction and commissioning phases of the wind farm which are/were no longer relevant. This State Environmental Management Plan was updated again in February 2020 in response to a request from the EPA to vary the Plan pursuant to condition FF7 (1) of the EPN. Other minor amendments were made, however there were no other significant updates to the document.

An Adaptive Management Protocol has also been approved and this is described in Section 9 of this report.

The following table (Table 4a & 4b) summarises the relevant management plans and their details (the current Departmental names are used).

Table 4a. Status of State Environmental Management Plans for the MRWF.

Environmental Management Plan and relevant permit condition	Authority	Year last approved	Status	Reporting required in AER?*
Wader Monitoring Plan	EPA	2020	Active, but all requirements completed	Yes
Fauna Monitoring Report	EPA	2007	Requirement completed	No
Avian Collision mitigation Report (Transline)	EPA	2007	Requirement completed	No
Schayer's Grasshopper surveys	EPA	2007	Requirement completed	No
Construction Rehabilitation Plan	EPA	2008	Requirements completed	No
Weed and Disease Management Plan	EPA	2020	Active	Yes
Construction Solid Waste Management Plan	EPA	2009	Requirements completed	No, internal auditing
Hazardous Materials Management Plan	EPA	2020	Active	No, internal auditing
Eagle Impact Offset Plan	EPA	2020	Active	Yes
(Wind Farm) Vegetation Management Plan	EPA	2020	Active	No, general comments included

Environmental Management Plan and relevant permit condition	Authority	Year last approved	Status	Reporting required in AER?*
Transmission Line Vegetation Management Plan	EPA	2020	Active	No, general comments included
Wind Monitoring Tower Avifauna Management Plan	EPA	2012	Requirements completed	No
Bird and Bat Mortality Monitoring Plan	EPA	2020	Active	Yes
Final Wind Farm Design Report	EPA	2012	Requirements completed	No
Final Transmissions Line Design Report	EPA	2012	Requirements completed	No
Construction and/or Operational Environmental Management Plan	Internal	Not Required	Active	Internally approved

Table 4b. Status of Commonwealth Environmental Management Plans for the MRWF.

Environmental Management Plan and relevant permit condition	Authority	Year last approved	Status	Reporting required in AER?*
CEM2 Turbine 6 Migratory Bird Impact Mitigation Plan	DAWE	Not approved	Not Required	Turbine 6 on Tank Hill was not constructed
CEM3 Wind Farm Listed Species Impact Mitigation Plan#	DAWE	2012	Active	No, summary and general comments included (some monitoring is reported as part of the Bird behaviour, Utilisation and mortality Monitoring Plan)
CEM4 Bird Utilisation, Behaviour and Mortality Monitoring Plan#	DAWE	2017	Active	Yes
Adaptive Management Protocol	DAWE	Submitted but not yet Approved	Active	No, general comments included
CEM5 Transmission Line Listed Species	DAWE	2009	Active	No, general comments included.

Impact Mitigation Plan#				
CEM6 Wedge-tailed Eagle Impact Offset Plan#	DAWE	2009	Active	No, general comments included

#compliance reporting is also conducted in accordance with Condition 7 of the EPBC Approval, e.g. "On 1 July of each year after the date of this approval, the person taking the action must provide a certificate stating that the conditions of this Approval have been complied with".

In summary, the following Sections of the State Environmental Management Plan 2020 require reporting are:

- Wader Monitoring Plan.
- Weed and Disease Management Plan.
- Eagle Impact Offset Plan (a consolidated version of the Wedge-tailed Eagle Impact Offset Plan and the White-bellied Sea Eagle Impact Offset Plan).
- Bird and Bat Mortality Monitoring Plan.

Relevant aspects of the Commonwealth Bird Utilisation, Behaviour and Mortality Monitoring Plan are also reported in this AER.

All of the above are reported in Sections 7 and 8 of this report.

Summary and general comments for the following plans/documents are provided section 7, 8 and 9 of this report:

- (State) Wind Farm Vegetation Management Plan.
- (State) Transmission Line Vegetation Management Plan.
- (Commonwealth) Wind Farm Listed Species Impact Mitigation Plan.
- (Commonwealth) Transmission Line Listed Species Impact Mitigation Plan.
- (Commonwealth) Wedge-tailed Eagle Impact Offset Plan.
- (Commonwealth/State) Adaptive Management Protocol (Section 9).

7. State Environmental Management Plan

7.1 Wader Monitoring Plan

7.1.1 Bird Utilisation studies

The required post construction bird utilisation surveys have been completed. A summary of the results was included in the 2016/17 AER and also reported separately to the EPA and DAWE.

7.1.2 Crepuscular and nocturnal movements

Monitoring of bird and bat collisions (see Section 7.4.1) has not detected a significant impact to priority species (or any species) known to be crepuscular or nocturnal in behaviour. As such no action was required during the reporting period.

7.1.3 Avoidance behaviour around turbines

The 2016/19 Public Environment Report provided a summary of the findings of the eagle avoidance study. See [MRWF PER 2016-19](#).

7.2 Weed and Disease Management Plan.

7.2.1 Operational Phase Commitments

All areas of disturbance associated with the wind farm footprint are regularly surveyed for the existence of weeds. This is generally conducted throughout the reporting period as a part of the farm wide weed control program and routine road and hardstand maintenance. Herbicide treatment is the most common control technique utilised but mechanical removal is also used on larger stands.

Monitoring of the transmission line for various issues, including weeds, is ongoing and conducted on a regular/annual basis. Sections of the transmission line corridor have previously been managed for the presence of any weed species through chemical application and mechanical removal. Transmission line weed populations are best described as localised with small numbers of individual plants. No control works were undertaken in the 2020-21 reporting period.

7.2.2 Controlling the spread of weeds

As the wind farm and transmission line are in the operational phase, the majority of works undertaken on either the wind farm or on the transmission line infrastructure are accessed via formed, all weather roads. As such there are no significant controls required to manage the spread of weeds and soil borne diseases. The exception to this is weed management works, vegetation management works and bird mortality surveys, where off-road access is required. Standard wash-down guidelines, as per the *Tasmanian Wash-down Guidelines*, and internal environmental management procedures are applied to these tasks where required.

Weed management works across the property (farm wide weed control program) have continued during the reporting period (outside of the footprint of the wind farm). Works have continued to focus of African boxthorn and gorse, with a long-term view to visually-eradicating both noxious weed species. A paddock-by-paddock approach has been implemented since construction, which involves handing-over weed free paddocks to the property farm licensee, for ongoing maintenance. Figure 14 shows the paddocks that have been declared noxious weed free and those paddocks still undergoing weed treatment as of June 2021.

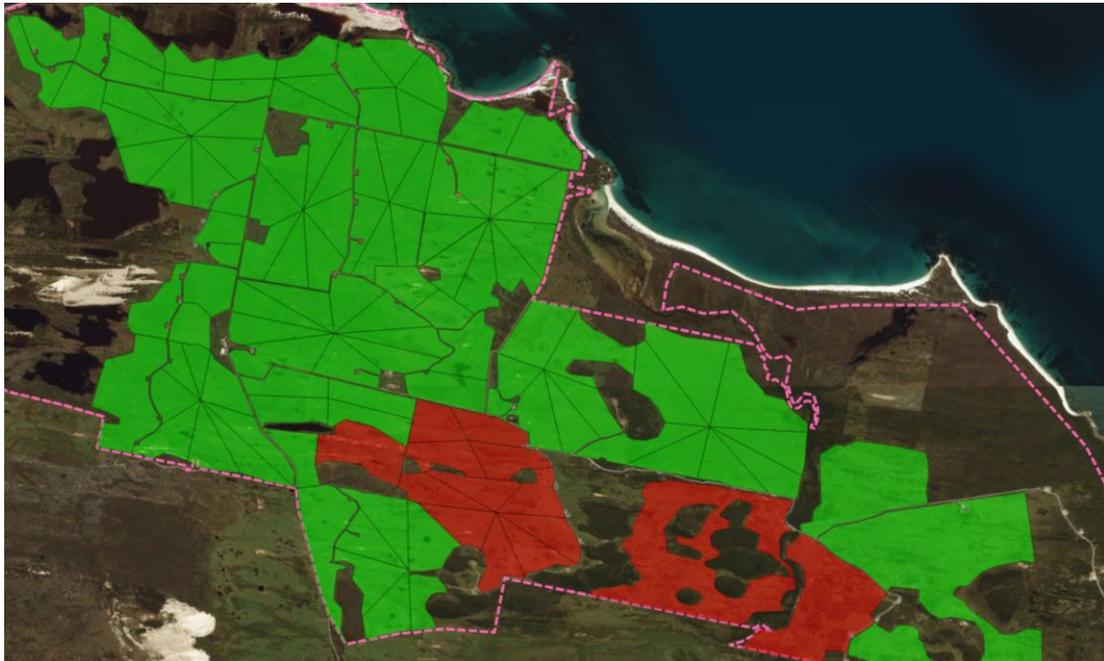


Figure 14. Paddock weed status, where red indicates paddock undergoing weed treatment and green indicates paddocks handed over to the grazing licensee for maintenance.

Weed management works have also been undertaken across areas of the property outside of the paddock areas, however, the priority at this stage is to see all paddocks handed to the licensee. This is expected to be completed within the next three years. Other weed species on the property that have received attention include slender thistle, horehound and Patterson's curse.

7.3 Eagle Impact Offset Plan

All initial actions outlined in this Plan (relating to both WTEs and WBSEs) have been completed. This includes the nest protection program and the study into the effectiveness of nest protection management prescriptions. The objectives and outcomes of these actions are detailed in the MRWF Public Environment Report 2013 (available on request). The plan remains active for the purpose of providing guidelines for offsetting eagle collisions.

Since the commissioning of the wind farm through to the end of the current reporting period, 26 WTEs and two white-bellied sea eagles (WBSE) have been identified as turbine collision victims. The 'base' offsets that were required in accordance with the initial state and commonwealth WTE Offset Plans were designed to mitigate the impacts of six WTE mortalities. WBSE offsets to mitigate the impacts of three mortalities were also required pursuant to the State permit conditions.

The first revision of the Eagle Impact Offset Plan (revised in 2016) committed to maintaining the offset arrangements (inherent in the original approval) of one offset for each mortality. The latest revision of the Plan in 2020 (as of January 2020) increased MRWF's offset commitment from one offset per mortality to two offsets (equivalent nest protection offsets). The Plan commits to either the nest protection (and surrounding habitat) through a conservation covenant, or an alternative project approved by the Director (EPA).

With respect to the EPBC Approval obligations for WTE mortalities over the 'base' offset of six, these requirements are outlined in the Bird Utilisation Behaviour and Mortality Monitoring Plan (BUBMMP) as 'corrective actions'. According to the Plan, the corrective action required for mortalities over the original 'base' (or at a higher rate than anticipated) is the protection of two WTE nest sites (and surrounding habitat) through a conservation covenant, or an alternative project approved by the DAWE. This therefore means that the obligations of the EPBC Approval resulting from a WTE mortality up until January 2020 were significantly greater than those specified in the State Environmental Management Plan, 2020.

The following projects/actions have been implemented in response to the offset requirements (both State and Commonwealth) over and above the 'base' offset projects.

- Protection of 2 nest sites.
- Financial contribution, equivalent value to 2 nest sites, to UTAS eagle research project.
- Financial contribution, equivalent value to 2 nest sites, to Bookend Trust/Nature Trackers citizen science project 'Where, where, Wedgie?'
- Protection of 1 nest site.
- Financial contribution to UTAS eagle research project – 'Co-ordinating Conservation and Research Priorities'.
- Implementation of project 'Using Robin (MAX) Radar to develop an eagle collision risk reduction Strategy at Musselroe Wind Farm'.
- Pending approval of financial contribution to UTAS project 'Identifying risk to Tasmanian Wedge-tailed Eagles from wind Energy Development: A state-wide model of collision risk'.

As there has only been two WBSE mortality recorded, no further offset actions have been required.

In addition to these projects, since 2018 Woolnorth Renewables has provided a financial contribution to the Raptor Refuge to assist in the operation of the facility. This arrangement will continue until at least 2023.

7.4 Bird and Bat Mortality Monitoring Plan

7.4.1 Operational Phase Wind Turbine Mortality Monitoring

During the 2020-21 reporting period there were 364 unique formal turbine surveys conducted. The majority of carcasses detected were identified as part of the formal monitoring program, however, some were also identified outside the formal monitoring program.

In total, 27 carcasses or feather spots (finds) were found in formal surveys, equalling a find during 7.4% of surveys (Table 5).

Table 5. Summary of mortality search finds across all survey years

Year	Bat mortality	Bird mortality	Feather spot
13/14	2	26	4
14/15	1	28	4
15/16	1	33	5
16/17	0	21	5
17/18	0	23	5
18/19	0	34	6
19/20	0	18	3
20/21	0	21	6
Av yr*	1	26	5

* rounded

Eight carcasses and one feather spot were identified outside of the formal surveys. No bats were observed in this reporting period. Table 6 below summarises the species identified during formal surveys and Table 7 summarises the species identified outside of formal surveys.

Table 6. Species identified during formal bird mortality surveys during the 2020-21 reporting period.

Common name	Number found
Australian Magpie	1
Australian Pelican	7
Brown Falcon	1
Cape Barren Goose	2
Forest raven	1
Kelp Gull	1
Pied oystercatcher	1
Shearwater Sp.	1
Storm-petrel species	2
Wedge-tailed eagle	2
White-bellied sea eagle	1
White-Faced Storm-Petrel	1
Unknown	6

Table 7. Species identified outside of the formal bird mortality surveys during the 2020-21 reporting period.

Common name	Number found
Australian Pelican	4

Wedge-tailed Eagle	4
Brown Falcon	1

The numbers of mortalities identified through formal surveys in the 2020-21 reporting period were slightly lower than previous periods, but generally comparable. The specific species identified during the 2020-21 reporting period are also similar to previous reporting periods. No injured birds were identified during the reporting period.

The only mortalities of listed species identified during the 2020-21 reporting period were the WTE (State and Commonwealth listed) and the WBSE (State and Commonwealth listed).

Reporting

All birds and bats detected in the monitoring (formal and informal finds) were reported as required in the Plan, by:

- Any birds and bats listed under the *Threatened Species Protection Act 1995* were reported to the Director of the EPA by telephone within 24 hours of their discovery, and to the EPA Project Officer and Manager of the Threatened Species Unit by email or telephone within 24 hours of their discovery.
- For all incidents relating to native species, a Bird/Bat Strike Report Form was submitted to the Director of the EPA within three days of discovery of a dead or injured threatened species.
- For all dead or injured EPBC listed bird species, a Bird/Bat Strike Report Form was submitted to the Commonwealth DAWE within seven days of discovery.

As agreed with DPIPW E all WTE carcasses were provided to the Tasmanian Museum and Art Gallery.

7.4.2 Continuous Improvement of Bird and Bat Monitoring Program

Wildspot Consulting are working on continually improving the accuracy and efficiency of the Bird and Bat monitoring program. Following the substantial changes made last year with the adoption of tablets equipped with mapping software for field work, data collection apps have been added to improve the precision and accuracy. This software has been utilised for both the bird mortality surveys and the turbine shutdown work described in section 5.2.1.

7.5 Wind Farm Vegetation Management Plan

Beyond the initial clearing of the site for construction of the wind farm no additional clearing has been necessary. From time to time, some vegetation slashing for the purposes of property level fire management is undertaken, however none was conducted during the 2020-21 reporting period. The rehabilitation of disturbed areas has been successful.

7.6 Transmission Line Vegetation Management Plan

Similarly to the wind farm, no further clearing of vegetation has been required in the transmission line easement during the 2020-21 reporting period.

8. Commonwealth Environmental Management Plans

8.1 Wind Farm Listed Species Impact Mitigation Plan

This Plan covers requirements relating to mitigating impacts on the habitats of listed migratory birds and listed threatened species during construction and maintenance of the wind farm (condition CEM3). There are no specific reporting requirements for the Plan beyond the requirements of Condition 7 of the EPBC Approval (*“On 1 July of each year after the date of this approval, the person taking the action must provide a certificate stating that the conditions of this Approval have been complied with”*). The only relevant information to report is included below:

- Bird and Bat collisions with turbines, identified during the reporting period, are summarised in Section 7.4.1 of this report.
- Discussion of activities relating to soil, vegetation and weed management are reported in Section 7 above.
- A number of new WTE nests were identified on or adjacent to the wind farm site during the 2020-21 reporting period (see Section 5.3).

8.2 Bird Utilisation Behaviour and Mortality Monitoring Plan

This Plan covers requirements relating to the monitoring of utilisation, behaviour and mortality of Commonwealth listed threatened and migratory bird species at the MRWF site (condition CEM4). The sections of the Plan that require reporting (beyond the requirements of Condition 7 of the EPBC Approval *“On 1 July of each year after the date of this approval, the person taking the action must provide a certificate stating that the conditions of this Approval have been complied with”*), are detailed below. The Plan was re-approved in September 2017, following a long review. The only noteworthy change was the removal of the intensive surveys of the NWWZ.

8.2.1 Bird utilisation and behaviour surveys

The post-commissioning bird utilisation surveys have been completed and a summary included in the 2016/17 AER.

8.2.2 Mortality surveys for listed birds

A general summary of the mortality surveys conducted during the reporting period is included in Section 7.4.1. As outlined above, the only EPBC listed species that was identified in the formal mortality surveys over the reporting period, two WTEs (four were also found outside the formal surveys) and once WBSE (listed as migratory). These incidents and any follow up investigation were reported to DAWE in the manner required by the Plan.

8.2.3 Management responses and mitigation

A component of this plan is to outline the corrective action (offset) obligations associated with any wind turbine related mortality impacts on Commonwealth listed species. Over the life of the MRWF three EPBC listed species have been identified through the mortality monitoring program (both formal and informal), the white-throated needletail, WTE and WBSE. No corrective actions have been implemented for the two white-throated needletail incidents.

For the 2020-21 reporting period six WTE mortalities were recorded at MRWF (2 during formal survey and 4 from informal finds). One WBSE mortality was also identified. Over the operating life of the wind farm (to the end of the 2020-21 reporting period), 26 WTE and 2 WBSE mortalities have been recorded. These numbers are consistent with the modelled estimates for a 90% avoidance rate presented in the assessment documentation and later the Plan but exceed the modelled estimates for a 99% avoidance rate on which corrective action benchmarks are based. During the reporting period, the benchmark for WTEs requiring an Adaptive Management Protocol (AMP) as an additional corrective action was reached. On this basis an AMP was developed and provided to the DAWE in November 2019. The AMP is discussed in Section 8.2.5. Regarding corrective actions in response to WTE mortalities, Section 7.3 includes a summary of the offset projects/actions.

8.2.4 Benchmarks

As stated above the number of collisions of WTEs has exceeded the base threshold described in the Plan. The threshold was exceeded on the basis that the rate of mortality exceeded the expected rate as well as the total number. The final level outlined in the Plan has been reached.

8.2.5 Adaptive Management Protocol

An Adaptive Management Protocol (AMP) was developed in response to reaching the final corrective action benchmark described in the Bird Utilisation, Behaviour and Mortality Monitoring Plan. The AMP is described in Section 9.

8.2.6 Management of listed threatened fauna

The construction of the transmission line was completed in 2013 including installation of the avian collision mitigation (see the MRWF Public Environment Report 2010-13).

No spotted-tailed quoll or Tasmanian devil den sites, or new active WTE nests have been located. Therefore, no action has been required.

8.2.7 Avian collision and electrocution mitigation

All avian collision mitigation has been installed as outlined in the MRWF Public Environment Report 2010-13.

8.3 Wedge-tailed Eagle Impact Offset Plan

This Plan satisfies the requirements of condition 6 (CEM6), which requires that a Plan be prepared to offset the impacts of the proposal on WTEs. The sections of the Plan that require

reporting (beyond the requirements of Condition 7 of the EPBC Approval “On 1 July of each year after the date of this approval, the person taking the action must provide a certificate stating that the conditions of this Approval have been complied with”), are detailed below.

All the actions in this Plan (nest protection, aerial searches and the study into the effectiveness of nest protection management prescriptions) have been completed. Details of these studies were reported in the MRWF 2010-13 Public Environment Report.

9. State and Commonwealth Approved

9.1 Adaptive Management Protocol

An Adaptive Management Protocol (AMP) was developed in response to:

- Reaching the final corrective action benchmark for WTEs described in the Bird Utilisation, Behaviour and Mortality Monitoring Plan, and
- A request from the Director of the EPA to submit a document according to EPN condition FF6 Mitigation Measures.

The AMP is summarised below. The AMP was approved by both the EPA and DAWE.

The AMP is implemented in addition to site-based corrective actions/offsets. The objective of the AMP is to:

- Develop an understanding of why there are higher than expected levels of collisions, and
- Use this understanding to formulate, test and refine management responses aimed at reducing these levels.

Adaptive management is a process of identifying an environmental impact, obtaining relevant information and data, evaluating this for evidence of effects or the requirement for modifications to monitoring, preparation of trials and tests of potential mitigation strategies and the review and implementation of successful findings or other potential strategies for testing. The framework is illustrated in Figure 15.

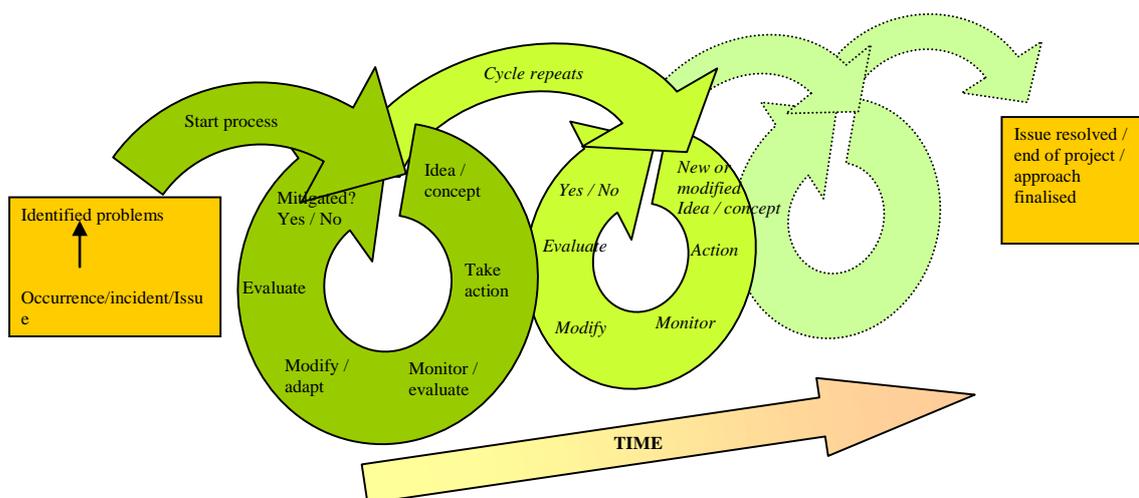


Figure 15. Schematic of the adaptive management approach used by WNR

The application of the adaptive management framework to address WTE impacts commenced a decade ago at the two other wind farm sites owned and operated by WNR; Bluff Point and Studland Bay Wind Farms. The application of the process has led to numerous observational studies, implementation of practical control measures and field trials of various technologies. At various stages, consultation exercises have also been conducted with species experts and general environmental managers about mitigation measures and options to trial.

Based on the work conducted to date, a number of summary points can be made:

- Observational studies indicate that eagle collisions are not easily predictable events. There appears to be no one variable (or collection of variables) that will always result in an increased level of risk.
- The effects of practical measures to reduce the overall attractiveness of our wind farm sites to eagles has been implemented based on general logic.
- Noise deterrent trials have proved the technique is ineffective.
- Observer based and rule orientated turbine shutdown programs have resulted in mixed degrees of success.
- Nest activity and success studies and genetic studies have provided small insights but provided little to assist in providing a tangible solution to the issue.

The AMP also outlines several recent studies, actions and trials conducted at MRWF and some of these are reported in Sections 5.1 and 5.2 of the Report.

The primary area of focus of the AMP is a technological solution designed specifically for bird detection, understanding utilisation, flight path monitoring and finally integration with the wind turbine control system to implement turbine shutdowns. This solution is discussed in detail in Section 5.2.3.

10. Community consultation and communication undertaken

10.1 Environmental Management activities and meetings

A summary of environmental management activities and meetings for the reporting period is provided in Table 8.

Table 8. Summary of environmental management activities and meetings during the reporting period 2020-21

Date	Activity or meeting	Comment
Activities undertaken and outlined in the approved EMPs are outlined in the relevant sections of this report. Other management activities and meetings held in conjunction or addition to the approved EMPs are listed in this table.		
July 2020	EPA meeting	General catch-up
Sept 2020	EPA, DPIPWE (PCAB) & DAWE	Musselroe Wind Farm Eagle Management Briefing
Dec 2020	External Audit	External audit by BSI for ISO 14001 certification
March 2021	DAWE site visit	Compliance audit, bird and bat, eagle impacts
April 2021	EPA meeting	General catch-up
May 2021	Where, Where, Wedgie	Participated in site survey
Throughout	Coastcare meetings	Discussion with local landholders

10.2 Other stakeholder activities

Table 9 below provides a summary of other community-based engagement activities undertaken in relation to the MRWF during the reporting period.

Table 9. Summary of other community-based engagement activities undertaken during the reporting period.

Event and comments	Date
Rail Trail Run Ride	August 2020
Bridport Scallop Fiesta	August 2020
Bridport 10 Plus support	October 2020
Scottsdale Show	November 2020
NE Volunteer Brigade Emergency Exercise	November 2020
Mannalargenna Day	December 2020

11. Glossary

AER	Annual Environmental Review
AMP	Adaptive Management Plan
BUBMMP	Bird Utilisation Behaviour and Mortality Monitoring Plan
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DPIPWE	Tasmanian Department of Primary Industry Parks Water and Environment
DPEMP	Development Proposal and Environmental Management Plan
Eagle	WTE or WBSE
EIR	Eagle Impact Review
EMP	Environmental Management Plan
EPA	Tasmanian Environment Protection Authority
EPBC	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPN	Environment Protection Notice
GPS	Global Positioning System
MRWF	Musselroe Wind Farm
NWWZ	North West Wader Zone
TSPA	Tasmanian <i>Threatened Species Protection Act 1995</i>
WBSE	White-bellied Sea-Eagle (<i>Haliaeetus leucogaster</i>)
WNR	Woolnorth Renewables Pty Ltd
WTE	Wedge-tailed Eagle (<i>Aquila audax fleayi</i>)

Species names referred to in text

Birds

Australian Magpie	<i>Gymnorhina tibicen</i>
Australian Pelican	<i>Pelecanus conspicillatus</i>
Brown Falcon	<i>Falco berigora</i>
Cape Barron Goose	<i>Cereopsis novaehollandiae</i>
Forest Raven	<i>Corvus tasmanicus</i>
Kelp Gull	<i>Larus dominicanus</i>
Petrel sp.	<i>Oceanitidae</i> sp.
Pied Oystercatcher	<i>Haematopus longirostris</i>
Shearwater sp.	<i>Puffinus</i> sp.
Storm Petrel sp.	<i>Pelagodroma</i> SP.
Wedge-tailed eagle	<i>Aquila audax fleayi</i>
White-bellied sea eagle	<i>Haliaeetus leucogaster</i>
White-faced Storm Petrel	<i>Pelagodroma marina</i>
White-throated Needletail	<i>Hirundapus caudacutus</i>

Mammals

Forester Kangaroo	<i>Macropus giganteus</i>
Cat (feral)	<i>Felis catus</i>
Tasmanian Devil	<i>Sarcophilus harrisii</i>
Wombat	<i>Vombatus ursinus</i>

Plants

African boxthorn
Gorse
Horehound
Patterson's curse
Slender thistle

Lycium ferocissimum
Ulex europaeus
Marrubium vulgare
Echium plantagineum
Carduus pycnocephalus

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