3.0 Feasible Alternatives

A background to the reasons for development of the action is provided in **Section 1.5** of this PER. Supporting the implementation of the Northern QREZ (described in **Section 1.5**) are a series of factors that provide overwhelming justification for the pursuit of renewable energy developments in this region. It is important to describe these factors before appropriately identifying and unpacking potential feasible alternatives to the Project, as this context must be factored into the consideration of alternatives.

The Project area is situated within the Northern QREZ, and in this specific location due to its proximity to existing and future transmission infrastructure, its low population density and its excellent wind energy resources (in comparison to other parts of the Northern QREZ). As a general rule, a viable wind resource is one that averages wind speeds of well over 7 m/s at the wind turbine hub height. This severely limits the locations where a wind project is likely to be viable within inland areas of Queensland, which are generally less windy than some of the southern Australian states. When other important project development factors are overlaid (e.g. ease of grid connection, land agreements, population density, etc.) it becomes apparent that there are few opportunities to develop viable wind farm projects in Queensland near the existing high voltage transmission network. This is best described in **Plate 3-1**, which demonstrates the limited opportunities for potential wind farm projects in the broader region.

Plate 3-1 is also overlaid with the extent of regulated vegetation (Category A and B under the *Vegetation Management Act 1999*), which demonstrates the constrained opportunities to develop a wind farm in this prospective northern Queensland wind resource without requiring clearing of regulated vegetation across most of the subject site. For the purposes of this PER, the presence of regulated vegetation throughout the broader region can be considered to be a proxy for MNES values of varying degrees.

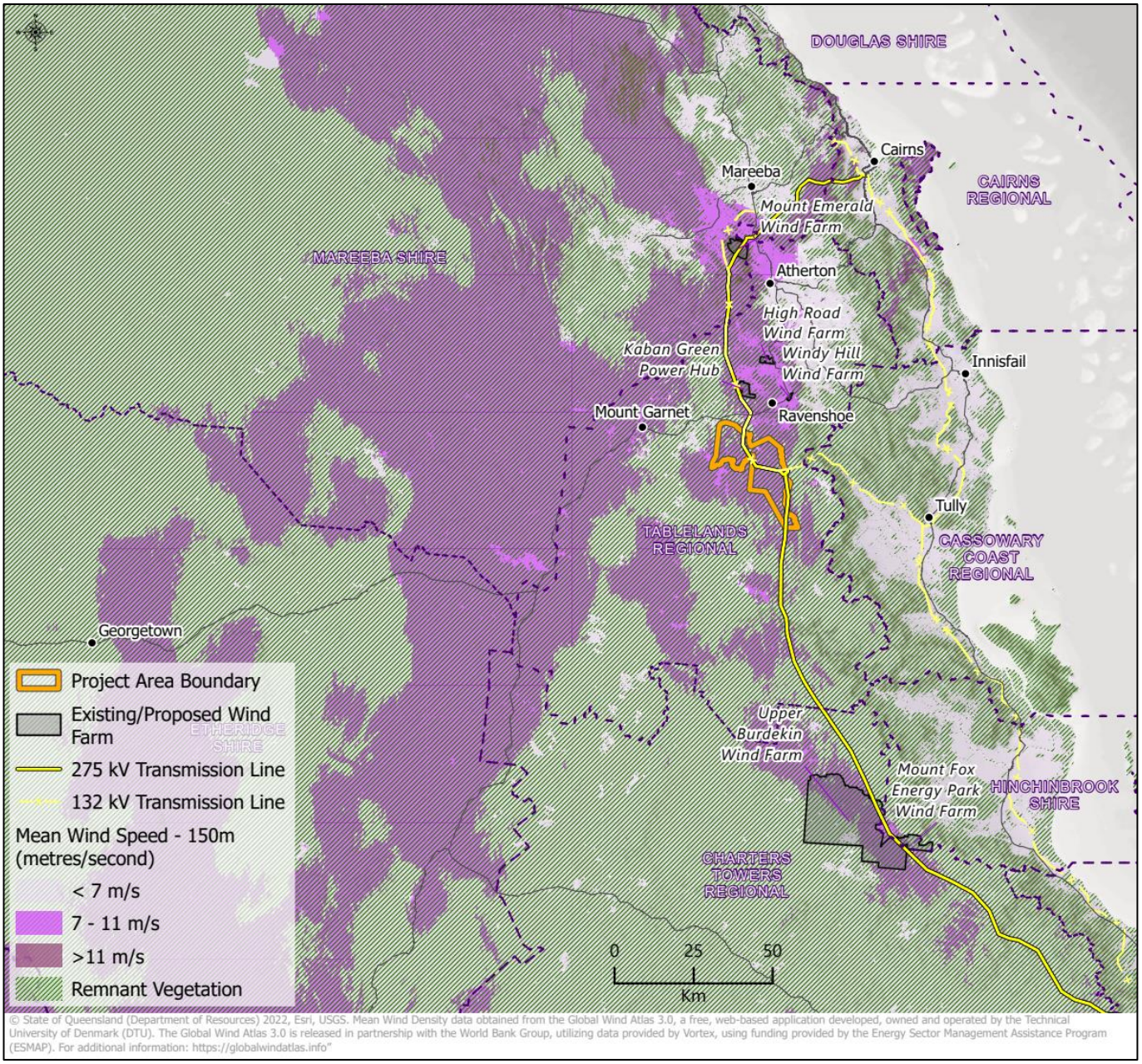


Plate 3-1 Areas of Prospective Wind Resource in the Broader Region, Proximity to Grid Infrastructure, Existing and Proposed Wind Farms, and Extent of Category A and B Regulated Vegetation

The following sub-sections of this PER explore the potential feasibility of various alternatives to the proposed action.

3.1 The "No Action" Alternative

The "No Action" alternative consists of the two host properties being left to support their current land uses in perpetuity. This alternative would see no wind farm development within the Project area. The values of the Project area described in **Section 4.0** would remain on their current trajectory (i.e. largely intact but with ongoing grazing activities and an increasing pest animal presence), and the potential impacts associated with the Project described in **Section 5.0** would not occur.

The "No Action" alternative would mean that the 602 MW of electricity associated with the Project would continue to be supplied by existing coal-fired power stations; the assumed direct displacement of carbon for the Project is equivalent to the emissions of 596,309 t $CO_{2\text{-}e}$ per annum. The "No Action" alternative would result in a significant loss of benefits at the local, State and National level, including but not limited to:

- Lost opportunity to harness an economic wind resource specific to this location and within the Northern QREZ;
- Lost opportunity to efficiently utilise the grid capacity (or, infrastructure) that already exists at this location;
- Lost opportunity to access the land and resultant loss of annual benefits to landholders in relation to commercial agreements to sub-lease the land for the proposed wind farm;
- Lost opportunity for traditional owners to realise the benefits under an Indigenous Land Use Agreement including financial contributions, training and employment;
- Lost opportunity for local employment during the construction and operational phases;
- Lost opportunity for significant local benefits via the Project's proposed Community Benefit Fund administered by the Community Advisory Group;
- Lost opportunity to displace historically more expensive non-renewable electricity and the lost opportunity to contribute to the AEMO 2022 ISP Step Change scenario;
- Lost opportunity to contribute to State targets of 70% renewable energy by 2032;
- Lost opportunity to contribute to Australia's international obligations including the Paris Climate Accord and the Glasgow Climate Pact; and
- Lost opportunity to mitigate a key threatening process to the OUVs of the WTQWHA.

Nevertheless, the "No Action" alternative would mean that given the strong demand for renewable energy projects would not dissipate; rather, there would be pressure for more intensive renewable energy developments (most likely wind farms) within nearby areas in order to capitalise on the strategic nature of the Northern QREZ, and specifically this locale within the Northern QREZ with sufficient wind resources and available grid connection. Given the history of previous vegetation removal throughout the Project area, it is conceivable to suggest that the "No Action" alternative would lead to sporadic clearing and ongoing selective timber logging practices within the Project area to support the existing and future agricultural pursuits.

More broadly, due to the unrelenting pressure for renewable energy projects, the "No Action" alternative would be reasonably expected to lead directly to the "Alternative Location" scenario described in **Section 3.2**.

3.2 An Alternative Location in the Northern QREZ

There are few alternative locations for the Project within the Cairns to Townsville section of Northern QREZ where the wind 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 Wet Tropics World Heritage Area as illustrated (see **Plate 3-2**). Furthermore, the majority of this land contains remnant vegetation.

Like any resource development, wind farm developments target a balance of the highest quality wind resource and closest proximity to existing fixed infrastructure. Furthermore, unlike coal or mineral resources where the mining tenements granted by the State provides legislated access to land for the project owner, wind resources do not currently have a tenement system; thereby requiring the wind developer to secure commercial agreements with landholders.

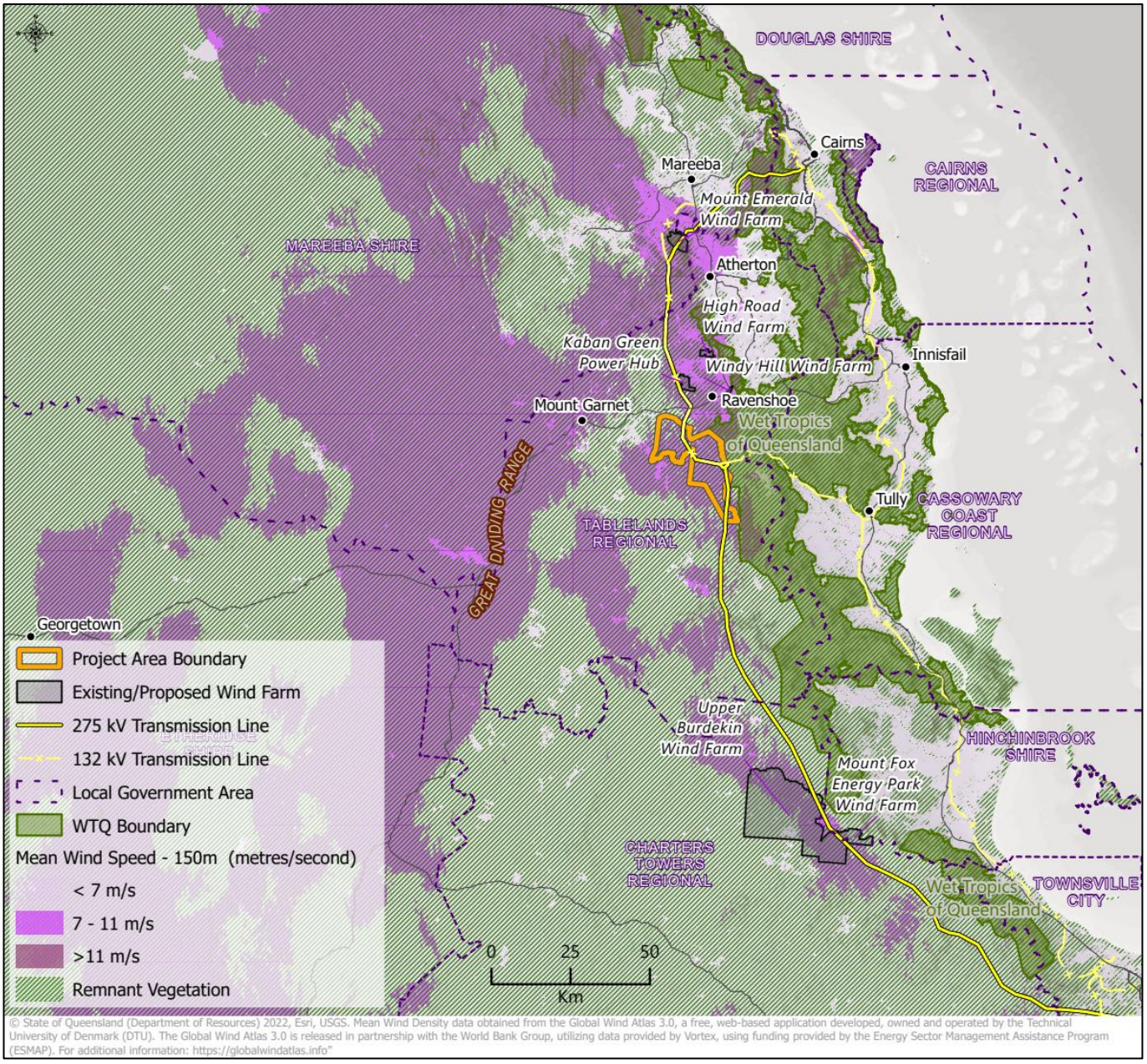


Plate 3-2 Areas of Prospective Wind Resource in the Broader Region, Proximity to Grid Infrastructure, Existing and Proposed Wind Farms, Extent of Category A and B Regulated Vegetation, and Extent of the WTQWHA.

When defining an Alternative Location scenario, it is necessary to stipulate:

- No alternative locations are considered feasible if they are within the Wet Tropics World Heritage Area. Therefore, such an alternative location is not explored in this PER.
- No alternative location on the eastern side of the Wet Tropics World Heritage Area is considered feasible, due to the presence of large settlements. Therefore, such an alternative location is not explored in this PER.
- World Heritage Areas are not considered feasible locations for a wind farm; therefore, the potential for offshore wind farms in the Great Barrier Reef WHA was not considered to be a feasible alternative to the action.

- Any alternative location of comparable wind resource and grid connection within the Northern QREZ is considered to have comparable ecological qualities and comparative proximity to the Wet Tropics World Heritage Area, and is likely to be closer to existing communities (refer to **Plate 3-2**). There are limited, if any, such opportunities. Therefore, such an alternative location is not explored in this PER.

- One common query fielded from Project stakeholders relates to why the Project is proposed within a largely vegetated environment, when there may be cleared farmland available for use in the broader region. An alternative location within the Northern QREZ in a more highly modified landscape (historically cleared for agricultural purposes) is not a feasible alternative, as there are no locations within the broader region that are sufficiently devoid of remnant vegetation (notwithstanding wind resource) (refer to **Plate 3-2**).

- An alternative location within the Northern QREZ therefore will necessarily involve the proposed placement of wind farm infrastructure within remnant vegetation within either the Einasleigh Uplands Bioregion or the Gulf Plains Bioregion. Considering the driver of proximity to existing grid infrastructure, it is considered that the alternative location should be assessed within the Einasleigh Uplands Bioregion[7]. It is conservatively assumed that an alternative renewable energy project capable of generating the Project's 1,985 GWh of electricity per year is likely to involve 30% more WTGs requiring 30% greater clearing footprint. Such a scenario would therefore be likely to:

  - Involve up to 112 WTGs;
  - Involve a project footprint of up to 1,436 ha (wind farm infrastructure);
  - Require an increase of 30% capital costs ;
  - Require 2 to 3 years of feasibility studies, wind resource monitoring and seasonal ecology surveys, thereby delaying the generation of renewable energy by at least 3 years;
  - Require an increase of 30% operational costs (conservatively).

The increased capital and delay to market is likely to significantly affect the attractiveness for investment in such a project.

The Einasleigh Uplands bioregion occurs within the Project Area. The MNES that may be significantly impacted by the alternative location scenario are therefore consistent with those identified for the Project in **Section 5.0** of this PER, with the exception of those MNES encountered within rainforest environments of the Wet Tropics bioregion. It should be noted that the Project footprint avoids direct impacts to rainforest environments and indirect impacts are to be managed through the measures identified in **Section 6.0** of this PER. Therefore, the Alternative Location scenario can be conservatively expected to have at least 30% greater impact on MNES (in terms of habitat clearing) than the Project.

3.3 An Alternative Configuration at Chalumbin

With the established understanding that the Project is optimally located within the Northern QREZ, it is necessary to explore potential alternative configurations within the Project area. These could be effectively explored as two separate alternative scenarios:

- A more intensive Project within the Project area; and
- A less intensive Project, with development only within the freehold Glen Gordon property.

[7] For ease of assessment it is conservatively considered that such an alternative location would include a direct on-site connection to the existing grid infrastructure, although there are few known opportunities for this to occur in the region.

3.3.1 The Higher Intensity Configuration Alternative

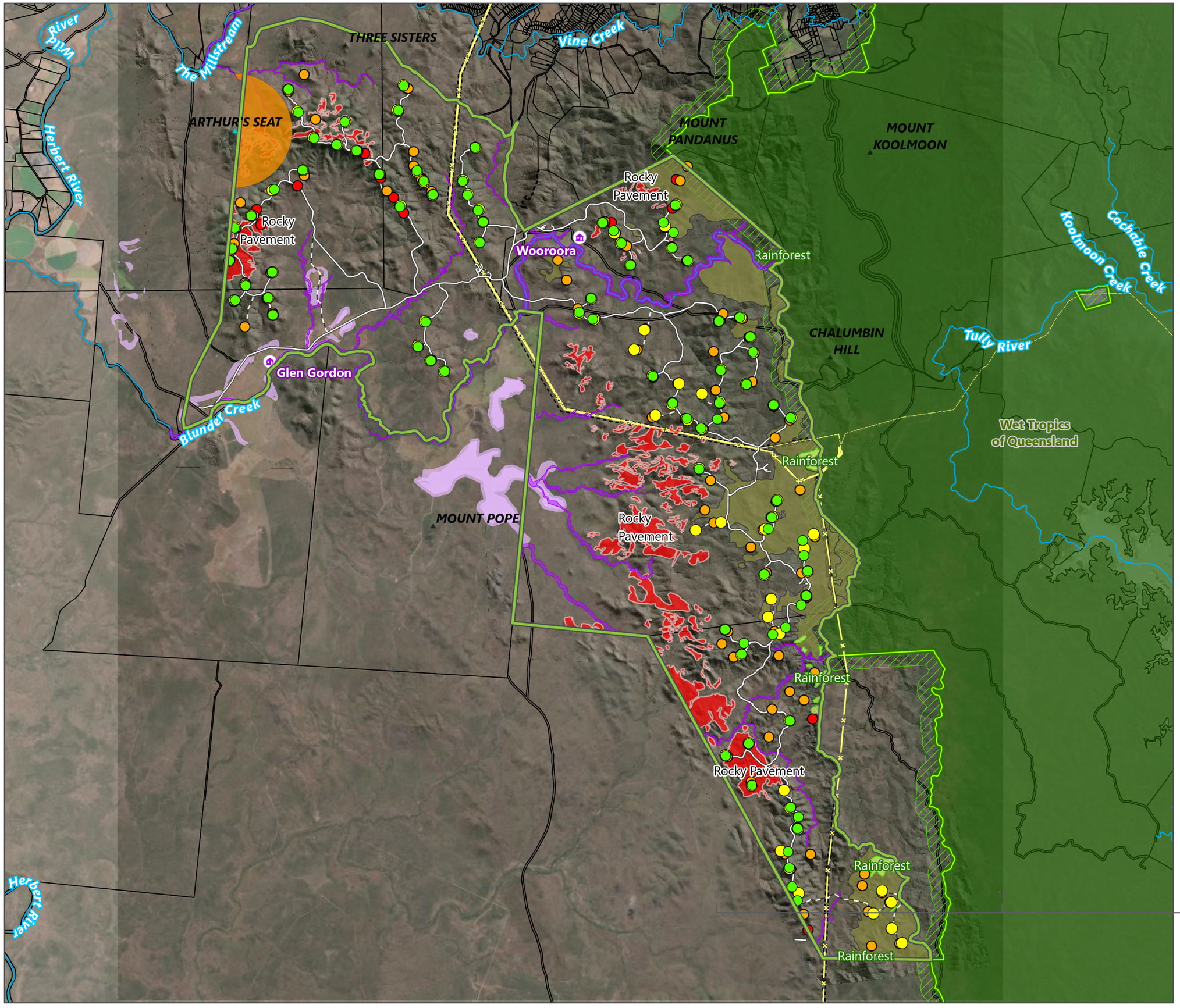
At the earliest stages of Project development, the proponent was investigating a proposed layout of approximately 200 WTGs throughout the Project area to maximise an economic wind resource. The Project area is certainly extensive enough to suitably accommodate this many WTGs. An early proposed wind turbine layout that demonstrates this higher intensity configuration (one that was initially designed to maximise the utilisation of the wind resource within the Project area) is provided in **Figure 3-1.** This shows turbine locations that are now no longer part of the proposed action due to constraints assessment and design refinement. The identification of constraints throughout the Project area has informed the currently proposed 86 WTG configuration, as described fully in **Section 6.1** of this PER.

Assuming a uniform contribution to the Project footprint (following civil and electrical design) on a per-turbine basis (i.e. approximately 12.5 ha per WTG[8]), it can be estimated that a 200 WTG Project within the Chalumbin Wind Farm Project area would equate to a disturbance footprint of 2,500 ha (approximately 8.0% of the Project area). Importantly, not only would this higher intensity scenario result in more than a doubling of the disturbance area, it would also:

- Include clearing of rainforest habitats (avoided by the Project (see **Section 6.1.2**));
- Include impacts within the buffer area around the culturally significant Arthurs Seat (avoided by the Project (see **Section 6.1.3**));
- Include direct impacts on MNES plant species associated with the rocky pavement environments (avoided by the Project (see **Section 6.1.4**));
- Conservatively double the potential significant impacts on MNES that are described in **Section 8.0** of this PER; and
- Extend the construction program and associated amenity impacts on Wooroora Road residents and users (these would conservatively be doubled).

For the reasons described in **Section 6.1**, the higher intensity configuration alternative was not adopted as the preferred development scenario for the Project.

[8] 1,071.1 ha across 86 WTGs, calculated to include all ancillary and associated infrastructure for the Project (e.g. turbine hardstands, access tracks, transmission infrastructure, site facilities, etc.).



ARK ENERGY

Attexo

Chalumbin Wind Farm

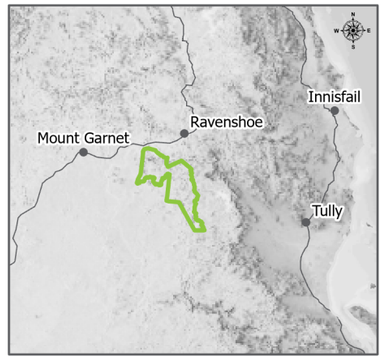
Design Refinement and Response to Observed Constraints

Figure 3.1

- Project Area Boundary
- Current Turbine Layout
- Avoid Wet Sclerophyll
- Avoid High Risk Constraints
- Preliminary Wind Model
- Proposed Access Track
- Initial Access Track
- WTQWHA Boundary
- WTQWHA Buffer (500m)
- Wet Sclerophyll Forest
- Rainforest Habitat
- Rocky Pavement Shrub Complex
- Cultural Heritage Constraint
- Potential Red Goshawk Nesting Habitat
- Wetland
- Homestead
- Existing 132kV Powerline
- Existing 275kV Powerline
- Watercourse
- Property Boundary
- Easement

Date: 18/10/2022 Author: TOD

Project: EPU-004 Reviewed: NOD



Scale: 1:125,000@A3

Data Source(s):
Local Government Area - Department of Resources (2022)
Earthstar Geographics, © State of Queensland (Department of Resources) 2022

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3.3.2 The Lower Intensity Configuration Alternative

A lower intensity configuration was also considered. The most logical scenario in this respect is the removal of the leasehold tenure from the Project area (i.e. developing the Project only on the Glen Gordon property – Stage 2 of the current Project) to (a) avoid Native Title processes, and to (b) increase separation from the WTQWHA. Using the currently proposed Project footprint as a basis, this would result in a development of 34 WTGs (up to 238 MW nameplate generation capacity), two permanent met masts and associated infrastructure. The disturbance footprint for this scenario is estimated at approximately 393 ha. Some benefits of this lower intensity configuration would include:

- Greater separation distance between the development and the Wet Tropics World Heritage Area;
- Reduction in the Project footprint by 65%;
- Associated reduction in significant residual impacts on MNES; and
- Shortened construction program and associated amenity impacts on Wooroora Road residents and users.

However, in considering the feasibility of this as an alternative, the following must also be noted:

- The 52 fewer WTGs and their associated nameplate generation capacity of up to 364 MW would need to be located elsewhere within the Northern QREZ. For reasons described in **Section 3.2** there are no obvious alternative locations for such development that would have comparable or lesser impacts on MNES;
- There are considerable economies of scale for including the 52 WTGs on Wooroora within the Project footprint, as the grid connection costs are sunken costs that are not uniformly influenced by the number of WTGs;
- The ILUA on the Wooroora property would no longer be required; therefore, there would be a resultant loss of financial, training and employment benefits to the Jirrbal #4 People (traditional owners);
- The Community Benefit Fund would need to be downscaled commensurate with a reduced generating capacity (the annual contribution is to be tied to the ultimate nameplate generation capacity of the Project); and
- An alternative project scenario involving only 34 WTGs is not suitable for investment of significant capital due to the significantly reduced generating capacity.

For the reasons identified above, the Project is proposed to include infrastructure within both Glen Gordon and Wooroora as the potential impacts associated with the Project have been avoided and minimised with any significant residual impact to be offset in accordance with the mitigation hierarchy that underpins the EPBC Act level (see **Section 6.0** of this PER). The current configuration of the Project is considered to be the optimal development scenario, taking into consideration all factors. The current configuration of the Project is also staged to allow flexibility in delivery and responsiveness to external market influences.

3.3.3 The Avoidance of Magnificent Brood Frog Habitat Alternative

Magnificent brood frog habitat is mapped throughout the Project area, within open eucalypt forest within 50 m of stream order 1 watercourses on rhyolites of the Glen Gordon volcanics (see **Section 4.5.2**). As illustrated by **Figure 4.18**, due to the nature of the modelled habitat within the Project area i.e. fringing lower-order waterways throughout the majority of the Project area, avoidance through design is not practicable as watercourse crossing are required for access tracks to each tower location. Therefore, the alternative option for avoid magnificent brood frog habitat is effectively the "No Action" alternative described in **Section 3.1** and discounted accordingly.

Project design refinement has led to the reduction of potential impacts to habitat for the species to the extent practicable (see **Section 6.1.6**); however, it is contended that any wind farm project within the Project area would not

achieve avoidance of the mapped habitat for the magnificent brood frog. The Project has necessarily adopted an approach of avoiding where practicable the known populations of the species (see **Section 8.4.2**) and where avoidance is not possible, the Project has committed to compensation measures including land-based offsets of more than five to one, and $250,000 towards research (see **Appendix O**) and industry-leading rehabilitation measures (see **Appendix K**).

3.3.4 The Avoidance of Wet Sclerophyll Forest Alternative

An alternative option to avoid all direct impacts within the wet sclerophyll forest vegetation of the Project area was investigated for the purposes of this PER. Wet sclerophyll forest (also known as tall open-forest) is...

> characterised by very tall eucalypt trees (and their close relatives) which form the upper canopy layer. The trunks of these trees tend to be straighter than those of other eucalypts, and their leafy parts are often concentrated in the top third of the tree. The understorey of wet sclerophyll forest can contain shrubs and small trees (often with rainforest species) or may be grassy with scattered shrubs. (DES 2014)

Wet sclerophyll forest is not a listed threatened community under the EPBC Act and is not endangered under the VM Act; rather the corresponding Regional Ecosystems are either Of Concern (REs 7.8.15, 7.8.16, 7.12.52, 12.2.4, 12.3.2 and 12.8.8) or Least Concern (REs 7.12.21, 7.12.22, 7.12.27, 12.8.9 and 12.11.2). **Figure 4.42** illustrates the spatial location of wet sclerophyll forest within the Project area.

As can be seen in **Figure 4.42**, to avoid wet sclerophyll forest would require the removal of Project infrastructure (or supporting infrastructure) that intersects this community, thereby eliminating:

- 11 WTGs on the Wooroora property north of the existing Chalumbin to Woree high voltage transmission line (and associated access tracks and meteorological masts); and
- 26 WTGs on the Wooroora property south of the existing Chalumbin to Woree high voltage transmission line (and associated access tracks and meteorological masts).

A total of 37 proposed WTGs would require removal from the Wooroora property in order to avoid the wet sclerophyll forest. This alternative is effectively akin to a subset of the Lower Intensity Configuration Alternative (see **Section 3.3.2**) and is not considered feasible due to the identified drawbacks associated with that alternative.

The Project has necessarily adopted an approach of avoid and minimising impacts from clearing to the extent practicable (see **Section 6.1.6**) and where avoidance is not practicable, the Project has committed to compensation measures including land-based offsets of more than five-to-one for impacted MNES (see **Appendix O**), contributions towards research and industry-leading rehabilitation (see **Appendix K**). A comprehensive impact assessment for the Project in relation to the wet sclerophyll forest is provided in **Section 8.8.3** with due consideration to the contributions that the wet sclerophyll forest makes to Outstanding Universal Value criteria ix and x for the WTQWHA. This also discusses the application of these criteria within the WTQWHA and beyond the WTQWHA boundary, and ultimately the application of these criteria to the Project under the EPBC Act.

It should be noted that as outlined in **Section 2.4** the Project has also removed eight wind turbines, 27 km of access tracks and 4 km of high voltage transmission lines, and considerably reduced potential impacts on wet sclerophyll forest by 31% (clearing of 117.5 ha rather than 170.1 ha). In addition, the Project has identified significant strategic offsets 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.

3.4 The Fossil Fuel Alternative

Despite the macro-scale drivers towards renewable energy developments, it is relevant to consider an alternative development to the Project that is a fossil fuel power generator. There is presently a topical coal fired power station development proposed in Barcaldine Regional Council (Central Queensland) with a generation capacity of up to 1,400 MW. The Chalumbin Wind Farm Project's maximum nameplate generation capacity is 43% of this coal fired generation proposal.

In theory, this fossil fuel alternative would negate the requirement for the Chalumbin Wind Farm Project and one more wind farm generator of a similar size and scale. However, for reasons supported through the greenhouse and carbon lifecycle assessment in **Section 13.2**, this fossil fuel alternative is highly undesirable. Such an alternative would add additional impetus to the extraction of coal resources in Central Queensland. Furthermore, as described in **Section 3.0** there is a global, national and state-wide push towards the phasing out of fossil fuel extraction and electricity generation through burning of fossil fuels.

The fossil fuel alternative would be a significant departure from Australia's commitments including those under the Paris Climate Accord and the Glasgow Climate Pact. Furthermore, 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 Wet Tropics World Heritage Area. Lastly, the fossil fuel alternative is in contradiction with the fundamental principles of Ecologically Sustainable Development, which is the central objective of the EPBC Act.