12 February 2024

Sophie Hazer
Senior Associate
Herbert Smith Freehills
By Email - sophie.hazer@hsf.com

Dear Sophie,

Hills of Gold Wind Farm - Independent Planning Commission Submission - Biodiversity

Project no. 40294

1 Introduction

I Mitchell Palmer of Biosis Pty Ltd (Biosis), have been instructed by Herbert Smith Freehills to prepare an expert view of key matters in relation to the Independent Planning Commission (IPC) hearing and assessment of the proposed Hills of Gold Wind Farm (the Project), as it relates to biodiversity. The purpose of this letter is to summarise facts and provide expert opinion, the latter where required, on the following items raised:

- Currency of field survey and assessment.
- Assessment of local microbat habitat.
- Smart curtailment.
- Biodiversity offsets.
- The reinstating of turbines WTG 53 to WTG 63 (11 wind turbines in total), currently recommended for removal by the Department of Planning, Housing and Infrastructure (DPHI) due to visual impacts, as well as WTG 28 on biodiversity impacts.
- Buffers between turbine blades and canopy of existing vegetation in Ben Halls Gap Nature Reserve.
- Reducing Serious and Irreversible Impacts (SAII) to a Critically Endangered Ecological Community (CEEEC), Box-Gum Woodland.

2 Executive Summary

As outlined in the Project's Secretary's Environmental Assessment Requirements (SEARs), the Environmental Impact Statement (EIS) must assess biodiversity values and the likely biodiversity impacts in accordance with the *Biodiversity Conservation Act 2016* (BC Act), including a detailed description of the proposed regime for minimising, managing and reporting on the biodiversity impacts of the development over time, and a strategy

Biosis Pty Ltd
Newcastle
Suite 8, 27 Annie Street
Wickham NSW 2293
Phone: 02 4911 4040
ACN: 006 175 097
ABN :65 006 175 097
Email: newcastle@biosis.com.au
biosis.com.au

to offset any residual impacts of the development. The BC Act prescribes that State Significant Development (SSD) projects trigger the NSW *Biodiversity Offsets Scheme* (BOS) and as such, require biodiversity impacts to be assessed in accordance with the NSW *Biodiversity Assessment Method* (BAM). The BAM prescribes that a Biodiversity Development Assessment Report (BDAR) must be prepared to address and implement the BAM and BOS, and is to be prepared by an Accredited Assessor.

The BC Act, the BOS and the BAM all contain the principles of the Avoid, Minimise and Offset hierarchy which ensures impacts to biodiversity values are reduced as much as possible during the planning and design stages of a project, and any unavoidable impacts are offset.

The Project has continued to apply these principles and has demonstrated the ability to avoid and minimise impacts through ongoing project design refinements, and best practise and recognised mitigation measures to mitigate or offset impacts. While there will be an overall ecological impact in delivering the Project, the residual impacts have been minimised through the ongoing amendments made to the Project, which were strongly focused on further reducing impacts to biodiversity values. Further reduction of impacts will be pursued throughout the detailed design phase, and construction and operational impacts will be minimised through the preparation and implementation of a Construction Biodiversity Management Plan and a Bird and Bat Adaptive Management Plan (BBAMP).

Of particular note are the avoidance of potential Serious and Irreversible Impacts (SAII) by the project. This includes potential for a direct SAII to certain cave dwelling microbats, and their potential breeding/roosting habitat, having been avoided through the removal and relocation of specific turbines from the project footprint. The potential for an operational SAII is considered to be highly unlikely as a result of the proactive 'Smart Curtailment' and reactive (triggered) curtailment strategies committed to by the Proponent. The potential for SAII to Box Gum Woodland CEEC is also considered unlikely, and has been further minimised through project design, and it is considered that the current level of proposed impact is a worst case and can be mitigated against, and reduced during future design stages.

Residual impacts will be offset in accordance with the BOS. Once these offsets are applied, no net loss to biodiversity is expected as a result of the Project. In addition, the establishment of local offset sites as Biodiversity Stewardship Sites has commenced (and is well progressed) and yielded a number of viable opportunities. Key to establishing local offsets is the aim of improving biodiversity values, and in particular habitat connectivity, at the local scale to mitigate the Project's impacts and improve biodiversity values in the locality. In particular, the potential to create Biodiversity Stewardship Sites on land surrounding the Project to improve the wildlife corridor between Ben Halls Gap Nature Reserve and Crawney Pass National Park, and on to Wallabadah Nature Reserve has been proposed. The Proponent has entered into agreements with a number of landholders to establish local Biodiversity Stewardship Sites in accordance with the BC Act legislative requirements.

Ongoing avoidance and minimisation of biodiversity impacts has been achieved with consultation carried out with the NSW Biodiversity and Conservation Directorate (BCD) and NSW National Parks and Wildlife Service (NPWS) during preparation the original BDAR, as well as multiple rounds post-EIS submission. BCD and/or NPWS were consulted in February and May 2021, February, March, May and August 2022 and in March and June 2023. This consultation covered a range of biodiversity matters including technical aspects of the biodiversity assessment, additional data collection, further application of the avoid, minimise and offset hierarchy, and the BBAMP. Details are provided in the Executive Summary section of the project's BDAR (Biosis 2023). The outcomes reached around avoidance and minimisation of impacts and the adaptive management approach were noted by BCD as being of a high standard during consultation on the proposed operational impact minimisation strategy in June 2023.

3 Currency of assessment

Substantial field survey in accordance with the Biodiversity Assessment Method (BAM) has been undertaken for the project between November 2018 and September 2022, and up until more recently, with the completion of further seasonal bird and bat field surveys throughout 2023. November 2018 surveys comprised initial survey and preliminary vegetation and habitat mapping only, with the majority of field surveys commencing from August 2019 onwards. Biodiversity surveys have therefore been conducted across several years and several seasons, all of which are clearly documented in Sections 4.1 and 5.3 of the BDAR (Biosis 2023). The Stage 1 BAM Operations Manual states that time limitations are imposed to ensure data used in assessments reflect the current biodiversity values on the subject land. Data from field survey undertaken and collected on the subject land within five years of the current proposal lodgement date can be used within an assessment. The use of a past survey must be documented in the BDAR. Surveys undertaken more than five years prior to the proposal lodgement date may be used to inform the assessment process but cannot be used in place of a species survey (DPE 2020).

The initial exhibited EIS was lodged in November 2020, and amendment reports from November 2022. Ongoing surveys since early 2021 have been completed to ensure a highly robust biodiversity impact assessment has been prepared for this project, and to ensure sufficient baseline data has been collected for ongoing adaptive management requirements. Therefore, it is considered that field data used in the assessment is robust, representative and current for the purposes of the assessment. However, further ongoing monitoring and data collection post approval will be conducted in accordance with adaptive BBAMP and Biodiversity Management Plans (BMP).

Biodiversity field surveys completed for the Project include:

- Initial vegetation (flora) and habitat surveys of the project area from 12 November 2018 to 15 November 2018.
- Winter flora surveys over 5 days in August 2019.
- Spring flora surveys over 5 days in November 2019 for the proposed transmission line and wind farm development footprint.
- Summer flora surveys over 5 days in February 2020 for the proposed transmission line and wind farm development footprint.
- Winter surveys completed 17-21 August 2020 for the proposed access/transportation routes, adjusted transmission line corridor and within Ben Halls Gap Nature Reserve, extending to a 100 metre buffer from the development footprint.
- Survey of property north of turbines WTG 5 and WTG 6 in January 2021 where optional BESS / substation / batching plant and associated transmission line areas are located.
- Surveys to collect an additional 24 BAM floristic plot data in March 2021. This included collection of detailed flora plot data within the sections of 'Devil's Elbow' proposed for re-alignment, as well as along Morrisons Gap Road.
- Field survey of relocated site access route from Crawney Road, ancillary transmission line areas and the proposed quarry in May and September 2022.
- Frog surveys were undertaken in spring 2019 (12 sites) and autumn 2020 (6 sites).
- Diurnal bird surveys undertaken at between 17 and 21 sites in August 2019, November 2019, February 2020, August 2022, November 2022, February 2023.

- Nocturnal bird surveys undertaken between, 26-30 August 2019 (2 nights), 18-21 November 2019 (2 nights), 24-26 March 2020 (3 nights), 11-12 May 2020 (2 nights) and 5-9 September 2022 (4 nights).
- A total of 41 days of targeted fauna surveys and habitat assessment between August 2019 and August 2020.
- Targeted owl habitat (hollow tree) surveys between 30 May and 3 June 2022.
- A total of 1362 trap nights using ground deployed infrared motion sensing cameras.
- A total of 1014 trap nights using arboreal deployed infrared motion sensing cameras.
- A total of 24 Ultrasonic bat detectors deployed for a total of 1042 trap nights, during the preparation of the BDAR, with an additional 6 detectors deployed for a minimum of 4 nights per survey in August 2022, November 2022, February 2023 for collection of additional baseline data for the BBAMP.

4 Assessment of local microbat habitat (caves, karsts etc)

In order to provide additional scientific advice on the likelihood of the project area and surrounding landscape to provide roosting and potential breeding habitat opportunities (such as caves and karst systems) for microbats, a desktop geomorphological assessment was undertaken by Environmental Geosurveys Pty Ltd (Environmental Geosurveys 2021) (attached as BDAR Appendix F [Biosis 2023]). Part of the assessment undertaken by Environmental Geosurveys included communication on the potential for local caves to support microbat populations with academic and expert speleologist—Dr Susan White of La Trobe University), illustrating 14 known caves with microbats known to be present, in the Tamworth area.

The assessment found that whilst the basalt lithology present at the project area may support opportunities for microbat roosts, no substantial caves were likely to be present, and that no data was found to suggest that the development footprint and immediate surrounds geomorphologically standout from the surrounding landscape in one way or another. Furthermore, it was concluded that the diverse terrain and lithology, and dynamic geomorphology result in high potential for microbat roosting sites to occur across the landscape as a whole, at all elevations within the expected flight range of microbats (estimated to be 50 to 75 kilometres) that may be present within the project area (Environmental Geosurveys 2021).

Further communication on the potential for local cave systems to support microbat populations, based on publicly available information, was undertaken by Biosis with a number of members of the broader speleological community in early 2020.These communications yielded little in the way of definitive information on microbat populations that could be used in the project's biodiversity impact assessment.

5 Bird and Bat Adaptive Management Plan and Smart Curtailment

Overview

The overarching objective is that the Project does not have a significant impact on the viability of the local and/or overall population of any species. It is my opinion that it is extremely unlikely that bird and bat fatalities due to collisions by any species at Hills of Gold Wind Farm will be sufficient to represent a significant impact on the species overall population. Pre-determined trigger levels will be applied that are substantially below the numbers of collision mortality events that are considered likely to represent a significant impact on the viability of the overall population of any species (i.e. 1% of the population). This approach is precautionary, and considered the most appropriate means of effectively measuring impacts to any at-risk populations or species during the operational phase of the Project, allowing for adaptive mitigation responses (proactive and reactive mitigation) to proactively avoid any likelihood of impacts, let alone significant impacts, to species.

Alerts, trigger levels and adaptive management actions will apply where the number of collisions in a defined period represents a low, but uncertain potential to result in a negative effect on the local population of a species.

Construction and operational management plans will all contain an adaptive management component. These plans will be receptive to any new technologies and well as any new and relevant data that may arise through ongoing assessment and monitoring and lead to the successful implementation of crucial objectives, whilst also allowing flexibility to changing dynamics, ongoing feedback and results.

The BBAMP, and associated implementation sub plans, have been developed (and will be finalised) in consultation with and approved by BCD as part of secondary consent conditions, as well as consultation with relevant subject matter experts. Adaptive management plans, such as the BBAMP, are a standard (and best practice) measure to ensure potential impacts considered uncertain at the time of a project's biodiversity assessment (such as operational impacts of wind farms associated with bird and bat strike) can be monitored and assessed, and if recorded are minimised and mitigated as far as is possible. The BBAMP developed for the Project includes robust and multi-faceted strategies to ensure that if any operational impacts such as blade strike do occur, they are detected early, minimised and mitigated where possible, and offset if required.

Smart curtailment for microbat species

Reducing bat mortality at wind farms is an increasing priority for energy producers and government regulators. One strategy to reduce the risk of bat collisions with turbines is curtailment, whereby turbine operation ceases during periods of high bat-mortality risk (periods when bats are most active). This strategy has proven to be effective at reducing bat mortality in Australia as well as in Europe and the United States (Bennet et al. 2022). However, blanket curtailment approaches (for example, curtailing turbines at pre-defined minimum cut in speeds), result in reduced energy production at times when bat activity may not be high and / or no bats are present.

In an attempt to reduce bat mortalities, while optimising energy production, more tailored strategies are being developed to increase the time during which turbines can continue operation and power production relative to blanket operational mitigation approaches. 'Smart curtailment' approaches are being developed that use and combine information about real-time bat activity and environmental information, such as weather conditions, in order to guide curtailment decisions based on real-time risks to bats. Smart curtailment provides wind energy facilities with a pathway for reducing bat fatalities whilst also reducing curtailment time when compared to blanket curtailment techniques thereby maximising energy production whilst minimising impacts to bats.

Overseas studies

Studies trialling the approach overseas have achieved significant reductions in bat mortality without the need for blanket curtailment of turbines at lower wind speeds (Hayes et al. 2019). It is important to note that overseas studies have often been used in conjunction with automated bat call identification software, which is not currently available for Australian bat species. Automated identification allows bat calls to be identified to species level in real-time and in a consistent, repeatable and time-efficient way. Development of an identification key to do this requires the collection of reference calls from captured bats, to extract the relevant data to develop and automated identification systems. In the Australian context, this is not possible on a continental scale due to the diversity and distribution of microbat species. Site-specific, regional identification keys may work, but due to the overlapping call characteristics of many species, it may not be possible use call-triggered smart-curtailment to respond to species-specific activity.

Application in Australia

There are no comparable studies available for Australian wind farms to our knowledge that trial the use of any smart curtailment systems for bats. Recent technological advances have seen the release of smart curtailment systems that are considered applicable to the Project. For example, the SMART (Song Meter with Analysis and Remote Transfer) system by Wildlife Acoustics, allows ultrasonic detectors to be mounted to the nacelles of turbines and files containing probable bat call information to be transmitted in real-time via modems and the cellular network to a database system where the information can then be analysed. The SMART system allows for user defined alarms which match bat call parameters that can be directly input into curtailment decision-making processes in real-time.

Technology such as the SMART system provides real potential for a tailored curtailment approach at the Hills of Gold wind facility that would provide operational flexibility in allowing turbines to continue producing energy when they might otherwise be curtailed based only on wind speed information. We understand that Wildlife Acoustics, the manufacturer of a tailored smart curtailment system, is currently testing their technology in Australia however no results have yet been made publicly available. As stated in the BDAR, the commitment has been made that any data collected for the Hills of Gold wind farm will be made available publicly.

When the smart curtailment acoustic monitoring system is engaged, real-time monitoring of microbat activity would allow turbines to be curtailed when bat activity reaches a pre-determined threshold. The smart curtailment acoustic monitoring system can also be switched off when wind speeds reach thresholds above which bat activity (and therefore collision risk) are considered to be negligible, which would be a set threshold agreed to following consultation with subject matter experts. Under these circumstances, electricity generation would proceed without intervention until wind speeds fall below the pre-determined threshold. This approach has been the subject of a study by Hayes et al (2019) that found implementing a similar acoustic monitoring and remote curtailment system when wind speeds were below 7.9 m/s, without the use of blanket low wind speed curtailments, reduced bat fatalities by 85 %.

Project application

From analysis of over 340 ultrasonic detector trap nights, collected across seven seasonal replicates between summer 2020 and summer 2023, is has been determined that most species recorded within the study area are likely to be resident, with potential to be active all year round. Ultrasonic detectors were placed below canopy level, as well at height on meteorological masts (as close to rotor swept height as possible). Although bats do enter periods of reduced activity over winter, in suitable conditions they are still likely to emerge for short periods even on cooler nights. Some species are known to enter torpor whereby their body temperature is reduced to conserve energy however, a true hibernation period whereby activity is predictably absent over any given period of time has not been observed amongst the species relevant to the Hills of Gold site. The above limitations do not detract from the opportunity that smart curtailment systems present to better understand the interaction between microbats and wind energy generation facilities in the Australian context.

For the Project, the wind speed thresholds for engagement of the smart curtailment acoustic monitoring system will initially be set at between 5.5 m/s and 7.5 m/s (noting the already increased cut in speeds) for moderate risk turbines. These engagement thresholds are based on wind speeds above which microbat activity is considered low (i.e. above 5.5 m/s) and very low (i.e. above 7.5 m/s), based on data collected during microbat utilisation surveys (Biosis 2023, Biosis 2024). It should be noted that engagement of this acoustic monitoring system at the above thresholds (5.5 – 7.5 m/s for moderate risk turbines) does not mean turbines will necessarily be further curtailed during periods where wind speeds are at these levels. The secondary component of the smart curtailment system ensures curtailment only occurs when microbat activity is present above pre-defined levels. Curtailment of turbines would only occur when bat activity is detected on the SMART system at or above the activity threshold triggers, at times when the systems are engaged. This allows for unimpeded operation of turbines when microbat activity is low for reasons such as cold / rainy weather, or reduced levels or duration of activity during the colder winter months.

Microbat activity level triggers have been determined based on site-specific data. Bat activity per 10-minute interval was compared with temperature and wind speed data to assess the conditions under which the majority of bat activity is recorded. This analysis determined that during the wind and temperature conditions detailed for Phase 2 and Phase 3 where the smart curtailment system would be engaged, the majority (90%) of 10 minute intervals contained fewer than 10 bat calls. This suggests that periods of high activity, when collision risk is likely to be greatest, occur when more than 10 calls are recorded in a 10 minute interval. It is considered appropriate that these trigger levels would be set to allow turbine operation when microbat activity levels are low, given the general trend of lower levels of activity at higher wind speeds, and only implement smart curtailment when activity levels are higher and there is an actual higher potential for blade strike. This trigger threshold is designed to act as a starting point for an adaptive management approach that may require refinement following establishment and in-situ testing of the SMART system. As this is a novel technology in Australia, a level of trial and error will need to form part of the implementation of this approach, within the overarching aim of minimising collisions to bats whilst also maximising energy production of the facility. In my opinion, adaptive management is critical and the appropriate mechanism to monitor success and respond quickly to refinements that may be required. This approach fits within the concept of adaptive management as documented in the Bird and Bat Adaptive Management Plan (BBAMP) (Biosis 2024).

It is intended that the design of the smart curtailment system will be developed in conjunction with BCS, and the acoustic system supplier once final project design and approvals are determined. As part of the implementation strategy and in consultation with BCS and subject matter experts, consideration will be given to whether the acoustic detectors are required to be mounted on the turbine hubs, or whether an effective approach may be to design the monitoring system such that it is more preventative, and picking up bat activity better with detectors mounted on lower masts, such as at 40 metres high (between canopy and rotor swept height) on met masts near moderate risk turbines. Monitoring for activity below the swept path may prevent blade strike and monitoring a bit further from the turbine could have a similar positive impact. As outlined above, it is proposed that the monitoring design be undertaken in conjunction with BCS and the acoustic system supplier once turbines are selected, the final design of the Project is completed, and utilises the additional data the Project proposes to collect.

Limitations

It is important to note that this technology is still in its infancy, and has not yet been tested on any operational wind facilities in Australia to our knowledge. There are a number of differences between the Australian context and overseas examples in the United States where it has been trialled, that make direct comparisons difficult between regions. For example, automated species analysis is currently widely used in both the United States and Europe, allowing real-time identification to species levels of microbat echolocation calls. This technology does not yet exist in Australia, thus limiting the flexibility of the SMART system to allow for species-level real-time identification as it can do in overseas contexts. The system is therefore currently limited to placing thresholds on overall bat activity only, rather than allowing real-time detection of at-risk species and curtailing turbines only when these species have been detected. This limitation is however considered more precautionary in terms of minimising potential microbat strike when overall activity is recorded as higher, compared to a species specific approach. Furthermore, whereas in the United States mass bat fatalities at wind facilities have often been associated with seasonal migration that occurs along known migratory pathways, few truly migratory bats exist in Australia. A number of cave-roosting species are known to undergo seasonal movements to maternity caves in order to birth their young in the warmer summer months however, these bats disperse into the landscape rather than undergoing a directional movement as with north-south seasonal migrations for example.

Detailed adaptive management

By taking an adaptive management approach to the implementation of these emerging technologies, there is an opportunity to better understand the conditions under which bats are most at risk of collisions, and apply this understanding to future wind energy developments. Implementing blanket curtailment, whereby cut-in speeds are prescribed based on either an arbitrary figure or on baseline surveys that may not be adequate predictors of operational activity, limits the potential to refine the conditions which allow for energy generation to be maximised whilst also minimising bat fatalities. By implementing these emerging technologies there is real potential to gain a better understanding of their applicability to Australian wind farms.

A well thought out adaptive management design whereby mortality data (collected during regular monitoring inspections) could be compared between turbines with and without smart curtailment would further allow for the benefits of the system to be tested, and any learnings to be incorporated into both the adaptive management framework at the Project site but also, to be applied to future wind energy developments where impacts to bats require consideration. A detailed implementation plan will be developed to ensure that the system will work effectively at the Hills of Gold site and be developed and approved as a sub plan to the BBAMP, and in consultation with BCS, the supplier and subject matter experts. The need for adjustments to the adaptive curtailment strategy will be determined through regular monitoring on the efficacy of the current strategy. Adjustments may include additional curtailment measures if an unacceptable number of strikes are found to occur, however the option to reduce the level of curtailment will also be prescribed, if sufficient evidence can be provided that it is safe to do so. Such evidence may include few, to no, recorded bat strikes at a given turbine, combined with a comparison of the results of a trial period of reduced curtailment. As such, turbines currently assessed as low risk of impact may become curtailed in the future, or those turbines currently considered to present a moderate risk of impacts may be removed from the curtailment strategy, or have curtailment strategies increased. All such changes would be guided by the monitoring and adaptive management processes. Detailed monitoring on the efficacy of the smart curtailment strategies, along with responsive management triggers are detailed further in Biodiversity Development Assessment Report (BDAR) (Biosis 2023) and adaptive components of the BBAMP (Biosis 2024).

Smart curtailment for "At risk" avifauna species

Overseas studies

Technology related to smart curtailment systems for birds are also advancing at a rapid rate. Automated avian detection systems allow for detection of bird species and the triggering of curtailment of select turbines. The IdentiFlight avian detection system (IDF) was designed in the United States specifically to reduce Golden Eagle mortalities on wind farms, with testing indicating that use of the system has achieved an 85 percent reduction in eagle fatalities at a wind farm site in Wyoming, USA (McClure et al. 2022).

The IDF system combines high-precision optical technology with artificial intelligence to detect raptors and other protected bird species within a 1 kilometre range. The IDF System tracks the movement of objects within its range, and quickly determines whether any objects are birds, and can learn to recognise key species of interest such as eagles. If a bird of interest is identified, the system begins to track the target, recording its position, predictive trajectory, and course probability relative to turbines in real time. Curtailment conditions are pre-determined, and if the target is predicted to cross into the rotor swept area of a turbine, the IDF Base Station issues a signal to the wind farm Supervisory Control and Data Acquisition (SCADA) system, which sends control signals to curtail relevant turbines to avert any collision. The system provides the visual and quantitative data needed to reduce or avoid collisions, but does not detect or document the collisions per se. This requires a carcass monitoring program, which includes regular and intensive on-ground searches for between three and five years (depending on turbine risk rating) post-commissioning, and is further detailed in the BDAR (Biosis 2023) and BBAMP (Biosis 2024).

Application in Australia

Unlike radar and other technological approaches to automated curtailment for birds, what distinguishes the IDF system is its ability to recognise different species and make curtailment decisions based on target species. Assessment of the effectiveness of the IDF system in Australia, at the Cattle Hill Wind Farm in Tasmania (Goldwind 2022), concluded that IDF significantly reduced Wedge-tailed Eagle collisions at the site. Furthermore, the data collected from the IDF system has provided detailed monitoring information on avifauna activity, and valuable insights into the understanding of eagle behaviours. The volume and quality of information captured by IDF is considered far more comprehensive than what is possible using traditional bird survey methods conducted by human observers.

Project application and adaptive management

For the IDF system to work accurately, it requires a large volume of bird images to be collected and classified to build a convolutional neural network that allows the system to recognise target species accurately, and minimise false triggers. It is therefore not suitable as a reactive management approach, but a means of pre-emptively reducing any potential mortality events. If installed early in the construction phase of the Project, by the time wind farm operations commence IDF is likely to have captured enough data to be able to recognise target species such as Wedge-tailed Eagle with a high level of confidence, and may also be able to group other bird species that have similar morphological characteristics based on their wingspan and dimensional data. The IDF curtailment prescription relevant to the site could also be adjusted as additional knowledge of eagle populations utilising the site is gained through the IDF system.

The commissioning stage is also likely to be the highest collision risk period for eagles, being the first time they will encounter the operational turbines, therefore having the IDF system (or its more advanced equivalent) tested and validated as fully operational by the time operations commence is almost certainly going to reduce future mortalities.

The effectiveness of the system is likely to vary between sites and performance will be dependent on site topography, vegetation, wind farm layout and the number of IDF towers able to be accommodated within the wind farm footprint. A detailed implementation plan will be developed to ensure that the system will work effectively at the Hills of Gold site. This will be developed and approved as a sub plan to the BBAMP, and in consultation with BCS, the supplier and subject matter experts. The area adjacent to Ben Halls Gap National Park is a priority candidate for initial installation of the system, given this eastern portion of the wind farm has been identified as an area with increased movements of Wedge-tailed Eagle, based on Bird Utilisation Survey (BUS) data collected during the preparation of the BDAR and BBAMP.

Conclusion

It is my opinion, with avoidance measures implemented to date and further final designs, and the inclusion of detailed triggers, and proactive and mitigation measures, including novel approaches to curtailment, the impacts to local and regional populations of at risk bird and bat species will be below significant impact thresholds.

6 Offsets - Establishment of local like for like stewardship sites

Overview of the Biodiversity Offset Scheme

The BOS framework combines the BC Act and the Biodiversity Conservation Regulation 2017 (BC Regulation), and aims to ensure development projects and clearing activities (requiring consent) result in a net positive gain for native biodiversity (i.e. native vegetation and flora/fauna habitats), through implementation of the principles of avoid, minimise and offsetting of impacts on biodiversity values.

There are two elements to the BOS; one for developers, and landowners, who are undertaking development projects (such as a wind farms) or clearing (requiring consent), which may generate an offset obligation which must be met to compensate for the removal of native biodiversity. The other is for landholders who may wish to establish a Biodiversity Stewardship Site over some (or all) of their land to create an offset site where biodiversity values similar to those impacted by development projects and clearing are protected an enhanced in perpetuity. This includes the implementation of funded vegetation management actions, paid for by the financial offset contribution paid by developers to meet their offset obligation.

Landholders must be eligible to establish a Biodiversity Stewardship Site, and offsets sites must be secured in-perpetuity via entering into a legally binding Biodiversity Stewardship Agreement, which is registered on the title of the land.

The biodiversity values present at a Biodiversity Stewardship Site, are expressed in the form of biodiversity credits (as they are for a consented development's offset requirement). Biodiversity credits can include either "Ecosystem credits", which represent native vegetation and their associated habitat values, and "Species credits" which represented specific habitat types or populations of certain threatened species. The number of Ecosystem credits and/or Species credits that can be generated at a Biodiversity Stewardship Site is dependent on the total area and condition of the biodiversity values present, as determined in accordance with the BAM.

Following project consent, the developer will be issued an offset obligation, expressed as a certain number and type of Ecosystem credits and/or Species credits. These credits can be transferred (purchased) from a Biodiversity Stewardship Site, and then "retired" fulfilling the developer's offset obligation. Securing an offset obligation must follow the "Like-for-Like Rules" and the "Variations to the Like-for-Like Rules" of the BOS, outlined in the BC Regulation, and offset credits are created at a ratio of between approximately 5:1 to 8:1 (i.e. for every 1 hectare of habitat removed, between 5 and 8 hectares of commensurate biodiversity must be conserved and managed in perpetuity).

Local project offsets

The Project requires up to 5981 Ecosystem Credits for impacts to native Plant Community Types (PCTs), and up to 10,383 Species Credits for impacts to habitat for a number of threatened species, based on inclusion of all 64 turbines and associated infrastructure proposed (Biosis 2023). These credits will be reduced depending on the final numbers of turbines and final project footprint consented and the associated impacts. There are currently three identified Biodiversity Stewardship Sites that are all immediately adjacent to the project area, providing ideal local and representative offsets, which have been assessed in detail for their potential to generate suitable matching biodiversity credits.

Based on the current layout of these three sites, they have the potential to generate up to 5670 Ecosystem Credits and 7421 Species Credits. Not all credits generated across the sites will be a direct match to the Project's impacts, however with the application of the "Like-for-Like Rules" and the "Variations to the Like-for-Like Rules", there is expected to be a shortfall of around 1640 Ecosystem Credit (approx. 27%) and 2960 Species Credits (approx. 29%). This illustrates that at least 70% of the biodiversity offsets required for the

Project can be secured in the immediate vicinity of the Project. This is considered a very high proportion compared to other approved SSD projects which are often unable to secure offsets immediately adjacent to the impact site. Notably the three currently proposed Biodiversity Stewardship Sites will be able to provide all of the offsets required for the Project's impacts to key locally occurring Northern Escarpment Wet Sclerophyll Forests and Northern Tableland Wet Sclerophyll Forests, and the associated habitats they support.

It should also be noted that there has been a recent change (to be implemented post-January 2024) to the way offsets for Barking Owl, Powerful Owl, Sooty Owl and Masked Owl (each assumed to be impacted by the Project) can be generated under the BAM. Sooty Owl and Masked Owl have both been recorded in/adjacent to the proposed offset sites, so direct offsets for those species are now expected to be able to be generated, where they were previously considered likely to be difficult (and are not included in the above numbers). This is due to a change in the requirements from confirming use of a proposed offset site for breeding purposes to, confirmed use of an offset site that supports breeding habitat.

The expected final shortfall in offsets can be secured either via the purchase of matching offsets already generated from other BSS (required to be located proximal to the Project based on the Like-for-Like rules) or by payment to the Biodiversity Conservation Fund which transfers the responsibility of offset security to the NSW Biodiversity Conservation Trust (BCT).

In my opinion, and through our thorough assessment, the establishment of local biodiversity offsets for the majority of the credit obligation (over 70%), will have local positive outcome for biodiversity conservation.

Post BAM assessment clearing

It should be acknowledged that minor locations with the project area have been legally cleared under approval from Local Land Services during the assessment phase of the Project. This clearing has taken place after the completion of data collection in accordance with the BAM, and the Project assessment has retained the 'pre-cleared' state of the vegetation and habitats. This means that these areas have been included in the Project's offset obligation, and will form part of the requirements to ensure a net positive gain for native biodiversity under the BOS.

7 Biodiversity impacts of reinstating of Turbines WTG 53 – WTG 63

Table 1 and Table 2 demonstrate the reduction in impacts that the removal of the 11 turbines, WTG 53 – WTG 63, will have on the overall residual biodiversity impact. This cluster of turbines forms part of the highest wind yielding turbines within the Project footprint, whilst also having some of the least impacts on biodiversity within the current development footprint. In summary, the removal of these turbines will result in a reduction of 1.2% of the Project's overall impacts to native vegetation, and 8.1% of all impacts to the NSW listed Ribbon Gum - Snow Gum -Mountain Gum Threatened Ecological Community (TEC). Of the latter, a total of 1.47 hectares of this TEC would be avoided by turbine removal.

In relation to individual species credit species, the removal of these turbines would reduce direct and indirect impacts by a combined total of 7.34 hectares, or by 2.2% of the overall impacts. Additionally, of the 11 turbines recommended for removal, eight are considered 'low risk' for bird and bat collision prior to mitigation, whilst all 11 are considered to be 'low risk' following the implementation of associated triggers, proactive and reactive mitigation. Overall, the impact of these 11 turbines is proportionally lower than the Project's overall impacts to habitat loss, and direct and indirect impacts to biodiversity. These turbines also represent proportionately lower risk turbines for both collision risk and barrier effect impacts, when compared to the remainder of the Project's turbines.

Table 1 Summary of species impacts in comparison to total impacts and those associated from turbines WTG53-63 only

Threatened species	Total Impact (ha)	Impact from WTG53-63 (ha)	Impact from WTG53-63 (%)
Barking Owl	84.57	0.32	0.4%
Booroolong Frog	0.95	0.00	-
Border Thick-tailed Gecko	0.67	0.00	-
Eastern Cave Bat	19.75	0.34	1.7%
Eastern Pygmy-possum	22.36	0.42	1.9%
Koala	46.28	2.21	4.8%
Large-eared Pied Bat	19.75	0.34	1.7%
Masked Owl	16.29	0.12	0.7%
Powerful Owl	17.26	0.32	1.9%
Sooty Owl	1.99	0.00	-
Southern Greater Glider	36.28	1.47	4.1%
Southern Myotis	3.93	0.11	2.9%
Spotted-tailed Quoll	45.62	1.47	3.2%
Squirrel Glider	17.5	0.20	1.2%
Total species impacts	333.2	7.34	2.2%

Table 2 Summary of vegetation impacts in comparison to total impacts and those associated from turbines WTG53-63 only

Vegetation	Total Impact (ha)	Impact from WTG53-63 (ha)	Impact from WTG53-63 (%)
PCT 1194 - High	16.25	0.42	2.6%
PCT 1194 - Moderate	15.63	1.05	6.7%
PCT 1194 - Low	6.48	0.74	11.4%
PCT 1194 - DNG	5.42	0.00	-
Ribbon Gum—Mountain Gum—Snow Gum Grassy Woodland TEC	27.24	2.21	8.1%
Native vegetation	190.54	2.21	1.2%
Exotic vegetation	236.62	19.54	8.3%
Total Footprint	447.10	21.75	4.9%

In my opinion, the reinstating of turbines WTG 53 – WTG 63, particularly low risk turbines, and predominantly turbines WTG 53, 55, 56, 60, 62 and 63, will not have a significant increase in the biodiversity impacts for the Project, and additionally, the removal of turbines WTG 53 – WTG 63 will have a negligible result on the overall Projects residual biodiversity impact.

8 Biodiversity impacts of reinstating of WTG 28

WTG 28 is being recommended for removal from the Project by DPHI on the basis of impacts to biodiversity values. Whilst WTG 28 is expected to result in proportionately higher impacts to biodiversity (in terms of area of impact per turbine) than WTG 53 – WTG 63, there are a number of biodiversity values that would not be directly impacted by its inclusion in the Project, namely; Booroolong Frog, Border Thick-tailed Gecko, Masked Owl, Sooty Owl and Southern Myotis. Furthermore 1.04 hectares (40 %) of the total impact to native vegetation that would result from the inclusion of the turbine in the Project will occur to lower condition vegetation mapped as occurring in a Moderate or Derived Native Grassland condition state. This illustrates efforts made to minimise impact to higher quality native vegetation and habitats.

Prior to the implementation of the adaptive management and mitigation measures described above, WTG 28 is considered to present a Moderate risk of turbine collision and a Minimal risk of barrier effect for local aerial fauna species. Once the robust mitigation measures are implemented, as per the BBAMP, it is my opinion that the risk of both turbine collision and barrier effect will be reduced to Low.

All biodiversity offsets that would be required to be secured for direct impacts to native vegetation from inclusion of WTG 28 in the Project can be secured at the currently proposed Biodiversity Stewardship Sites (see above). One of the proposed sites occurs adjacent to the proposed location of the WTG, but also sited far enough away that the WTG is not expected to impact upon the Stewardship Site. A substantial portion of the species credit offsets that would be required from inclusion of WTG 28 can also be secured in the immediate vicinity with Koala, Spot-tailed Quoll and Greater Glider all being recorded within the adjacent offset site boundary. Establishment of local offset sites, and securing any residual credit requirements under the other measures open to the proponent under the BOS will ensure net positive gain for native biodiversity if WTG 28 remains part of the Project.

9 Buffers between turbine blades and the surveyed boundary of Ben Halls Gap Nature Reserve

A key element in the turbine risk assessment for potential blade strike and barrier effect impacts, undertaken as part of the BDAR, is the distance between the operational turbine blades and existing habitat in the form of tree canopies. Generally, the closer an operational turbine blade is to tree canopies, the higher the risk of impact to aerial species that may be utilising treed habitats. Furthermore, an additional 50 metre 'zone of disturbance' has been considered for potential indirect impacts, which extends out from the end of the blade tip. Within this additional zone of disturbance, indirect impacts associated with items such as air disturbance, noise and blade movements, may result in habitats present being less utilised by fauna species (Biosis 2023).

It is understood that the current recommended consent conditions include the following:

- No wind turbine blade tip may be located within 130 metres from the surveyed boundary of Ben Halls Gap Nature Reserve.
- The revised location of the blade of a wind turbine is at least 130 metres away from the surveyed boundary of Ben Halls Gap Nature Reserve.

It is considered likely that the intent of these conditions is to ensure that turbine blades, and the extended zone of disturbance, do not impact on existing native vegetation (and the habitat it provides) within the Ben Halls Gap Nature Reserve.

Section 7.2.2 of the BDAR (Biosis 2023) provides information on the setbacks of all proposed turbines from existing tree canopy habitats (post-construction). The section also includes the formula for calculating buffers to areas of retained vegetation developed in *Natural England Technical Information Note TIN051 – Bats and onshore wind turbines interim guidance* (Natural England 2009). This method takes into consideration the hub height and blade length of adjacent turbines and identifies the required horizontal distance a turbine should be placed to maintain a suitable buffer (see Figure 1 below, noting that this diagram does not represent the parameters of the turbines proposed for the project).

$$b = \sqrt{(50 + bl)^2 - (hh - fh)^2}$$

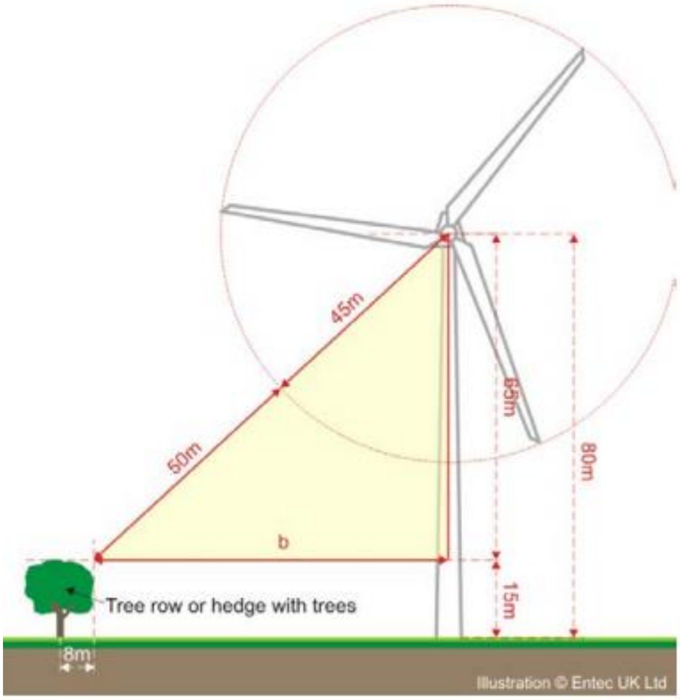

Figure 1 **Extract from Technical Information Note TIN051 Bats and onshore wind turbines, showing how buffer distance is determined from top of canopy to blade tip**

Table 3 provides calculated buffer distances between the existing tree canopy habitat within the boundary of Ben Halls Gap Nature Reserve and the proposed turbine locations recommended by DPHI, (updated from those included in the BDAR [Biosis 2023]), to show how the turbines can be micro-sited and achieve greater minimum setbacks from the nature reserve boundary and the habitat present. These turbines include; WTG 38, WTG 39, WTG 40, WTG 43, WTG 44 and WTG 45.

These calculations have been based on the following parameters:

- Blade length (*bl*) of 82 metres.
- Hub height (*hh*) of 150 metres.
- Feature height (*fh*) of 24 metres.

- Relevant setbacks (*b*) between the proposed turbine GPS locations and the surveyed boundary of Ben Halls Gap Nature Reserve (note the reserve boundary was derived from surveyed data and cadastral (GIS) information where minor gaps occur in the survey data).

Table 3 Buffer distances between blade tips and existing habitat within the surveyed boundary of Ben Halls Gap Nature Reserve (BHGNR)

Turbine No.	Proposed setback to BHGNR boundary (m)	Blade tip buffer distance to BHGNR canopy (m)
WTG 38	192	147.7
WTG 39	150	113.9
WTG 40	133	101.2
WTG 43	132	100.5
WTG 44	159	120.9
WTG 45	136	103.4

It is demonstrated above in Table 3 that in all cases, there are sufficient setbacks able to be achieved between the proposed GPS locations of the six turbines adjacent to Ben Halls Gap Nature Reserve, such that existing canopy within the surveyed boundary of the Nature Reserve will be separated by at least 100 metres from operational blade tips, and outside the 50 metre zone of disturbance.

It is my opinion that, to ensure that habitat within Ben Halls Gap Nature Reserve is not within the zone of disturbance for turbines WTG 38, WTG 39, WTG 40, WTG 43, WTG 44 and WTG 45:

- No wind turbine blade tip may be located within a 50 metre blade tip buffer from the surveyed boundary of Ben Halls Gap Nature Reserve.
- The revised location of the blade of a wind turbine has at least a buffer of 50 metres from the canopy of existing native vegetation within the Ben Halls Gap Nature Reserve.

However as a minimum requirement, consent conditions should be amended to state that:

- No wind turbine may be located within 130 metres from the surveyed boundary of Ben Halls Gap Nature Reserve.
- The revised location of a wind turbine is at least 130 metres away from the surveyed boundary of Ben Halls Gap Nature Reserve.

10 Reducing and managing Serious and Irreversible Impacts to Box Gum Woodland

Throughout the development of the project layout, design decisions have been implemented to avoid impacts to Box Gum Woodland during the wind farm concept design, following it being highlighted at the outset of the Project as a key ecological concern. This has included early biodiversity surveys, preliminary assessments, and workshops held between project ecologists, civil engineers and wind modelers to minimise impacts to the areas of mapped Box Gum Woodland. This includes selection of the final transmission line corridor partly based on its proportionately lower impacts to Box Gum Woodland.

Continued project design refinements undertaken between the BDAR exhibited with the EIS and the current layout have resulted in a further reduction of impact to Box Gum Woodland CEEC from 13.3 hectares to 8.15

hectares. This equates to approximately 4% of the Project's impacts to native vegetation. Approximately 67% of the impacts to Box Gum Woodland (5.4 hectares) will occur on areas of lower ecological condition, mapped as derived native grassland (DNG) or in a low condition vegetation zone. This percentage has increased with the changes to site access, where impacts to Devil's Elbow for transport purposes have now been removed. The Project is not considered likely to reduce the extent of the CEEC at the national, bioregional or local scales, and as such the scale of the impact will not lead to a reduction in the geographic distribution of Box Gum Woodland across its distribution. Furthermore, indirect impacts associated with disruption or abiotic process, the loss of functionally important species, and/or exacerbation of fragmentation and isolation are not considered likely to be substantial as a result of the Project.

In my opinion, impacts to SAII, and specifically in relation to Box Gum Woodland, have been adequately avoided and addressed during the assessment.

I trust that this advice and my opinions are of assistance to you however please contact me if you would like to discuss further.

Yours sincerely,

Mitch Palmer
Manager – Ecology and GIS (NSW)
B.Science
BAM Accredited Assessor 170501

References

Bennett E, Florent SN, Venosta M, Gibson M, Jackson A, & Stark E 2022. '*Curtailment as a successful method for reducing bat mortality at a southern Australian wind farm*', Austral Ecology, 47, 6: 1329–1339.

Biosis 2023. *Hills of Gold Wind Farm Biodiversity Development Assessment Report*. Report for Someva Renewables. C, Wharfe, M, Palmer, M, Davis (Arup), M, Hyde. Biosis Pty Ltd., Sydney, NSW. Project no. 34963.

Biosis 2024. Hills of Gold Wind Farm – *Draft Bird & Bat Adaptive Management Plan*: Report for Engie. Authors: Palmer, M., Williams, F. and Wharfe C., Biosis Pty Ltd, Melbourne. Project no. 37884.

Department of Planning, Industry and Environment (DPE). *Biodiversity Assessment Method 2020 Operational Manual – Stage 1*, 2020.

Environmental Geosurveys Pty Ltd 2021. *Hills of Gold Wind Farm Geomorphology and Geology and Potential Microbat Roosting Habitat*, Report prepared for Biosis Pty Ltd. Author: Rosengren. N

Goldwind 2022. *Assessment of effectiveness of the IdentiFlight avian detection system: Wild Cattle Hill Wind Farm*. Prepared in satisfaction of EPBC Approval 2009/4838 Conditions 6A-6C., Report prepared for Wild Cattle Hill Pty Ltd. Authors: Rogers, D Goldwind Australia. Document number: CH-PM-REP-0125.

Hayes, M. A., L. A. Hooton, K. L. Gilland, C. Grandgent, R. L. Smith, S. R. Lindsay,J. D. Collins, S. M. Schumacher, P. A. Rabie, J. C. Gruver, and J. Goodrich-Mahoney. 2019. *A smart curtailment approach for reducing bat fatalities and curtailment time at wind energy facilities*. Ecological Applications 00(00):e01881.10.1002/eap.1881.

McClure CJW, Rolek BW, Dunn L, McCabe JD, Martinson L, & Katzner TE 2022. '*Confirmation that eagle fatalities can be reduced by automated curtailment of wind turbines*', Ecological Solutions and Evidence, 3, 3: e12173.

Natural England 2009. Natural England Technical Information Note TIN051. Bats and onshore wind turbines Interim guidance. Third edition 11 March 2014 www.naturalengland.org.uk