

## Chalumbin Wind Farm

# Final Public Environment Report

EPBC 2021/8983

**Prepared for:**

Chalumbin Wind Farm Pty Ltd

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## Executive Summary

### INTRODUCTION

Chalumbin Wind Farm Pty Ltd (CWF), a fully owned subsidiary of Ark Energy Projects Pty Ltd (Ark Energy), is developing the Chalumbin Wind Farm Project (the Project). Ark Energy is a subsidiary of Korea Zinc, the world's largest producer of zinc and the first major refiner to join RE100 and commit to powering its global operations from 100% clean energy by 2050, starting with Sun Metals, the largest private employer in Townsville, North Queensland. In May 2022 Ark Energy completed a friendly acquisition of leading Australian renewable energy company Epuron. Ark Energy's development portfolio includes approximately 9,000 megawatts (MW) of utility-scale wind and solar projects across Australia.

The objective of the proposed action is to construct and operate a renewable energy facility of approximately 602 MW nameplate generation capacity to efficiently supply renewable electricity to the National Electricity Market (NEM). Queensland reached 20 % renewable energy supply at the end of 2020, and the Queensland Government has a target of 70 % renewable energy by 2032 and 80% by 2035, including an additional 25,000MW (or 25 gigawatts) of large-scale wind and solar. The proposed action will play a considerable and timely role in helping Australia work towards meeting international agreements including the Paris Climate Accord and the Glasgow Climate Pact, to help achieve reductions in future greenhouse gas emissions and to lessen the impact of climate change. The Project is located within the Northern Queensland Renewable Energy Zone (QREZ), one of three such zones that have been identified by the Queensland Government and the Australian Electricity Market Operator (AEMO) that will be developed in a coordinated way to deliver a diverse mix of cleaner, cheaper and reliable energy generation. The Northern QREZ is considered to have some of the best untapped wind resource in the country.

The Project has been designed taking into account site constraints and opportunities, and community and stakeholder input. From an original development concept of 200 wind turbines capable of harnessing the economic wind resource, the Project was refined to 95 wind turbines for the referral in July 2021 under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) considerate of constraints and opportunities on the site such as the ecology and cultural heritage values. The Project (in a 94 wind turbine arrangement) received a Development Permit under the *Planning Act 2016* (Qld) from the Department of State Development, Infrastructure, Local Government and Planning (DSDILGP) on 30 June 2022.

Following further studies and stakeholder engagement since that time, the following significant changes have been made:

- Removal of 8 wind turbines, reduction in access tracks by 27 km and relocation of the southern sub-station, which reduces the internal overhead transmission line by 4 km. These changes reduce clearing overall by 5%, and importantly the potential impacts to wet sclerophyll forest are reduced by 31%;
- A significant increase in biodiversity offsets to ensure a net positive impact, including three large areas totalling more than 6,855 ha, primarily located immediately adjacent to the Wet Tropics of Queensland World Heritage Area (WTQWHA). This includes the largest patch of intact wet sclerophyll forest adjacent to the Tully Falls National Park and creates connectivity between Koombuloomba National Park and Yourka Reserve Nature Refuge;
- Commitment to avoid ground-disturbing works in the highest rainfall months of January, February and March;
- Consideration of an alternate access via Innot Hot Springs for heavy vehicles in response to concerns from residents along the existing proposed access via Wooroora Road. The feasibility of this alternate access is dependent on ongoing investigations into the load rating of the Herbert River bridge to accommodate heavy vehicles; and





- Consideration of a construction camp in response to concerns from residents in Ravenshoe about potential displacement of the community from affordable housing stock as a consequence of the construction workforce.

The current design (for which a formal variation was accepted by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) on 18 February 2023 under section 156 of the EPBC Act) comprises up to 86 wind turbine generators and associated infrastructure, and will connect to an existing 275 kV Powerlink transmission line that traverses the Project site with sufficient capacity in the network north of the Ross substation, Townsville. The Project will generate around 1,985 GWh of renewable electricity per year, which is equivalent to the power requirements of around 320,000 Queensland homes.

The Project is located across two privately-held properties, Wooroora and Glen Gordon Stations, located approximately 15 km southwest of Ravenshoe, in Far North Queensland, both used primarily for cattle grazing. Surrounding properties are also used for grazing with the Yourka Reserve Nature Refuge located to the south. The WTQWHA is located adjacent to the eastern boundary of the Project area.

All Project disturbance is located within the two cattle grazing properties with a minimum distance of 600 m between any proposed infrastructure and the WTQWHA and with existing clearing for the Powerlink transmission lines along the WTQWHA boundary for much of its length. Climate change is widely recognised as the most threatening processes to the Outstanding Universal Values (OUVs) of the WTQWHA. Some 80% of vegetation that requires clearing for the proposed action, within the two grazing properties, is 'least concern' under the Queensland *Vegetation Management Act 1999*. This type of vegetation commonly occurs throughout the two biogeographical regions of the Wet Tropics and the Einasleigh Uplands in North Queensland.

Due to global supply constraints and significant increases in the cost per installed megawatt, the Project is likely to be staged with development (Stage 1) of the Wooroora property first (including 52 wind turbine generators (WTGs), switching station and supporting infrastructure) followed by development (Stage 2) of the Glen Gordon property (including 34 WTGs, switching station and supporting infrastructure). A final investment decision (FID) for Stage 1 (circa A\$1B) is anticipated in H2 2023 with construction to commence as soon as approval under the EPBC Act has been obtained, once pre-construction approval conditions are met, and outside of the peak wet season months of January to March. A FID for Stage 2 is expected in 2024.

Construction is expected to commence in H2 2023 or H1 2024, subject to the timing of approvals, feasibility studies and FID. The construction phase is expected to last for a period of approximately 24-30 months (for both Project stages sequentially) with commissioning anticipated for Stage 1 in 2026 and Stage 2 in 2027, subject to FID.

The Project was referred to DCCEEW in July 2021 (EPBC 2021/8983) and was determined to be a controlled action due to the potential for significant impacts on the following Matters of National Environmental Significance (MNES):

- World Heritage property;
- National Heritage place;
- Listed threatened species and communities; and
- Listed migratory species.

The assessment approach was determined to be by Public Environment Report (PER), final Guidelines for which were issued by DCCEEW in November 2021. This PER contains information about the Project and its relevant impacts in accordance with the PER Guidelines, enabling stakeholders and the Minister to understand the environmental consequences of the Project relevant to the above MNES.



## DESCRIPTION OF THE ACTION

The Project area covers a total of 31,225 ha plus adjoining road reserves. The Project footprint is the maximum area of disturbance, which is estimated at 1,071.1 ha or approximately 3.4 % of the Project area. The Project footprint is sufficiently wide to allow the micro-siting of infrastructure to respond to site-specific constraints and opportunities as design increases in definition towards construction. The Project has made an industry-leading commitment to rehabilitate temporary construction disturbances and retain only the minimum footprint required for safe operations of approximately 107.2 ha (equivalent to 0.3 % of the Project area).

Key Project components will include:

- 86 wind turbines, including foundations, blade laydown areas, hardstands and firebreaks;
- New Powerlink connection substations (one per Stage) to connect to the existing 275 kV line and an adjacent battery energy storage system (BESS) and synchronous plant for grid stability;
- Two wind farm collector substations, to electrically connect the two Stages if required;
- Medium voltage overhead and underground powerlines, predominantly aligned with the wind farm access roads;
- High voltage overhead powerline as part of Stage 2, to connect the collector substations to the Powerlink switchyard and into the wider grid;
- Up to 5 permanent wind monitoring masts;
- Approximately 122 km of unsealed access roads of varying width, depending on the earthworks required at each location. Areas disturbed for road construction outside of the 5.5 m operational track width will be rehabilitated following construction;
- Temporary concrete batching plants, temporary construction compounds and laydown / stockpile areas, and temporary site offices; and
- A permanent site entrance on Wooroora Road and permanent site office, with an alternative site entrance being investigated from Innot Hot Springs.

Construction is expected to commence in mid-2023, subject to the timing of approvals, feasibility studies and FID. The construction phase is expected to last for a period of approximately 24-30 months (for both project stages sequentially) with commissioning anticipated for Stage 1 in 2025 and Stage 2 in 2026, subject to FID. Construction personnel of approximately 250 to 350 staff employed during the peak construction period are proposed to stay in local accommodation, most likely at Ravenshoe, Millstream or Innot Hot Springs.

However, Ark Energy is currently investigating the feasibility of an alternative accommodation option close to the Project area following feedback from Tablelands Regional Council, local residents and other stakeholders on the stressed accommodation market in the broader region and the potential to further reduce construction related impacts on nearby residents. Any accommodation facility would be temporary (during the construction period), subject to its own approvals and would be located in such a way that it does not have a significant impact on Matters of National Environmental Significance.

The operational life of the wind farm is expected to be 30 years. Approximately 15 to 30 full-time jobs will be generated during operation, typically 10 to 20 technicians along with a Project Manager, administration and other support roles. This will include environmental roles on an as-needed basis to assist in operational monitoring.

At the end of the initial operations phase, infrastructure may be repowered with new equipment for a further 30-year operating life, or decommissioned, with the site rehabilitated to facilitate continuation of the current land use (agriculture) or an alternative land use. If decommissioned, most above-ground infrastructure apart from roads (which



are left to benefit the landholders) will be removed (e.g., all turbines, transmission lines, etc.) with concrete foundations buried in-situ. The land will then be rehabilitated in line with development approval conditions and specific landowner agreements. Some infrastructure may remain in-situ depending on landowner preferences.

## FEASIBLE ALTERNATIVES

An assessment of feasible alternatives has been undertaken as part of this PER that considers alternative locations for the Project, alternative configurations at the current location, a fossil fuel alternative and the “no action” alternative.

The assessment demonstrates that there are few alternative locations for the Project within the Cairns to Townsville section of the Northern QREZ where the resource to the west of the Great Dividing Range (away from higher density populations to the east) is located close to an existing high voltage transmission line and outside of the WTQWHA. The majority of this land contains remnant vegetation, which can be considered a proxy for MNES values. Owing to a superior wind resource within the Project area and ready access to the NEM, an equivalent development elsewhere within the Einasleigh Uplands Bioregion (i.e. the western part of the Northern QREZ, furthest from the WTQWHA) would likely involve significantly greater disturbance of remnant vegetation and (by association) MNES habitat.

Two alternative configurations within the Project area were assessed; a more intensive Project (up to 200 turbines) and a less intensive Project (approximately 34 wind turbines on the freehold Glen Gordon property only). The more intensive configuration would eventuate in the clearing of rainforest habitat (which is avoided by the current design), include impacts within the buffer area around Arthur’s Seat (a site of significant Indigenous cultural importance), include direct impacts on MNES plant species associated with rocky pavement habitats (which are avoided by the current design), and extend the duration of amenity impacts to Wooroora Road residents and users. The less intensive configuration would provide greater separation of the Project from the WTQWHA, shorten the duration of amenity impacts to Wooroora Road residents and users, and reduce by over half the Project footprint and thus direct impacts to MNES. However, this alternative configuration would considerably decrease the nameplate generation capacity of the Project and would require this considerable shortfall to be met in a less efficient manner elsewhere in the Northern QREZ. Further alternatives were considered, including the potential avoidance of all wet sclerophyll vegetation (which would reduce the Project by 37 wind turbine generators), and the potential avoidance of all magnificent brood frog habitat. These were both also found to be unfeasible.

New fossil fuel power generation would add additional impetus to the extraction of coal resources in Central Queensland at a time when there is a global, national and state-wide push towards the phasing out of fossil fuel extraction and electricity generation. The fossil fuel alternative would be a significant departure from Australia’s international commitments including those under the Paris Climate Accord and the Glasgow Climate Pact. The fossil fuel alternative would contribute to the ongoing acceleration of climate change impacts globally, nationally, regionally and locally. Importantly, the fossil fuel alternative would add to the climate change impacts already threatening MNES throughout Australia, including those of the Project area and the WTQWHA. The fossil fuel alternative is also in direct contradiction with the fundamental principles of Ecologically Sustainable Development, which is the central objective of the EPBC Act.

## DESCRIPTION OF THE ENVIRONMENT

The northern portion of the Project area, including the Wooroora Homestead, the Glen Gordon Homestead and the Kara Outstation, were previously a focus of Jirrbal activity both before European colonisation and in the early pastoral history. The Wooroora and Glen Gordon Stations were established for pastoral purposes from the late 1800s. The Project area is currently used for cattle grazing, with areas ranging from degraded (in the north) to relatively undisturbed (in the south).



The Project area is not located within any Protected Area but is bounded by national parks and reserves to the east (that form part of the WTQWHA and National Heritage Place), by Ravenshoe Forest Reserve 1 to the north and by the Yourka Station special wildlife reserve to the southeast.

The Project area is located along the boundary of the Wet Tropics bioregion to the east and the Einasleigh Uplands bioregion to the west. Vegetation within the Project area is generally of remnant status (given the predominantly steep topography) and is dominated by various communities associated with woodlands or open forests. Small patches of discrete rainforest communities are located within the Project area; however, none of these are located within the Project footprint. Rainforest is largely located to the east of the Project area within the WTQWHA. In the flatter parts of the Project area, clearing has occurred for grazing, generally within proximity to the homesteads.

The Project area is located on the north-eastern edge of the Herbert River catchment, the largest catchment of the Wet Tropics region. The Herbert River flows in a generally south-eastern direction intersecting 15 major tributaries before discharging into the Coral Sea near Lucinda, Queensland. Blunder Creek is the largest waterway to traverse the Project area, flowing east to west across both properties before joining the Herbert River approximately 9 km to the west. The riparian vegetation associated with this waterway, and the waterway itself, provide habitat for a range of native species. Having permanent water available in various stretches of the creek, this waterway provides refuge habitat for wildlife during drier periods. In addition to Blunder Creek, there is a series of stream orders 1, 2 and 3 across the Project area, most of which are highly seasonal.

The Project area is located on the western edge of the Wet Tropics of Queensland and the dominant rainfall pattern is monsoonal. Alternating wet and dry seasons typically last for four to eight months although this can vary considerably, depending on the severity of the El Nino / Southern Oscillation. There is also variability in rainfall across the Project area (generally wetter in the east and drier in the west). Mean annual rainfall in the area ranges from 894 mm to 1,719 mm, with the wettest month being February, and the driest month being September (mean of 23.1 mm). Approximately three-quarters of the average annual precipitation occurs between the months of December and April.

The Project area is defined by a taller series of hills forming ridgelines, connected by numerous saddles or knolls, that extend along the eastern edge of the Wooroora property, and across the north of Wooroora and Glen Gordon. These ridges form the boundary of the local watershed formation, draining southwest through low plains and alluvial areas towards the Herbert River. The majority of the hills are associated with emergent granite formations rising to approximately 990 m AHD in the north of Glen Gordon, with the alluvial plains in the south of Wooroora being the lowest point within the Project Area at approximately 671 m AHD. The proposed wind turbine locations are predominantly situated on the eastern and northern ridgelines described above, or occasionally on other isolated scattered hills within the properties, with elevations ranging from 730 m to 990 m.

The following MNES are described in detail, in terms of their threat status, distribution, population, ecology and habitat preferences; known threats; survey effort; and Project area habitat assessment:

- Listed threatened ecological communities (TECs):
  - Mabi forest (complex notophyll vine forest 5b) TEC – critically endangered – not found within the Project area during Project surveys; and
  - Broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland TEC – endangered – not found within the Project area during Project surveys.
- Listed threatened species:
  - North Queensland lace (*Aponogeton bullosus*) – endangered – not found within the Project area during Project surveys;
  - *Homoranthus porteri* – vulnerable – found within the Project area during Project surveys;



- *Prostanthera clotteniana* – critically endangered – found within the Project area during Project surveys;
  - *Triplarina nitthaga* – vulnerable – found within the Project area during Project surveys;
  - Australian lace-lid (*Litoria dayi*) – vulnerable – not found within the Project area during Project surveys;
  - Magnificent brood frog (*Pseudophryne covacevichae*) – vulnerable – found within the Project area during Project surveys;
  - Mountain mistfrog (*Litoria nyakalensis*) – critically endangered – not found within the Project area during Project surveys;
  - Masked owl (northern subspecies) (*Tyto novaehollandiae*) – vulnerable – found within the Project area during Project surveys;
  - Red goshawk (*Erythrotriorchis radiatus*) – vulnerable – not found within the Project area during Project surveys;
  - Southern cassowary (southern population) (*Casuarius casuarius johnsonii*) – endangered – not found within the Project area during Project surveys;
  - White-throated needletail (*Hirundapus caudacutus*) – vulnerable, migratory – found within the Project area during Project surveys;
  - Ghost bat (*Macroderma gigas*) – vulnerable – not found within the Project area during Project surveys;
  - Koala (*Phascolarctos cinereus*) – up-listed from vulnerable to endangered on 12 February 2022 – not found within the Project area during Project surveys;
  - Northern greater glider (*Petauroides minor* syn. *Petauroides minor* in Queensland) – vulnerable – found within the Project area during Project surveys;
  - Northern quoll (*Dasyurus hallucatus*) – endangered – not found within the Project area during Project surveys;
  - Spectacled flying-fox (*Pteropus conspicillatus*) – endangered – not found within the Project area during Project surveys;
  - Spotted-tailed quoll (North Queensland subspecies) (*Dasyurus maculatus gracilis*) – endangered – not found within the Project area during Project surveys;
  - Yellow-bellied glider (Wet Tropics subspecies) (*Petaurus australis* Wet Tropics subspecies) – endangered – found within the Project area during Project surveys.
- Listed migratory species:
    - Black-faced monarch (*Monarcha melanopsis*) – found within the Project area during Project surveys;
    - Fork-tailed swift (*Apus pacificus*) – found within the Project area during Project surveys;
    - Latham’s snipe (*Gallinago hardwickii*) – not found within the Project area during Project surveys;
    - Rufous fantail (*Rhipidura rufifrons*) – found within the Project area during Project surveys;
    - Satin flycatcher (*Myiagra cyanoleuca*) – not found within the Project area during Project surveys; and
    - Spectacled monarch (*Monarcha trivirgatus*) – found within the Project area during Project surveys.



The values of the WTQWHA and NHP are also described, broadly and with specific reference to values that may be impacted by the Project. This includes an assessment of the Project area's indigenous values, as identified through cultural and archaeological investigations commissioned by the proponent through the Jirrbal People #4 (the Traditional Owners).

The Project area lies within the traditional lands of the Jirrbal Aboriginal people, one of five Wet Tropics rainforest groups that make up the Dyrbal Aboriginal language, all descendants from a single ancestor group. The Jirrbal estate saddles part of the central Wet Tropics NHP. The Indigenous values of the Wet Tropics NHP are not definitively mapped. As consultation and engagement progresses, more is learned about the cultural landscape of the Project area. The consultation and engagement continues to identify cultural sites, stories of creation beings movements across the Project area, and places of importance to Jirrbal people today.

The National Heritage List criteria describe the characteristics of a 'cultural landscape' and these are explored within this PER. Oral traditions also include Jirrbal intangible cultural heritage on their beliefs, traditions, customs, stories, and other non-physical cultural practices and knowledge, cultural heritage values that are a highly significant component of the Jirrbal cultural landscape.

Historical evidence shows some of the management methods Jirrbal people applied to shape and maintain their cultural landscape. Campsites and rainforest tracks were regularly burnt to keep them clear of vegetation, and the existence and maintenance of open grassy sclerophyll pockets, often on the fringe of the rainforest, allowed for the establishment of semi-permanent camp sites and for large inter-tribal ceremonial gatherings to take place.

Engagement with Jirrbal knowledge holders, site inspections, review of previous work and research commissioned for this PER identified a number of significant cultural site types within the broader Project area that contain heritage values similar to those protected by the National Heritage List in the Wet Tropics NHP. These include "pockets", "story places", walking tracks and campsites, and "supermarket ecosystems".

## IMPACT ASSESSMENT

Potential impact associated with construction and operation of the Project have been described and quantified where possible. Throughout the construction phase the Project has the potential to impact MNES values via the following:

- Vegetation clearing resulting in loss of habitat;
- Habitat fragmentation and reduced connectivity;
- Fauna injury or mortality during vegetation clearing and potential entrapment in trenches when installing underground powerlines;
- Fauna injury or mortality due to vehicle strike;
- Wildlife disturbance due to dust, noise, light and vibration emissions;
- Reduced water quality due to erosion and sedimentation;
- Potential spills of hazardous materials;
- Introduction or increased prevalence of pests and weeds due to increased vehicle movements and vegetation clearing;
- Increased risk of bushfire due to potential ignition sources on site associated with increased activity;
- Greenhouse gas emissions; and



- Potential disturbance of Aboriginal cultural heritage.

Throughout the operational phase, the Project has the potential to impact on MNES via the following:

- Fauna injury or mortality due to vehicle strike;
- Collision with turbines towers, blades and powerlines;
- Barotrauma;
- Wildlife disturbance due to noise and light emissions;
- Barrier effects;
- Potential spills of hazardous materials;
- Increased pests and weeds due to increased vehicle movements;
- Increased risk of bushfire due to potential ignition sources on site associated with increased activity; and
- Disruption of visual amenity.

Cumulative impacts on MNES are assessed for the Project in conjunction with other wind farm developments that are in operation, in construction or are being planned within the Tablelands region. The potential cumulative impacts of the Project in conjunction with anticipated climate change effects have also been considered.

The Project is not considered likely to lead to any significant facilitated impacts<sup>1</sup> on MNES, with the PER providing an assessment of potential new high voltage powerlines within the region (determined to be not facilitated by the Project), and an assessment of potential local government road upgrades at pinch points for component deliveries (determined to be negligible in the context of potential impacts to MNES).

The potential for the Project to lead to erosion and sedimentation impacts is investigated through a series of calculations through the Revised Universal Soil Loss Equation (RUSLE). The calculations determine that the Project will not lead to an increase in erosion and sedimentation impacts (above existing conditions) during construction or operation; largely due to the implementation of erosion and sediment measures and the Project's proposed rehabilitation commitments.

## **AVOIDANCE, MITIGATION AND MANAGEMENT MEASURES**

Early stages of the Project scoping and design included the commissioning of a range of due diligence assessments (both desktop and field) to understand the existing values of the Project area and surrounds. This included a wind measurement campaign, desktop and field ecological surveys, early engagement with the Jirrbal People #4, early engagement with the Wet Tropics Management Authority, engagement of planning and impact assessment specialists, engagement of civil engineers and engagement of landscape and visual amenity specialists.

The iterative nature of the Project design, progressively considering Project objectives, wind resource quality and environmental values demonstrates the Project's implementation of the mitigation hierarchy:

- Avoidance;
- Minimisation;

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<sup>1</sup> Facilitated impacts are those which result from actions (including actions by third parties) that are enabled by development of the Project.



- Mitigation;
- Rehabilitation; and
- Offset when all reasonable efforts for the preceding stages have been exhausted (unavoidable residual impacts).

This commitment to ecologically sustainable development practice has resulted in tangible and significant changes to the Project, the most notable of which involves a reduction in proposed wind turbines within the Project area from 200 to 86 (and associated decrease in Project footprint). This process sought to avoid impacts to the most significant and sensitive values within the Project area (both culturally and ecologically), and sought to incorporate the primary feedback from key stakeholders on the Project.

In particular, the following is noteworthy:

- Direct impacts have been avoided within the WTQWHA through Project design, with indirect impacts avoided through consideration of edge effects and the Outstanding Universal Values associated with the WTQWHA:
  - Maintaining a buffer of 600 m from the boundary of the WTQWHA;
  - Relocation and reorientation of the southern substation and switching station for the Project to avoid and minimise impacts to wet sclerophyll forest;
  - Removal of proposed infrastructure within wet sclerophyll forest in the south of Wooroora (reducing impacts to wet sclerophyll forest by 31%); and
  - Facilitating fauna movement through key patches of wet sclerophyll forest vegetation so as to ensure that the function of this buffering environment is retained through construction and operation of the Project.
- Impacts to rainforest habitats have been avoided through Project design;
- Impacts to Arthur’s Seat and other known culturally significant sites have been avoided through Project design;
- CWF has made a commitment to avoid ground-disturbing construction works during the highest rainfall months of January, February and March;
- To address potential impacts on the northern greater glider, any unavoidable removal of potential dens will be mitigated through installation of nest boxes and/or translocated stags within retained habitat on a 2:1 basis. Furthermore, any potential fragmentation impacts will be addressed through rope crossings and glider poles to connect areas of habitat across the construction and operational footprints; consistent with measures employed successfully for other linear infrastructure projects.

The following management plans have been prepared as part of this PER and are intended to be refined and expanded on by the Construction Contractor as the Project design progresses:

- Environmental Management Plan Outline;
- Preliminary Construction Management Plan (including a Preliminary Erosion and Sediment Control Plan);
- Sediment and Erosion Management Plan;
- Preliminary Bird and Bat Management Plan;
- Preliminary Fauna Management Plan;
- Preliminary Vegetation Management Plan; and
- Preliminary Weed and Pest Management Plan; and





- Preliminary Rehabilitation Plan.

## REHABILITATION

Rehabilitation of the areas disturbed by construction but not required for operational activities forms a critical element of the Project's efforts to minimise the extent and duration of impacts to MNES and the broader values of the Project area. A Preliminary Rehabilitation Plan has been prepared for the Project and is provided as part of this PER.

The Project has made an industry leading commitment to rehabilitate construction disturbances and retain only the minimum footprint required for safe operations of approximately 107.2 ha (0.3 % of the Project area). A focus of the Preliminary Rehabilitation Plan will be to rehabilitate habitat for those MNES assessed as having a significant residual impact including masked owl and greater glider (80 %, this also comprises potential habitat for koala) and magnificent brood frog (70 %) with a goal to rehabilitate 70 % of all other areas.

The purpose of the rehabilitation program is to facilitate the re-establishment of native ecosystems that are self-sustaining in the long-term and provide comparable habitat value to the pre-construction ecosystems. As the majority of the Project area currently supports remnant vegetation, this means the intention is for rehabilitated vegetation communities to have reached remnant status by the end of the operational lifetime of the proposed wind farm. In reality, achieving remnant status is likely to be achieved considerably earlier than this (15 to 20 years), and would be determined by comparing the rehabilitated vegetation communities with published benchmarks for the relevant regional ecosystems. This rehabilitation is a key strategy to address short-term habitat loss and potential fragmentation impacts associated with the Project.

Rehabilitation of 675 hectares of temporary construction disturbance will require an upscaling of the local and regional capability for large scale restoration and tree planting, involving a broad cross-section of non-government organisations, traditional owners and local community stakeholders. This capacity building has the potential to provide enduring value should this new capability be applied more broadly throughout the wet tropics bioregion.

## SIGNIFICANT IMPACT ASSESSMENT

The EPBC Act Matters of National Environmental Significance Significant Impact Guidelines 1.1 provide overarching guidance on determining whether an action is likely to have a significant impact on a matter protected under the EPBC Act. The Project has also been assessed against the requirements of the following:

- The Biodiversity Convention;
- The Apia Convention;
- CITES;
- International treaties relating to migratory birds: the Bonn Convention, CAMBA, JAMBA and ROKAMBA; and
- Various recovery plans and threat abatement plans.

The assessment has indicated that despite the application of rigorous mitigation measures, the Project is likely to have significant residual impacts on the magnificent brood frog, the masked owl, the northern greater glider, the koala and the spectacled flying-fox. The Project is not expected to have a significant residual impact on the natural heritage values of the WTQWHA, or on the natural or Indigenous cultural heritage values of the WTQNHP.



## OFFSETS

The Project is likely to result in a significant residual impact<sup>2</sup> on known and potential habitat for five MNES: magnificent brood frog, masked owl, northern greater glider, koala and spectacled flying-fox. Under the EPBC Act, environmental offsets are required to compensate for these impacts, after all reasonable efforts have first been made to avoid, minimise, mitigate and rehabilitate.

The Project has been conservatively assessed likely to have a significant residual impact on the koala, despite no evidence of koala having been found within the Project area during extensive survey effort. If koalas are present within the Project area, it is likely to be on a very sporadic basis, restricted to the riparian zones (which will not be affected by construction of the wind turbines themselves) and/or in low numbers. Nonetheless, potential habitat for the koala is widespread within the Project area and, given the species' recent decline due to multiple, ongoing threatening processes across its range, the koala is included as a significant residual impact.

An Offset Management Strategy is provided to identify the environmental offset requirements of the Project and to demonstrate the feasibility of securing a scientifically robust offset program, in support of securing Project approval. The Offset Management Strategy provides a description of offset delivery options and the Project's proposed offset delivery approach. It is currently intended that 100 % of the MNES offsets will be delivered as land-based offsets.

The Offset Management Strategy includes indicative offsets located on the host properties. The indicative offsets include three significant areas totalling more than 6,855 ha, primarily located immediately adjacent to the WTQWHA, including the largest patch of intact wet sclerophyll forest adjacent to the Tully Falls National Park, and the creation of formal connectivity between Koombooloomba National Park and Yourka Reserve Nature Refuge. The indicative offset areas total 6-11 times the size of the significant residual impacts.

In addition to 100% of direct land-based offsets, the Offset Management Strategy includes a significant indirect offset for the magnificent brood frog to advance the scientific knowledge for this species, in the form of contribution towards research of up to \$250,000, with further detail on the mechanics of this contribution to be discussed and agreed with DCCEEW and relevant stakeholders including the Magnificent Brood Frog Working Group. This is despite the Project impacting only 6.4 ha of known habitat for the magnificent brood frog (a further 114.1 ha is *potential* habitat critical to the survival of the species).

The indicative offset areas will be subject to further detailed field assessment and analysis using the EPBC offset calculator as the Project progresses.

## OTHER APPROVALS AND CONDITIONS

The Project will be undertaken in accordance with the requirements of both Commonwealth and Queensland legislation. The primary approvals for the Project are the approval under the EPBC Act (for which this PER is prepared) and, at the State level, the *Planning Act 2016* (Planning Act) for Material Change of Use (Wind farm development) and Operational Works (clearing native vegetation). On 30 June 2022 the Project received the State-level development permit under the Planning Act (ref: 2112-26517 SDA).

Other than the EPBC Act., the key legislation pertinent to the permitting and approval processes and environmental management for the Project is described within this PER.

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<sup>2</sup> A significant residual impact is defined an impact that remains after all reasonable efforts have been made to avoid, minimise and mitigate the impact, that is important, notable or of consequence, having regard to its context or intensity (Australian Government's Significant Impact Guidelines 1.1 for Matters of National Environmental Significance)



## CONSULTATION

### Local community and stakeholders

Ark Energy understands the importance and benefits to all parties of effective, comprehensive and meaningful consultation and is a signatory to the Clean Energy Council's 'Best Practice Charter for Renewable Energy Projects', which is a voluntary commitment to engage respectfully with communities, be sensitive to environmental and cultural values, and make a positive contribution to the regions in which it operates.

CWF has been engaged in consultation with key stakeholders since initial monitoring of the wind resource on host properties in 2017 and the local community more broadly since 2021. A Stakeholder and Community Engagement Plan (SCEP) was developed to guide consultation and identified a range of stakeholders likely to have an interest in the Project.

The CWF Project team includes consultation specialists and the approach to consultation has been guided by the International Association for Public Participation (IAP2), widely accepted as the benchmark, as well as various best practice guidelines. The approach has been genuine, open, inclusive and responsive, and focused on achieving optimal benefits and outcomes. A variety of methods and techniques have been used to facilitate consultation and seek feedback and input, including a dedicated website and contact channels, direct correspondence, in-person meetings, hosted site visits, regular newsletters, feedback forms, local public information sessions, a local information hub and a Community Advisory Group (CAG).

Guided by the interests of stakeholders and community members consultation has focused on five key areas:

- Ecological impacts;
- Transport route;
- Landscape and visual amenity;
- Aboriginal and cultural heritage; and
- Community benefits.

CWF has sought to identify and address concerns in a timely and professional manner, and wherever possible incorporate consultation input into the proposal to improve Project outcomes and community benefits. Input sourced through consultation with stakeholders and community members has significantly influenced the CWF Project's design and commitments. In particular, in response to engagement with ecology stakeholders including Wet Tropics Management Authority major design changes have been made to minimise the impact of clearing on wet sclerophyll forest, and the proposal includes industry-leading commitments for rehabilitation and significant, strategic offsets adjacent to the WTQWHA.

Future consultation will take the same approach and utilise the same methods and techniques. Areas of focus for future consultation will be collaboration with local stakeholders and community members to design the Community Benefit Program and collaboration with local environment stakeholders and community groups for the proposed rehabilitation and offset plans.

### Traditional Owners

Early in the development process, CWF identified that the Jirrbal People hold a registered Native Title claim (Jirrbal People #4) over the Project area. The Jirrbal People are legally represented by North Queensland Land Council (NQLC) as the recognised Native Title Representative Body for the region in which the Project is located.



Ark Energy engaged with NQLC as part of early planning for the Project and coordinated meetings to introduce the Project. Through NQLC, Ark Energy was advised that the proposed agreements for cultural heritage protection and management and Native Title consent should be between the Project and the named Applicants to the Jirrbal #4 Native Title Claim as the Statutory Party and Wabubadda Aboriginal Corporation Registered Native Title Body Corporate (WAC) as the Aboriginal Party Corporation.

Native Title has been extinguished on Glen Gordon Station due to the freehold form of tenure and the Leasehold tenure of Wooroora Station has not had Native Title extinguished. The Project was advised that the Aboriginal Party for the purpose of the *Aboriginal Cultural Heritage Act 2003* (ACHA) over the entire Project area is the Registered Native Title claimants and that the coordination of services from Jirrbal representatives for the operation of the CHMA would be performed by WAC. The NQLC are privy to extensive genealogy and anthropological records which have been used to substantiate to the satisfaction of the National Native Title Tribunal that the Jirrbal #4 applicants have a connection to the Project area and they also maintain a confidential database of individuals who are recognised as being Jirrbal people. As is customary and appropriate, the Project has relied on the NQLC, Jirrbal Applicants and WAC to identify people who should be invited to receive Project information and to provide feedback to the Project.

The Project commenced discussions about cultural heritage identification and management in September 2020 and agreed to negotiate a CHMA for the Project. Both the Project and Jirrbal representatives agreed the importance of documenting a comprehensive CHMA before the Project progressed any ground disturbing site activities. The CHMA was negotiated with legal advice and support being provided to Jirrbal representatives via NQLC, and the Agreement was executed by the parties in late October 2020. The CHMA will continue to be the principal arrangement for identification and management of cultural heritage.

An Indigenous Land Use Agreement (ILUA) for Wooroora Station was endorsed by the Jirrbal #4 Applicants and WAC on 7 May 2022 and subsequently signed by the Applicants, WAC and CWF.

## **Publication of Draft PER**

On 7 November 2022, DCCEEW considered the Draft PER to have adequately addressed the PER Guidelines and directed the proponent to publish the Draft PER pursuant to section 98 of the EPBC Act. The Draft PER was consequently available for public comment from 7 November 2022 to 9 January 2023.

There were 783 submissions received to the Draft PER, across 609 unique respondents. Key issues or matters raised within the submissions included:

- Adequacy of the Draft PER in relation to the PER Guidelines;
- Alignment of the Project with broader Federal and State Government Policies and initiatives;
- Methodology applied for the field surveys and significant residual impact assessment for MNES;
- Potential impacts associated with noise emission and electromagnetic frequencies;
- Landscape and visual impacts attributable to the Project;
- Construction and operational impacts of the Project and the cumulative effects in the context of other wind farm projects in the region;
- Loss of habitat, survey effort and impacts from the introduction of weed and pest species contributing to the reduction of MNES species including koala, magnificent brood frog and red goshawk;
- Indirect impacts to the Wet Tropics Queensland World Heritage Area and its associated Outstanding Universal Values, including clearing of wet sclerophyll forest;



- Alternatives to the Project including: location, capacity, configuration and other energy generating technologies;
- Support for the Project and the objectives to assist with achieving Queensland's renewable energy targets;
- Reliability of proposed environmental offsets for delivering net benefit for MNES;
- Soil loss during construction, the appropriateness of erosion and sediment control measures, and potential impacts to waterways, the Great Barrier Reef and aquatic species;
- Emissions generated by the manufacturing of the Project materials, loss of carbon storage from vegetation clearing and the viability of the Project in comparison to other electricity generating alternatives;
- Success of rehabilitation of temporary construction areas and ongoing maintenance and responsibility of the rehabilitation program;
- Scope and effectiveness of consultation and engagement with local residents and other stakeholders;
- Effectiveness of consultation with Traditional Owners;
- Social and economic benefits of the Project, short and long term, and the outcomes for local and regional communities;
- Impacts of proposed transportation routes and construction activities on local communities; and
- Management of materials and the reuse and recycling of turbines at decommissioning.

CWF has taken account of the issues raised within the submissions and a response to each issue is provided in Appendix U of this Final PER. The Final PER has been updated where necessary to provide additional information to respond to matters raised in the submissions, and as a natural consequence of project evolution.

## **ENVIRONMENTAL RECORD OF THE PROPONENT**

CWF is a special purpose vehicle created for the Project and is a subsidiary of Ark Energy Projects Pty Ltd (formerly Epuron Projects Pty Ltd). Such project companies are commonplace to hold the agreements and approvals throughout the life of the project should wider ownership change and ensures that commitments made at any stage of the project must be maintained by an eventual owner or investor in the project. Ark Energy has been developing renewable energy projects since 2003, with the successful permitting of over 4,000 MW of wind farm projects and over 400 MW of solar farm projects. Ark Energy is committed to avoiding, minimising and mitigating potential environmental impacts through the development of its renewable energy project portfolio.

Ark Energy's projects have a history of responsible environmental management. There are no past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment, or the conservation and sustainable use of natural resources against Ark Energy.

Ark Energy aims to ensure that all of its developments meet industry best practice, and that development practices are continually improved. Ark Energy is a leader in the renewable energy industry's best practice endeavours; contributing to the development of various government and industry guidelines, and taking a lead on project commitments. For example, Ark Energy (as Epuron) was the first company in Australia to propose a community development fund as part of a renewable energy project, a commitment that continues to this day.

Ark Energy will commit the Project to a suite of management actions outlined in this PER and associated documents.



## ECONOMIC AND SOCIAL MATTERS

An economic and social impact assessment has been undertaken of the Project as part of the PER. The Project will provide economic activity to the local, regional and Queensland economy during both the construction and operation phase.

The annual construction impact of the Project on the local economy is estimated at up to:

- \$194M in annual direct and indirect output;
- \$79M in annual direct and indirect value-added;
- \$31M in annual direct and indirect household income; and
- 418 direct and indirect jobs.

The Project is estimated to make up to the following total annual contribution to the local economy during operations:

- \$111M in annual direct and indirect regional output or business turnover;
- \$93M in annual direct and indirect regional value-added;
- \$4M in annual direct and indirect household income; and
- 49 direct and indirect jobs.

For both the construction and operations phases, these benefits are progressively larger at the regional and Queensland levels.

The Project proposes to work in partnership with Tablelands Regional Council and the local and regional community to help maximise the projected economic local and regional benefits whilst minimising potential impacts. In this respect, a range of general economic impact mitigation and management measures are proposed and will include:

- Employment of local and regional residents preferentially, including traditional owners and gender diversity, where they have the required skills and experience.
- Participating, as appropriate, in business group meetings, events or programs in the local and regional community.
- Locally source non-labour inputs to production where local and regional producers can be cost and quality competitive.

In February 2022, CWF announced a Community Benefit Fund (CBF) for the life of the project (commencing during construction) to provide enduring value to the Ravenshoe and associated Tablelands LGA communities from the Project. The CBF is intended to share an industry-leading allocation of funds approximating \$500,000 per annum towards initiatives the community cares about. Initial feedback from stakeholders indicates the community could benefit from the CBF by allocations towards a shortage of affordable housing and in response to emergencies and natural disasters.

A greenhouse gas assessment has been undertaken to quantify the anticipated greenhouse gas emissions associated with the Project through the following processes:

- Energy expended in the production of materials (i.e. embodied energy);
- Fuel consumed through the transportation of materials to site; and
- Loss of carbon sequestration potential through the clearing of vegetation.



Conversely, a wind energy project provides an opportunity to achieve greenhouse gas reductions through replacement of bituminous coal as a fuel source. The greenhouse gas savings of a wind energy project are represented by the emissions that would occur if the equivalent energy output was achieved using fossil fuels.

The total greenhouse gas 'cost' of the Project is estimated at 920,662 t CO<sub>2-e</sub> and will occur primarily during the construction phase. Once operational, the wind turbines are predicted to reduce Australia's greenhouse emissions by 596,309 t CO<sub>2-e</sub>/year. At this rate, the Project will offset its greenhouse costs within 1.5 years of commencing operations. Over the full operational life of the wind turbines, the GHG savings facilitated by the Project are expected to be 20 times greater than the emissions associated with its construction. Therefore, the Project is justifiable from a greenhouse perspective.

## CONCLUSIONS

Climate change and its consequent manifestations (e.g. higher temperatures, rising sea levels, melting of polar ice caps, desertification, ecosystem destabilisation, and more frequent and more intense natural disasters) is a major global threat to biodiversity, ecosystem services and ecological integrity. It is also recognised as the biggest known health threat to humanity. Globally, there is now a recognised urgency to act swiftly and meaningfully to slow down climate change. This will require systemic changes to many aspects of our lives, including how our electricity is generated, distributed and consumed. Fundamental to this is the transition away from the reliance on fossil fuel energy sources, and the uptake of utility-scale renewable energy generators.

Alternative energy generators must be cost-competitive with fossil fuel generators if they are to experience the uptake required across the world to work towards decarbonisation. Of all the energy sources, wind and solar photovoltaic generation have the lowest levelized cost of energy (LCOE) for new-build utility-scale generation within Australia. Wind energy sources provide ideal complementarity to solar generation in Queensland, as wind speeds typically increase during the night-time when solar generation is not available.

The Queensland Government and AEMO has, through the QREZ initiative, sought to strategically identify the best places for future renewable energy projects in Queensland. The Northern QREZ is one of the locations earmarked for the future concentration of renewable energy projects. Key factors to determine the most prospective places within the Northern QREZ for wind farm projects include certainty of wind resource, ready access to the grid and appropriate separation from dense settlements. The Project is located in a sparsely populated area of excellent wind resource and strong grid infrastructure with the capacity to handle the generation from the Project.

The WTQWHA is located adjacent to the Project area, with a minimum separation distance of 600 m from the closest Project infrastructure, and a much larger buffer for all other Project infrastructure. CWF has sought to ensure that the Project design was undertaken with the primary driver of avoiding and minimising potential impacts to the WTQWHA and other MNES, all while having the "bigger picture" of the LCOE, the Northern QREZ and the decarbonisation of the local, regional, national and global economies in mind.

Detailed studies across the Project area for 24 months have helped to inform the Project design. The Project is now less than 50% of its original proposed size, and avoids what the Project team determined to be "no-go" areas due to their high levels of ecological and cultural sensitivity. Following feedback from stakeholders since the EPBC Act referral, and advancement of the feasibility studies, a further eight wind turbines have been removed to reduce clearing in wet sclerophyll forest with an associated reduction in access roads by 27 km and relocation of the southern substation and associated reduction in internal overhead transmission lines by 4 km. These significant changes further reduce the clearing in wet sclerophyll forest by 31%. Construction involving earth disturbance activities during the peak wet season months of January to March will also be avoided.

A significant increase in biodiversity offsets is proposed, to ensure a net positive impact, including three significant areas totalling more than 6,855 ha, primarily located immediately adjacent to the WTQWHA, including the largest



patch of intact wet sclerophyll forest adjacent to the Tully Falls National Park, and the creation of formal connectivity between Koombooloomba National Park and Yourka Reserve Nature Refuge.

This PER demonstrates how the Project has avoided impacts on MNES to the extent possible while balancing the need to access the wind resource as a replacement for fossil fuels to mitigate climate change. Consequently, the proposed action is assessed as having an unavoidable significant residual impact on five individual MNES (the magnificent brood frog, the masked owl, the northern greater glider, the koala and the spectacled flying-fox). These significant residual impacts are unavoidable; however, the PER has shown that these impacts can be mitigated and offset in accordance with the EPBC Act Offsets Policy.

Sufficient areas are available on the two host properties (i.e. within the Project area) for land-based offsets for the magnificent brood frog, masked owl, northern greater glider, koala and spectacled flying-fox. Indirect offsets are also proposed in the form of contribution towards research for the magnificent brood frog (in addition to 100% land-based offsets) given there is little known scientifically about this species.

Significantly, the Project has made an industry-leading commitment to rehabilitate 70 % of the construction footprint, to restore habitat and connectivity, a first of its kind. Rehabilitation will reduce the temporary construction footprint from 1,071.1 ha (3.4 %) to an operational footprint of 107.2 ha (0.3 %) over time, involving local community, traditional owners and non-government organisations. Importantly, the PER has demonstrated that the Project will not have a significant residual impact on the WTQWHA. Impacts to wet sclerophyll forests have been avoided and minimised to the greatest practical extent through iterative and sensitive design, with the residual impacts (117 ha) representing 0.17% of the wet sclerophyll forest available in the broader Wet Tropics bioregion. The Project also represents a step towards addressing climate change, which is recognised as the most significant threat to the WTQWHA. In this context, it is important to note that the carbon lifecycle of the Project demonstrates a clear and overwhelmingly significant benefit; the Project will be carbon neutral within 1.5 years of operation, and will offset 20 times the carbon liability associated with the construction of the Project when compared with a similar-sized coal fired power station.

The Project will provide significant net benefit to the Ravenshoe Community and Tablelands Regional Council local government area in the form of socio-economic benefits during the construction and operational phases. Economic stimulus is estimated at \$100 m to \$250 m in direct and indirect expenditure in the local region during the construction phase. To ensure enduring value during the operational phase, the CWF Project has made a commitment to an industry-leading Community Benefit Fund of approximately \$500,000 per annum for the life of the Project. Based on feedback from the community, it is expected that the Community Benefit Fund would contribute towards social housing and emergency relief initiatives, to be determined by the Community Advisory Committee being established for the Project. The Indigenous Land Use Agreement will provide further benefits for the traditional owners of the land including access to country in addition to financial, training and employment initiatives.

The Project also provides significant benefits at a larger scale in the form of the Queensland Government's commitment towards 70 % renewable energy by 2032 and in satisfying LCOE imperatives, and the broader global driver for renewable energy projects to replace fossil fuel generation sources. These measures are necessary at a global level to address climate change and in turn mitigate a key threatening process to the WTQWHA and the various MNES within the Project area.

For these reasons, the Project advances the principles of ecologically sustainable development, and the objectives and requirements of the EPBC Act.





## Acronyms and Abbreviations

Abbreviation	Term
°C	Degrees Celsius
\$m / \$M	Million dollars
ACH Act	<i>Aboriginal Cultural Heritage Act 2003 Qld</i>
ADR	<i>Accepted development requirements for operational work that is constructing or raising waterway barrier works</i>
AEMO	Australian Energy Market Operator
AEP	Annual Exceedance Probability
AHD	Australian height datum
ALA	Atlas of Living Australia database
AMD	Acid and Metalliferous Drainage
ANZSIC	Australia and New Zealand Standard Industrial Classification
ARF	Areal reduction factor
ARR	Australian Rainfall and Runoff (Guideline)
AS	Australian Standard
asl	Above sea level
ASS	Acid sulfate soils
AWC	Australian Wildlife Conservancy
BACI	Before-After-Control-Impact
BBMP	Bird and Bat Management Plan
BESS	Battery energy storage system
BMP	Bushfire Management Plan
BoM	Bureau of Meteorology
BPESC	Best Practice Erosion and Sediment Control
BUS	Bird utilisation surveys
CAFNEC	Cairns and Far North Environment Centre
CAG	Community Advisory Group
CAMBA	China-Australia Migratory Bird Agreement
CBA	Cost Benefit Analysis
CBF	Community Benefit Fund
CEC	Clean Energy Council
CEMP	Construction Environmental Management Plan
CHMA	The Cultural Heritage Management Agreement between Epuron Projects Pty Ltd ( <b>Proponent</b> ); Angela Braun, Elizabeth Cashmere, Bradley Go Sam and Kathleen Haines



Abbreviation	Term
	( <b>Statutory Party</b> ); and Wabubadda Aboriginal Corporation RNTBC (ICN: 7117) ( <b>Aboriginal Party Corporation</b> )
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
CMS	Conservation of Migratory Species
CO <sub>2-e</sub>	Carbon Dioxide Equivalent
CRC	Carrion removal coordinator
CWF	Chalumbin Wind Farm Pty Ltd
DAF	Queensland Department of Agriculture and Fisheries
DATSIP	Department of Aboriginal and Torres Strait Islander Partnerships
DAWE	Australian Department of Agriculture, Water and the Environment (former)
DBH	Diameter at breast height
DBMP	Direct Benefit Management Plan
DBNGP	Dampier to Burnbury Natural Gas Pipeline
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DCDB	Digital cadastral database
DEM	Digital elevation model
DES	Queensland Department of Environment and Science
DEWHA	(former) Australian Department of Environment, Water, Heritage and the Arts
DNISP	Distribution Network Service Provider
DoEE	(former) Australian Department of Environment and Energy
DoR	Queensland Department of Resources
DSDILGP	Queensland Department of State Development, Infrastructure, Local Government and Planning
DRDMW	Queensland Department of Regional Development, Manufacturing and Water
DSE	Victorian Department of Sustainability and Environment
DSEWPC	(former) Australian Department of Sustainability, Environment, Water, Population and Communities
DSM	Digital surface model
EA	Environmental Authority
EDL	Ecologically dominant layer
EHP	(former) Queensland Department of Environment and Heritage Protection
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EO Reg	<i>Environmental Offsets Regulations 2014 Qld</i>
ESCP	Erosion and Sediment Control Plan



Abbreviation	Term
EP Act	<i>Environmental Protection Act 1994 Qld</i>
EP Reg	<i>Environmental Protection Regulation 2019 Qld</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 Cth</i>
EPP	Environmental Protection Policy
EPP (Air)	<i>Environmental Protection (Air) Policy 2019 Qld</i>
ERA	Environmentally Relevant Activity
ESD	Ecologically Sustainable Development
EVNT	Endangered, Vulnerable or Near Threatened (under the NC Act)
FCAS	Frequency control ancillary services
FID	Final Investment Decision
FSC	Fauna spotter catcher
GDA	Geocentric Datum of Australia
GHG	Greenhouse Gas
GJ	Gigajoule
GJ/t	Gigajoules per tonne
GPS	Global positioning service
GRP	Gross regional product
GW	Gigawatt
GWh	Gigawatt hours
GWh/annum	Gigawatt hours per annum
ha	Hectare
HBT	Hollow bearing trees
HRWF	High Road Wind Farm
IAP2	International Association for Public Participation
IECA	International Erosion Control Association
IFD	Intensity, frequency and duration
ILUA	The Indigenous Land Use Agreement for the Project registered on 4 November 2022, known as the Chalumbin Wind Farm Area ILUA (National Native Title Tribunal reference QI2022/013).
IO	Input-Output
ISP	Integrated System Plan
IUCN	International Union for the Conservation of Nature
J#4	Jirrbal People #4
JAMBA	Japan-Australia Migratory Bird Agreement
LiDAR	Light imaging detection and ranging



Abbreviation	Term
kg/ha	Kilograms per hectare
km	Kilometre
km/h	Kilometres per hour
KPI	Key Performance Indicator
kV	Kilovolt
LCOE	Levelised cost of energy
LGA	Local government area
LiDAR	Light detection and ranging
LVIA	Landscape and Visual Impact Assessment
m	Metre
MCU	Material change of use
MEWF	Mount Emerald Wind Farm
MJ/kWh	Megajoules per kilowatt hour
MLES	Matters of Local Environmental Significance
mm	Millimetres
MM	(meteorological) monitoring mast
MNES	Matters of National Environmental Significance
m/s	Metres per second
MSDS	Material Safety Data Sheet
MSES	Matters of State Environmental Significance
MW	Megawatt
NBSAP	National Biodiversity Strategy and Action Plan
NC Act	Queensland <i>Nature Conservation Act 1992</i>
NC Regulation	<i>Nature conservation (Wildlife) Regulation 2006</i> Qld
NEM	National Electricity Market
NHP	National Heritage Place
NIASA	Nursery Industry Accreditation Scheme Australia
NQLC	North Queensland Land Council
NRM	Natural Resource Management
NSW	New South Wales
NT Act	<i>Native Title Act 1993</i> Cth
O&M	Operations and maintenance
OAMP	Offset Area Management Plan
OHTL	Overhead transmission line



Abbreviation	Term
OMS	Offset Management Strategy
OPW	Operational works
OUV	Outstanding universal value
OVA	Other value-added
PER	Public Environment Report, this document
Planning Act	<i>Planning Act 2016</i> Qld
PMST	Protected Matters Search Tool
PO	Performance Outcome
PVC	Polyvinyl chloride
QCCCE	Queensland Climate Change Centre of Excellence
QEOP	Queensland Environmental Offset Policy version 1.11
QFES	Queensland Fire and Emergency Services
Qld	Queensland
QPWS	Queensland Parks and Wildlife Service
QREZ	Queensland renewable energy zone
RE	Regional ecosystem
REZ	Renewable Energy Zone
RFFE	Regional Flood Frequency Estimation
RFS	Rural Fire Service
RM	Rational method
RNTBC	Registered Native Title Body Corporate
RPP	Riverine Protection Permit
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
RSA	Rotor swept area
RUSLE	Revised Universal Soil Loss Equation
SARA	State Assessment and Referral Agency (Qld)
SCEP	Stakeholder and Community Engagement Plan
SGS	Sub-grid sampling
SLO	Social Licence to Operate
SMP	Species Management Program
SPRAT	Species Profiles and Threats (database)
SRI	Significant Residual Impact
State Code 16	State Code 16: Naïve vegetation clearing (Qld)
State Code 23	State Code 23: Wind farm development (Qld)



Abbreviation	Term
t	Tonne
t CO <sub>2-e</sub> per annum	Equivalent tonnes of carbon dioxide emissions per annum
TEC	Threatened ecological community
TNSP	Transmission Network Service Provider
TRC	Tablelands Regional Council
TREAT	Trees for the Evelyn and Atherton Tablelands
TSSC	Threatened species scientific committee
UBWF	Upper Burdekin Wind Farm
VM Act	<i>Queensland Vegetation Management Act 1999</i>
VPS	Vantage point surveys
WAC	Wabubadda Aboriginal Corporation
Waste Act	<i>Waste Reduction and Recycling Act 2011 Qld</i>
Water Act	<i>Water Act 2000 Qld</i>
WHA	World Heritage Area
WoNS	Weed of National Significance
WPMP	Weed and Pest Management Plan
WT	Wet Tropics
WTG	Wind turbine generator
WTMA	Wet Tropics Management Authority
WTQ	Wet Tropics of Queensland
WTQNHP	Wet Tropics of Queensland National Heritage Place
WTQWHA	Wet Tropics of Queensland World Heritage Area