

Chalumbin Wind Farm Project Offset Management Strategy

Prepared for:

Chalumbin Wind Farm Pty Ltd

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1.0 Introduction

1.1 Background

Chalumbin Wind Farm Pty Ltd (CWF), a subsidiary of Ark Energy Projects Pty Ltd (Ark), proposes to develop the Chalumbin Wind Farm Project (the Project) at a location approximately 15 km southwest of Ravenshoe in Far North Queensland within the Tablelands Regional Council Local Government Area (LGA). The Project is a proposed wind farm that consists of up to 86 wind turbine generators (WTGs) and associated infrastructure.

The Project was referred to the then Department of Agriculture, Water and the Environment (DAWE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and on 10 August 2021 was determined to be a controlled action (2021/8983) to be assessed by Public Environment Report (PER). Draft Guidelines for the PER were prepared by DAWE and released for public comment between 5 October and 2 November 2021. DAWE subsequently issued the final PER Guidelines on 29 November 2021. The PER Guidelines include a requirement to provide details of environmental offsets by way of a draft Offset Management Strategy or a draft Offset Area Management Plan.

This Offset Management Strategy has been developed as part of the PER because environmental impact assessment has determined that the Project is likely to have unavoidable significant residual impact on certain matters of national environmental significance (MNES) listed under the EPBC Act, as well as matters of state environmental significance (MSES) listed under the *Environmental Offset Regulation 2014* which are applicable to State approvals.

Fundamental to the Offset Management Strategy is the dedication of a comprehensive offset package for those MNES assessed as having an unavoidable SRI, taking into account the sensitive Project setting adjacent to the Wet Tropics of Queensland (WTQ) World Heritage Area and National Heritage Place. The offset package includes land-based offsets for the full SRI for each relevant MNES; in addition, rehabilitation will be undertaken of all construction disturbance areas which are not required for operation (accounting for approximately 89 % of the total disturbance footprint), as summarised in **Table 1-1**. Indicative offset areas within the host properties are illustrated in **Figure 1-1**.

Table 1-1 Offset Package

MNES	SRI (ha)	Habitat in Offset Areas (ha)				Ratio of Offset to SRI
		Offset Area 1 (Glen Gordon)	Offset Area 2 (Wooroora north)	Offset Area 3 (Wooroora south)	Total	
Koala	843.81	561	1,137	3,728	5,426	6:1
Magnificent brood frog	120.51	Nil upstream of Project footprint	1,068 upstream of Project footprint	341 upstream of Project footprint	1,409	11:1
Masked owl	1,026.3	561	2,014	4,849	7,424	7:1
Northern greater glider	887.9	462	1,986	3,454	5,902	6:1
Spectacled flying-fox	976.1	560	1,982	4,260	6,802	7:1

In addition to the direct (land-based) offsets, a significant indirect offset is proposed 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.

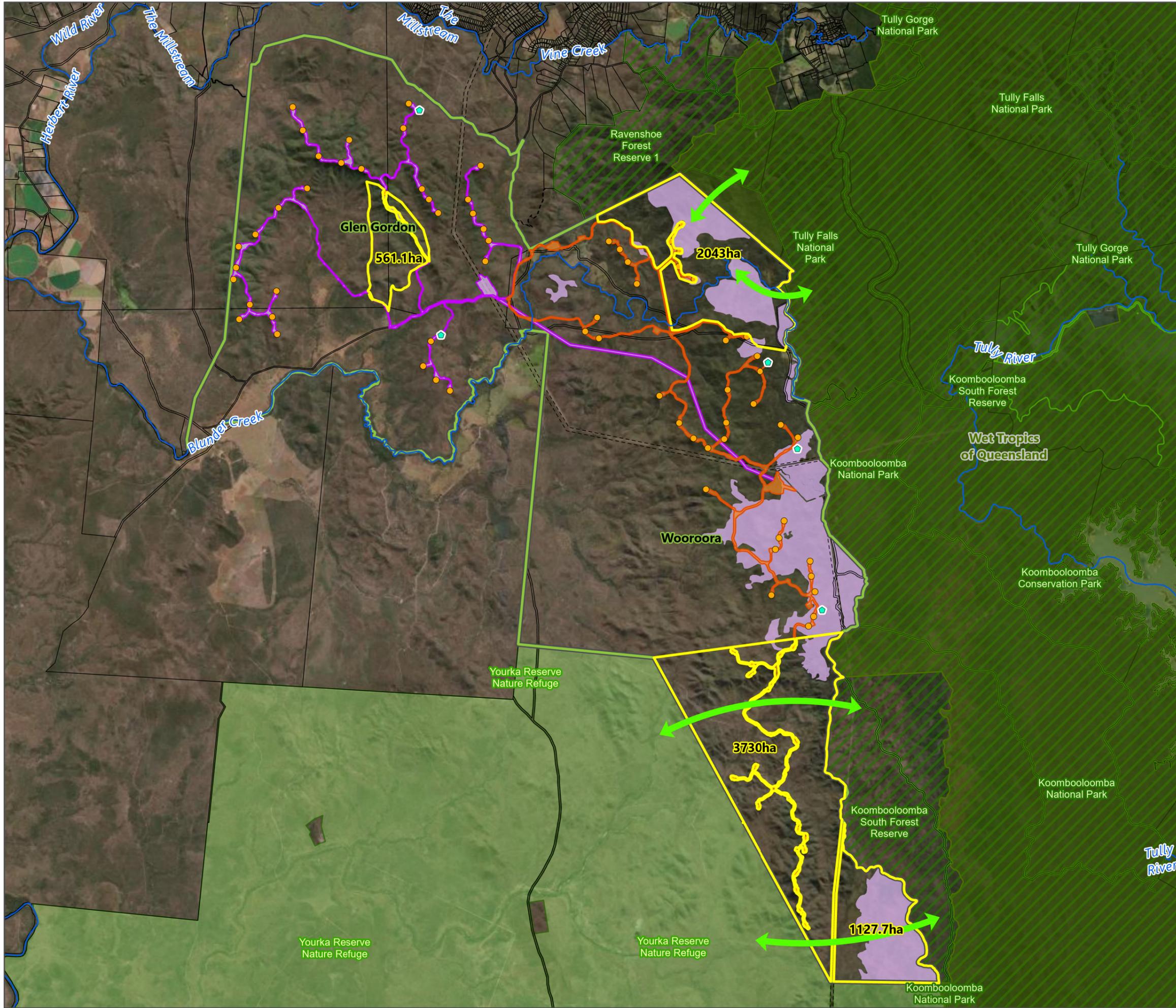
This Offset Management Strategy provides sufficient information to enable approvals to be issued and identifies future actions and deliverables to finalise the environmental offsets proposal, including development and approval of an Offset Area Management Plan prior to Project commencement. Further details relating to rehabilitation can be found in the Preliminary Rehabilitation Plan (Appendix K to the PER).

1.2 Purpose and Scope

The purpose of this draft Offset Management Strategy is to identify the environmental offset requirements of the Project and demonstrate the feasibility of securing a scientifically robust offset program, in support of securing Project approval at the State and Federal levels.

The scope of this report includes:

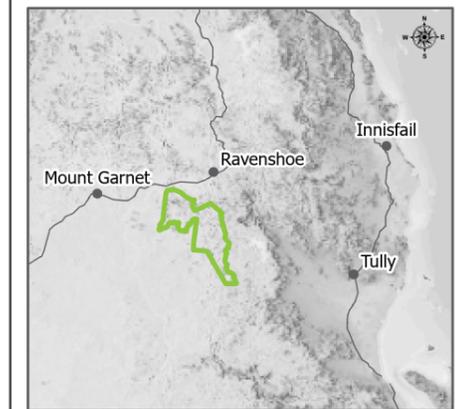
- An outline of relevant approvals and the environmental offset regulatory framework at Federal and State level;
- A summary of the significant residual impacts to MNES and MSES, and identification of the Project's environmental offset requirements;
- A description of offset delivery options and a proposed offset delivery approach for the Project, including actions and timeframes for future stages in the offset program;
- The approach to and results of the offset availability analysis;
- Identification of potential offset areas;
- For each MNES value to be offset, a description of the final conservation outcomes being sought, progressive milestones to be achieved to demonstrate progress towards these final outcomes and high-level management measures considered likely to be required to achieve the progressive milestones and final conservation outcomes;
- Identification of next steps to finalise the offset package; and
- A summary of compliance of the proposed offset package with the requirements of the relevant national and State offset policies.



Chalumbin Wind Farm
Indicative Offset
Management Areas
Figure 1.1

- Project Area Boundary
- Turbine
- ◆ Met-mast
- Clearance Envelope Stage 1
- Clearance Envelope Stage 2
- Indicative Offset Area
- ↔ Connectivity Route
- Protected Area Estate
- Nature Refuge
- Wet Sclerophyll Forest
- WTQ Boundary
- Lot Boundary
- Easement

Date: 17/10/2022 Author: TOD
Project: EPU-004 Reviewed: NOD



Scale: 1:125,000@A3
Data Source(s):
Digital Cadastral Database - Department of Resources (2022)
Earthstar Geographics, © State of Queensland (Department of Resources) 2022

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2.0 Approvals and Regulatory Framework

Environmental offset requirements for the Project occur at the Federal and State level. Relevant legislation and policies are described in the following sections.

2.1 Federal Government Approval

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's central piece of environmental legislation that provides a legal framework to manage proposed actions that will or are likely to have an impact on MNES, which includes nationally and internationally important flora, fauna, ecological communities and heritage places.

The Project was determined as a 'controlled action' due to the potential for significant impacts to occur to the Wet Tropics of Queensland (World Heritage Area and National Heritage Place), listed migratory species, and threatened species and communities. It therefore requires approval under the EPBC Act. Due to the likelihood of a significant residual impact on MNES, an environmental offset is required to compensate for that impact.

2.1.1.1 EPBC Act Environmental Offsets Policy

Avoidance, minimisation and mitigation measures are the primary strategies for managing the potential significant impact of a proposed action. Offsets do not reduce the likely impacts of a proposed action, but instead compensate for any residual significant impact.

Environmental offsets are required to comply with the EPBC Act Environmental Offsets Policy (DSEWPC 2012). This policy outlines the Australian Government's approach to the use of environmental offsets ('offsets') under the EPBC Act.

Where environmental offsets are required for MNES an offsets package should be provided. An offsets package is a suite of actions that a proponent undertakes to compensate for the residual significant impacts to the identified MNES. The EPBC Act requires offsets to be comprised largely of direct (land-based) offsets and other compensatory measures. Offsets should align with conservation priorities for the impacted protected matter and be tailored specifically to the attribute of the protected matter that is impacted in order to deliver a conservation gain (DSEWPC 2012).

Offsets that deliver social, economic and/or environmental co-benefits are encouraged.

2.1.1.2 Direct Offsets

Direct offsets are those actions that provide a measurable conservation gain for an impacted protected matter. Direct offsets are an essential component of a suitable offsets package. Typically a minimum of 90% of the offset requirements for any given impact must be met through direct offset (DSEWPC 2012). Deviation from the 90% direct offset requirement will only be considered where:

- It can be demonstrated that a greater benefit to the protected matter is likely to be achieved through increasing the proportion of other compensatory measures in an offsets package; or
- Scientific uncertainty is so high that it is not possible to determine a direct offset that is likely to benefit the protected matter.

Conservation gain is the benefit that a direct offset delivers to the protected matter, which maintains or increases its viability or reduces any threats of damage, destruction or extinction. A conservation gain may be achieved by:

- Improving existing habitat for the protected matter; or
- Creating new habitat for the protected matter; or
- Reducing threats to the protected matter; or
- Increasing the values of a heritage place; or
- Averting the loss of a protected matter or its habitat that is under threat.

2.1.1.3 Compensatory Offsets

Other compensatory measures are those actions that do not directly offset the impacts on the protected matter but are anticipated to lead to benefits for the impacted protected matter, for example funding for research, implementing priority actions outlined in applicable recovery plans or educational programs. Other compensatory measures should relate to the impacted aspect of the protected matter. For example, research into effective re-vegetation techniques for a particular ecological community may be an appropriate component of an offsets package for an action that involves clearing of that ecological community (DSEWPC 2012).

2.2 State Approval

2.2.1 Planning Act 2016

Under the *Planning Act 2016*, wind farm development is assessable development (a material change of use for a wind farm). In accordance with Part 21, Division 2, Table 1 of the *Planning Regulation 2017*, the Project requires assessment and decision by the Department of State Development, Infrastructure, Local Government and Planning (DSDILGP), represented by the State Assessment and Referral Agency (SARA), as assessment manager. The Project will be assessed against State Code 23: Wind farm development (State Code 23).

The purpose of State Code 23 is to protect individuals, communities and the environment from adverse impacts resulting from the construction, operation and decommissioning of wind farm development. Table 23.2.1 of State Code 23 lists the relevant performance outcomes and acceptable outcomes (as applicable) with which the Project must demonstrate compliance. Offsets must be provided where there is an unavoidable residual impact on Matters of State Environmental Significance (MSES). Offsets must be provided in accordance with the *Environmental Offsets Act 2014*.

2.2.2 Queensland Environmental Offset Framework

Environmental offsets are required when a *prescribed activity* causes *significant residual impacts* on *prescribed matters* of national, state or local significance despite all reasonable avoidance and mitigation measures. This framework provides structure for delivering, monitoring and assessing environmental offsets and is comprised of the *Environmental Offsets Act 2014*, *Environmental Offsets Regulation 2014* and Queensland Environmental Offsets Policy (v.1.10).

Under the Queensland Environmental Offset Framework, an environmental offset may be required when:

- An activity has been identified as a *prescribed activity*;

-
- An activity will have an impact on a *prescribed environmental matter*;
 - The activity will have a *significant residual impact* on a *prescribed environmental matter*, despite all reasonable avoidance and mitigation measures; and
 - An environmental offset is an appropriate solution.

The above points must be considered when identifying if a prescribed activity requires environmental offsets and conditions to be imposed.

2.2.2.1 Environmental Offsets Act 2014

The main purpose of the *Environmental Offsets Act 2014* (EO Act) is to counterbalance *significant residual impacts* of an activity on *prescribed environmental matters* at the Commonwealth, State and local level using environmental offsets. This Act states environmental offsets must achieve a *conservation outcome* for the impacted matter. A *conservation outcome* is achieved if, selected and delivered correctly, an offset can maintain the status quo of the *prescribed environmental matter* as if the development and offset had not occurred. The Act defines a *prescribed environmental matter* as:

1. *A prescribed environmental matter is any of the following matters prescribed under a regulation to be a prescribed environmental matter –*
 - a) *A matter of national environmental significance*
 - b) *A matter of State environmental significance*
 - c) *A matter of local environmental significance*

Section 14(1) outlines that an administering agency can impose an offset condition on an authority if:

- a) *the prescribed activity will, or is likely to, have a significant residual impact on a prescribed environmental matter; and*
- b) *all reasonable on-site mitigation measures for the prescribed activity have been, or will be, undertaken.*

The offset conditions imposed by administering agencies have limitations and are outlined in Section 15(1-4):

1. *An administering agency may impose an offset condition on an authority only if:*
 - a) *The same, or substantially the same, impact has not been assessed under a relevant Commonwealth Act; and*
 - b) *The same, or substantially the same, prescribed environmental matter has not been assessed under a relevant Commonwealth Act*
2. *Subsection (1) applies whether or not the assessment resulted in the imposition of an offset condition*
3. *However, Subsection (1) does not apply if the prescribed environmental matter to which the condition relates is a protected area*
4. *An administering agency that is a local government may impose an offset condition on an authority only for the following:*
 - a) *A matter of local environmental significance*
 - b) *Another prescribed environmental matter that is further prescribed by regulation as relevant for this subsection*

The EO Act in accordance with the Policy provides three approaches in which an offset can be delivered and requirements per the delivery. These include a proponent-driven offset, a financial settlement offset or a combination of both. For a proponent-driven offset, an offset delivery plan and an agreed delivery arrangement is required before starting an activity. For a financial settlement offset, the amount payable must be in accordance with this Act and the Policy, and in the way stated in the agreed delivery arrangement. A detailed description of a proponent-driven, financial settlement or combination offset is provided in Division 4&5 of the EO Act and **Section 2.2.2.3** of this document.

Part 6A of the Act outlines that offset conditions cease to apply when a duplicate condition is imposed at another level of jurisdiction.

2.2.2.2 Environmental Offsets Regulation 2014

The Project can be considered a *prescribed activity* under Schedule 1 Section 4 of the *Environmental Offsets Regulation 2014* as defined by the following points:

1. *Taking a protected plant within the meaning of the Nature Conservation Act 1992 under a protected plant clearing permit granted under the Nature Conservation (Administration) Regulation 2006, section 15 in an area outside a protected area*
2. *Development for which an environmental offset may be required under any of the following State Development Assessment Provisions –*
 - a) *module 8 (native vegetation clearing)*
3. *Development for which an environmental offset may be required under any of the following –*
 - a) *a local planning instrument;*
 - b) *State planning regulatory provision within the meaning of the Sustainable Planning Act 2009*

Schedule 2 Section 5 of the *Environmental Offset Regulation 2014* provides a list of *prescribed environmental matters* of State environmental significance (MSES) some of which the Project may potentially impact. These MSES are listed below:

2. *Regulated Vegetation*
 - 1) *the prescribed regional ecosystems that are endangered regional ecosystems comprise a matter of State environmental significance.*
 - 2) *the prescribed regional ecosystems that are of concern regional ecosystems comprise a matter of State environmental significance.*
 - 3) *a prescribed regional ecosystem is a matter of State environmental significance if it is –*
 - a) *a regional ecosystem that intersects with an area shown as a wetland on the vegetation management wetlands map*
 - b) *an area of essential habitat on the essential habitat map for an animal that is endangered wildlife or vulnerable wildlife or a plant that is endangered wildlife or vulnerable wildlife*
 - 4) *a prescribed regional ecosystem is a matter of State environmental significance to the extent the ecosystem is located within a defined distance from the defining banks of a relevant watercourse*
3. *Connectivity areas*
 - 2) *the prescribed regional ecosystem is a matter of State environmental significance if the administering agency is satisfied, having had regard to criteria in the environmental offsets policy about connectivity areas, that –*
 - a) *The connectivity area is of sufficient size or configured in a way that maintains ecosystem functioning; and*
 - b) *The prescribed regional ecosystem will remain despite a threatening process within the meaning of the Nature Conservation Act 1992*
6. *Protected wildlife habitat*

- 1) An area that is shown as a high-risk area on the flora survey trigger map and that contains plants that are endangered wildlife or vulnerable wildlife is a matter of State environmental significance
- 2) An area that is not shown as a high-risk area on the flora survey trigger map, to the extent the area contains plants that are endangered wildlife or vulnerable wildlife, is a matter of State environmental significance
- 3) (only applicable to South East Queensland)
- 4) A habitat for an animal that is endangered wildlife or vulnerable wildlife or a special least concern animal is a matter of State environmental significance

2.2.2.3 Queensland Environmental Offset Policy v 1.10

The Queensland Environmental Offset Policy is a decision-support tool used to assess offset proposals and ensure requirements of the EO Act are met. This Policy is relevant to this Project as it provides guidance on offset requirements for impacts on *prescribed matters* at commonwealth, State and local level. Offsets delivered under this policy must achieve a *conservation outcome* for the impacted *prescribed matters*.

All offsets must meet the following principles:

- Offsets will not replace or undermine existing environmental standards or regulatory requirements, or be used to allow development in areas otherwise prohibited through legislation or policy;
- Impacts must first be avoided, then mitigated, before considering the use of offsets for any remaining impact;
- Offsets must achieve a conservation outcome that counterbalances the significant residual impact for which the offset was required;
- Offsets must provide environmental values as similar as possible to those being lost;
- Offset provision must minimise the time-lag between the impact and delivery of the offset;
- Offsets must provide additional protection to environmental values at risk, or additional management actions to improve environmental values; and
- Where legal security is required, offsets must be legally secured for the duration of the impact on the *prescribed environmental matter*.

The Policy proposes three offset delivery options:

- Proponent-driven offset, comprising:
 - A land-based offset;
 - Actions in a Direct Benefit Management Plan (DBMP); or
 - Both; or
- Financial settlement offset; or
- Combination of a proponent-driven offset and a financial settlement offset.

Land-based offset can be an individual or multiple parcels of land being managed to achieve a *conservation outcome* for any impacted *prescribed environmental matters*. To achieve a *conservation outcome*, a land-based offset site must have the following characteristics:

-
- In relation to endangered and of concern regional ecosystems:
 - Of the same broad vegetation group as the impacted regional ecosystem;
 - Of the same regional ecosystem status; and
 - Within the same bioregion;
 - In relation to a plant or animal that is critically endangered, endangered, vulnerable, near threatened and special least concern wildlife under the *Nature Conservation Act 1992*:
 - The offset site must contain, or be capable of containing, a self-sustaining population of that same impacted species;
 - For vegetation intersecting a wetland:
 - Of the same broad vegetation group as the impacted regional ecosystem;
 - Within the same bioregion; and
 - Associated with a wetland
 - For connectivity:
 - A non-remnant ecosystem; and
 - In the same subregion; however, if the subregion is intact, the offset should be in the nearest fragmented subregion
 - Maximum four times the area of impact on each MSES
 - Provide a gain in 'habitat quality' suitable to compensate the loss of 'habitat quality' at the impact site (habitat quality assessment with the Guide to Determining Terrestrial Habitat Quality)

The Policy outlines additional offset tools including Strategic Offset Investment Corridors (SOICs) and Advanced Offsets. SOICs are pre-defined areas of land that contain MNES and MSES that are not subject to high development pressure or zoned for urban activities. Advanced offsets are parcels of land reserved for the future potential use as an offset site for impacted matters. Proponents are encouraged to seek SOIC opportunities with landholders because of the landscape-scale benefits to prescribed matters.

DBMP offsets is a packaged investment that provides priority actions that address threats and benefits for *prescribed environmental matters*. The Policy requires a DBMP is pre-approved by the Department of Environment and Science (DES) before being considered as part of an offset delivery approach. Pre-approval of a DBMP for MSES can be done by DES, or relevant local government under local government's jurisdiction. DES will only approve a DBMP with endorsement of the plan from the administering agency responsible for the management of MSES.

Proponent-driven offsets require an offset delivery plan which must:

- Describe how the offset will be undertaken and how the conservation outcome will be achieved, including how the plan will:
 - Effectively account for and manage the risk of failing to achieve the conservation outcome;
 - Ensure the offset provides benefits in relation to the prescribed environmental matter in addition to other benefits provided under a requirement of, or an authority under an Act;

-
- Have transparent government arrangements , including being able to be readily measured, monitored, audited and enforced;
 - Ensure the offsets is of a scale and size proportionate to the significant residual impact on the prescribed environmental matter;
 - State that the proponent and any other entity that owns land on which the offset will be undertaken, agrees to the offset being undertaken
 - Be signed by the proponent and any other entity that owns land on which the offset will be undertaken;
 - Describe the prescribed environmental matter to which the offset condition relates;
 - State whether the offset condition will be delivered wholly or partly on the land where the offset will be undertaken;
 - Include particulars of or a description sufficient to identify the land on which the offset will be undertaken;
 - Identify and contain details of any person with interest in the land on which the offset will be undertaken;
 - Describe the land where the offset will be delivered;
 - Describe the existing land use of the land on which the offset will be undertaken and any impact that land use may have on the delivery of the offset;
 - State:
 - The measures the proponent will take to secure the land as a legally secured offset area;
 - Why the proponent considered the states measures taken are reasonable and practical;
 - The period during which measures will be taken and why this is a reasonable period to secure the offset.

Financial settlement offsets allow a proponent to provide a payment in accordance with this Policy and meet offset requirements. For financial settlement offsets required by the State, payment amount must be calculated in accordance with the Financial Settlement Offset Calculation Methodology. This methodology must be used when determining a suitable offset payment for impacts on MSES.

A combination of proponent-driven and financial settlement is also an offset option. The Policy's suggested process for delivering this type of offset to achieve offset obligations focusses primarily on proponent-driven offsets, with the outstanding balance being provided as financial settlement.

2.2.3 Nature Conservation Act 1992

The purpose of the *Nature Conservation Act 1992* is to provide for the conservation of nature whilst enabling indigenous people to be involved in the management of protected areas. This Act is triggered under Schedule 1 s[4](5) of the *Environmental Offset Regulation 2014* in that '*taking a protected plant within the meaning of the Nature Conservation Act 1992 outside a protected area*' is a *prescribed activity* and will '*require a protected plant clearing permit granted under the Nature Conservation (Administration) Regulation 2006*'.

2.2.4 Vegetation Management Act 1999

The purpose of the *Vegetation Management Act 1999* is to regulate the clearing of vegetation whilst managing for environmental effects caused by clearing. The Project involves operation works, that is clearing native vegetation, which is otherwise prohibited if not for a relevant purpose (*Planning Regulation 2017*). However, under Section 22A(2)(d) of the *Vegetation Management Act 1999*, the Project is considered a relevant purpose; '*for relevant infrastructure activities and clearing for the development cannot reasonably be avoided or minimised*'. The clearing of native vegetation will require an environmental offset under State Code 16: Native vegetation clearing (State Code 16) of the SDAP under the Planning Act.

2.3 Environmental Offset Hierarchy

The Queensland Environmental Offsets Framework is not currently accredited by the Australian Government in relation to offsets for the purposes of the EPBC Act, therefore the framework is not applicable to impacts on MNES and jurisdiction responsibility remains with the relevant Federal agency (DES 2021). For MSES, the Queensland Government has jurisdiction over offset requirements. Local Government has jurisdiction over MLES which must be specified in a local government planning scheme and be approved by the state in accordance with the Minister's Guidelines and Rules under the *Planning Act 2016*.

To avoid duplication of offset conditions across jurisdictions, the EO Act requires agencies to consider existing offset conditions that have been applied to the activity. The EO Act requires that the State cannot impose an offset condition that is the same or substantially the same impact, if DAWE has assessed an activity as a controlled action and decided that an offset is, or is not required. In addition, the EO Act requires that a MLES cannot be the same or substantially the same as an MNES or MSES, therefore duplication of MLES offset conditions with MNES or MSES offset conditions should not occur.

3.0 Project Environmental Offset Requirements

3.1 Ecological Values of the Project Area

The Project is located across two properties located approximately 15 km southwest of Ravenshoe in Queensland, within the Tablelands Regional Council Local Government Area. Both properties are primarily used for grazing and there are several easements intersecting them associated with roads and high-voltage electrical infrastructure. Surrounding properties are used for grazing and conservation purposes, with National Parks and Timber Reserve abutting the northern and eastern boundaries of Wooroora Station. The eastern boundary of the Project area abuts the Wet Tropics of Queensland World Heritage Area and National Heritage Place.

The Project area is located along the boundary between 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 and dominated by various communities associated with woodlands or open forests. Some areas have been cleared for grazing, generally within close proximity to the homesteads. The most common vegetation community within the Project area is Regional Ecosystem (RE) 9.12.2, a woodland community dominated by a mix of *Corymbia citriodora*, *C. intermedia* and *Eucalyptus portuensis* that occurs on the slopes and ridges of hills across both Wooroora and Glen Gordon Stations. Within the Einasleigh Uplands bioregion portion of the Project area, the equivalent vegetation community (RE 7.12.34) is the second most dominant. At the tops of many of these hills, scattered rocky scarps and rocky granite pavements contain shrubland and closed forest communities of *Acacia* spp. and *Lophostemon suaveolens* associated with RE 7.12.65k. Other communities that occur across these hills include the *Eucalyptus reducta* dominated RE 7.12.21, *Eucalyptus resinifera* and *Corymbia intermedia* woodland associated with RE 7.12.52, and occasional patches of vine thicket. The most common communities within the low-lying areas of the Project Area are RE 9.5.5a, a mixed woodland of *Eucalyptus crebra*, *Corymbia clarksoniana* and *C. citriodora*, and RE 9.3.16, a *Eucalyptus tereticornis* and *E. platyphylla* woodland occurring on alluvial flats.

The Project area is located on the north-eastern edge of the Herbert River catchment, the largest catchment of the Wet Tropics region. Blunder Creek is the largest waterway to traverse the Project area with a catchment of 142 km². Blunder Creek flows east to west across both Wooroora and Glen Gordon before joining the Herbert River approximately 9 km to the west. Blunder Creek is identified as a stream order 4 where it traverses the Wooroora property and becomes a stream order 5 waterway within Glen Gordon. 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 will also likely provide refuge habitat for wildlife during drier periods. The majority of infrastructure associated with the Project will avoid direct and indirect impacts to Blunder Creek. In addition to Blunder Creek, there is a series of stream orders 1, 2 and 3 across the site, including within the Project footprint. Third order streams present include Lily, Pandanus, Oaky and Kara Creeks; all of which are tributaries to Blunder Creek. Waterways include creeks with a soft substrate bottom, and rocky gullies with distinct water holes and densely vegetated riparian vegetation.

There are a number of small man-made farm dams across both properties, with evidence of frequent use by cattle (low to no vegetation cover, high turbidity). There are no nationally important wetlands within the Project area; however, there are a number Great Barrier Reef Wetland Protection Areas (Qld). None of these are intersected by proposed Project infrastructure.

3.2 MNES Assessment of Significant Impacts and Offset Requirements

To support any offset assessments that may be required, it is important to evaluate the specific MNES attributes that occur within the proposed disturbance area (e.g. foraging habitat, breeding habitat, used for dispersal, etc) and the quality of mapped habitat areas. This information is required to inform offset calculations (as described in **Section 5.1**).

Desktop assessments and comprehensive seasonal ecological surveys of the Project area were undertaken between October 2020 and January 2022. These were undertaken to gain an understanding of the broader environmental values, landscape features, vegetation communities and threatened species that are known or have the potential to occur in both a broader study area and the Project area. These assessments have identified MNES that are known or considered likely to occur within the Project area. CWF has worked to identify measures that can be taken to further avoid or minimise impacts on these MNES through alteration of Project design. Full details of how the mitigation hierarchy has been applied to the Project are provided in Section 6 of the PER. Section 7 of the PER includes details on proposed rehabilitation of areas that will be temporarily disturbed during Project construction but that are not required for use during the operational phase. Significant impact assessments have subsequently been undertaken following the EPBC Act Significant Impact Guidelines 1.1 (DoE 2013) and these are presented in Section 8 of the PER.

An assessment of MNES known or considered likely to occur within the Project area and whether they are likely to be significantly impacted is provided in **Table 3-1**. The MNES considered to have a significant residual impact include:

- Koala – 413.56 ha of habitat¹ associated with Stage One and 430.24 ha associated with Stage Two;
- Magnificent brood frog – 67.9 ha of habitat associated with Stage One and 52.6 ha associated with Stage Two;
- Masked owl – 576.2 ha of habitat associated with Stage One and 450.2 ha associated with Stage Two;
- Northern greater glider – 520.3 ha of habitat associated with Stage One and 367.6 ha associated with Stage Two; and
- Spectacled flying-fox – 553.3 ha of habitat² associated with Stage One and 422.8 ha associated with Stage Two.

¹ No evidence of koala has been found within the Project area despite extensive survey effort. As such, the Project area is not considered to provide habitat critical to the survival of the species. 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 has been included in this offset package.

² The spectacled flying-fox has also not been recorded within the Project area, nevertheless, the species has been included in this offset package.



Table 3-1 Significant residual impacts on MNES known or likely to occur within the Project area

MNES	Habitat description	Habitat available in Project area (ha)	Area of habitat impacted (ha)	Significant residual impact	Offset required?
Threatened Ecological Community					
Mabi Forest (Complex Notophyll Vine Forest 5b) Threatened Ecological Community	Directly corresponds to REs 7.8.3 or 7.3.37	Nil	Nil	Unlikely	No
Broad leaf tea-tree (<i>Melaleuca viridiflora</i>) woodlands in high rainfall coastal north Queensland	May correspond to REs 7.3.8, 7.5.4, 8.3.2, 8.5.2 and 8.5.6 provided the vegetation meets key diagnostic characteristics	6.3 ha of RE 7.3.8	Nil	Unlikely The RE 7.3.8 vegetation was found not to meet the diagnostic characteristics of the TEC	No
Threatened Flora Species					
North Queensland lace (<i>Aponogeton bullosus</i>)	Non-ephemeral / semi-permanent watercourses with fringing riparian vegetation	189.4	3.1 ha	Unlikely Targeted surveys have not confirmed the presence of this species within the Project area	No
<i>Homoranthus porteri</i>	Rocky pavement shrubland complex on granite and rhyolite outcrops which broadly	1,555.7	23.9 ha	Unlikely Targeted surveys have confirmed the	No



MNES	Habitat description	Habitat available in Project area (ha)	Area of habitat impacted (ha)	Significant residual impact	Offset required?
	(but not exclusively) correlates to REs 7.12.57 (BVG 9d) and 7.12.65k (BVG 29b).			absence of individuals within the Project footprint in areas of suitable habitat	
<i>Prostanthera clotteniana</i>	Rocky pavement shrubland complex on granite and rhyolite outcrops which broadly (but not exclusively) correlates to REs 7.12.57 (BVG 9d) and 7.12.65k (BVG 29b).	1,555.7	23.9 ha	Unlikely Targeted surveys have confirmed the absence of individuals within the Project footprint in areas of suitable habitat	No
<i>Triplarina nitchaga</i>	Rocky pavement shrubland complex on granite and rhyolite outcrops which broadly (but not exclusively) correlates to REs 7.12.57 (BVG 9d) and 7.12.65k (BVG 29b).	1,555.7	23.9 ha	Unlikely Targeted surveys have confirmed the absence of individuals within the Project footprint in areas of suitable habitat	No
Listed Threatened Amphibian Species					



MNES	Habitat description	Habitat available in Project area (ha)	Area of habitat impacted (ha)	Significant residual impact	Offset required?
Australian lace-lid (<i>Litoria dayi</i>)	Upland rainforest and wet sclerophyll forest alongside perennial streams	3.8	Nil	Unlikely	No
Magnificent brood frog (<i>Pseudophryne covacevichae</i>)	Potential breeding habitat for magnificent brood frog was mapped as potential seepages, and zero and first order streams on rhyolites of the Glen Gordon volcanics. Non-breeding habitat was mapped as open eucalypt forest within a 50 m buffer around the potential breeding habitat.	8,085.4	120.5 ha	Likely	Yes
Mountain mistfrog (<i>Litoria nyakalensis</i>)	Upland rainforest and wet sclerophyll forest alongside perennial streams	3.8	Nil	Unlikely	No
Listed Threatened Bird Species					
Masked owl (northern) (<i>Tyto novaehollandiae kimberli</i>)	Potential nesting habitat comprises rainforest, riparian forest or open eucalypt forest containing "large trees" at a density of > 25 trees per ha (; foraging habitat is rainforest, riparian forest and open forest within a buffer area around nesting habitat based on a core range of 155 ha.	30,324.7	1,026.3 ha	Likely	Yes



MNES	Habitat description	Habitat available in Project area (ha)	Area of habitat impacted (ha)	Significant residual impact	Offset required?
Red goshawk (<i>Erythrotriorchis radiatus</i>)	Potential nesting habitat is remnant vegetation up to 1 km from a watercourse (stream order 3 or greater) and with a canopy height greater than 20 m; foraging habitat is any other non-rainforest remnant or regrowth vegetation.	30,320.3	1,031.74 ha	Unlikely ³	No
Southern cassowary – Southern population (<i>Casuarius casuarius</i>)	Critical habitat is remnant vegetation dominated by rainforest communities and wet sclerophyll as listed in Appendix 2 of the species Recovery Plan (Latch 2007).	218	Nil	Unlikely	No
White-throated needletail (<i>Hirundapus caudacutus</i>)	No habitat mapping has been undertaken for white-throated needletail as this species could occur in any airspace over the Project area	Nil	Nil	Unlikely	No
Listed Threatened Mammal Species					
Black-footed tree-rat (<i>Mesembriomys gouldii rattoides</i>)	Potential habitat has been mapped as riparian forest (as this is more likely to support <i>Pandanus</i> , a key food species) below 700 m, buffered by 500 m as this is	9,782.2	184.86 ha	Unlikely	No

³ The red goshawk has not been observed within the Project area. There is potential for the Project to have a significant residual impact on the red goshawk, in the event that turbine collision occurs. If a collision event leads to a significant residual impact (through exceeding an impact trigger limit), it may be necessary for the Project to offset this impact through payment into a research fund for the species.



MNES	Habitat description	Habitat available in Project area (ha)	Area of habitat impacted (ha)	Significant residual impact	Offset required?
	reportedly the species' foraging range (TSSC 2015a)				
Ghost bat (<i>Macroderma gigas</i>)	Potential roosting habitat in areas of rocky relief (as identified through analysis of LiDAR data); foraging within woodland habitats within 2 km of potential roost sites	17,926.9	655.63 ha	Unlikely	No
Koala (<i>Phascolarctos cinereus</i>)	Potential habitat is remnant and regrowth vegetation communities containing locally important koala tree species or ancillary tree species as listed per bioregion in Youngentob et al 2021.	25,231.4	843.81 ha	Likely	Yes
Large-eared horseshoe bat (<i>Rhinolophus robertsi</i>)	Potential habitat was mapped as rainforest, riparian forest and densely vegetation gullies within open eucalypt woodland	1,579.2	17.6 ha	Unlikely	No
Northern bettong (<i>Bettongia tropica</i>)	Potential habitat has been mapped as wet sclerophyll forests and vegetation communities dominated by <i>Corymbia citriodora</i> and <i>C. platyphylla</i>	1,951.7	81.2 ha	Unlikely	No
Northern greater glider (<i>Petauroides volans</i>)	Denning habitat comprises ground-truthed vegetation communities containing tree species characterising greater glider habitat (as listed in DES 2022) and containing "large trees" at a density of >25 trees per ha for the	23,301.4	887.9 ha	Likely	Yes



MNES	Habitat description	Habitat available in Project area (ha)	Area of habitat impacted (ha)	Significant residual impact	Offset required?
	Wet Tropics bioregion (lower quartile of 46.5 cm DBH based on LQ = Mean – (0.65 x SD)) and >20 trees per ha for the Einasleigh Uplands bioregion. Foraging habitat comprises vegetation communities containing habitat trees species listed in DES 2022 within a buffer area around denning habitat based on a conservative home range size of 12 ha.				
Northern quoll (<i>Dasyurus hallucatus</i>)	Potential shelter habitat comprising areas of rocky relief were identified through analysis of LiDAR data; potential foraging habitat is Eucalypt woodland within 1 km of potential shelter habitat.	9006	331.84ha	Unlikely	No
Semon's leaf-nosed bat (<i>Hipposideros semoni</i>)	Potential habitat within the Project area is limited, and was mapped as rainforest, wet sclerophyll forest and riparian forest	5,034.4	143.6 ha	Unlikely	No
Spectacled flying-fox (<i>Pteropus conspicillatus</i>)	Eucalypt forest and rainforest within a foraging distance of 50 km of the known Malancamp	28,890.3	976.1 ha	Likely⁴	Yes

⁴ There is potential for the Project to have a significant residual impact on the spectacled flying-fox through turbine collision and/or barotrauma. If such an event leads to a significant residual impact (through exceeding an impact trigger limit), it may be necessary for the Project to offset this impact through payment into a research fund for the species.



MNES	Habitat description	Habitat available in Project area (ha)	Area of habitat impacted (ha)	Significant residual impact	Offset required?
Spotted-tailed quoll – northern subspecies (<i>Dasyurus maculatus gracilis</i>)	Upland closed forests > 900 m altitude, all notophyll, mesophyll and wet sclerophyll forest at or above this elevation has been mapped as preferred potential habitat	3,452.4	124.7 ha	Unlikely	No
Yellow-bellied glider (<i>Petaurus australis</i> Wet Tropics subspecies)	Remnant vegetation dominated by <i>Eucalyptus grandis</i> for denning or <i>E. resinifera</i> for foraging	999.9	28.14 ha	Unlikely	No
Listed Threatened Reptile Species					
Atherton delma (<i>Delma mitella</i>)	Potential habitat has been mapped as wet sclerophyll forests.	3,453	124.7 ha	Unlikely	No
Listed Threatened Migratory Species					
Black-faced monarch (<i>Monarcha melanopsis</i>)	Remnant vegetation dominated by rainforest communities	2,254.8	3.6 ha	Unlikely	No
Fork-tailed swift (<i>Apus pacificus</i>)	No habitat mapping has been undertaken for white-throated needletail as this species could occur in any airspace over the Project area	Nil	Nil	Unlikely	No
Latham's snipe (<i>Gallinago hardwickii</i>)	Open, freshwater wetlands with low, dense vegetation (swamps, flooded grasslands or heathlands, bogs) or habitat with saline or brackish water during migration and have	365	Nil	Unlikely	No



MNES	Habitat description	Habitat available in Project area (ha)	Area of habitat impacted (ha)	Significant residual impact	Offset required?
	been found in modified or artificial habitats close to human activity				
Rufous fantail (<i>Rhipidura rufifrons</i>)	Rainforest and wet sclerophyll forests	3,578.8	117.5 ha	Unlikely	No
Satin flycatcher (<i>Myiagra cyanoleuca</i>)	Eucalypt forest and woodlands at high elevations, but not rainforests	26,965	958.5 ha	Unlikely	No
Spectacled monarch (<i>Symposiachrus trivirgatus</i>)	Rainforest and moist eucalypt forest, including riparian vegetation.	3,904.1	122.01 ha	Unlikely	No

3.3 MSES Assessment of Significant Impacts and Offset Requirements

Significant residual impacts to MSES were assessed under the Significant Residual Impact Guidelines for Planning Act Approvals (DSDIP 2014) associated with vegetation clearing (State Code 16). This includes the following MSES:

- Endangered and Of Concern REs;
- Remnant vegetation within a defined distance of a watercourse;
- REs that intersect with a wetland;
- Connectivity; and
- Essential habitat.

Environmental offsets will be conditioned through the development approval for any significant residual impacts considered likely to occur to MSES, in accordance with the EO Act.

As assessment of MSES known or considered likely to occur within the Project area and whether they are likely to be significantly impacted by Project disturbance is provided in **Table 3-2**.

The MSES considered to have a significant residual impact include:

- Of Concern remnant vegetation – 222 ha;
- Watercourse vegetation – 16 ha; and
- Essential habitat – 132 ha.

Table 3-2 Significant residual impacts on MSES known or likely to occur within the Project area

MSES	Habitat within Project area (ha)	Area of habitat impacted (ha)	Significant residual impact	Offset required?
Endangered and Of Concern regional ecosystems (REs)⁵				
Endangered RE 7.8.19 (BVG:9c)	14.4	Nil	Unlikely	No
Of Concern RE 7.3.26 (BVG:16a)	395.7	Nil	Unlikely	No
Of Concern RE 7.3.43 (BVG:9e)	297.1	3.6	Likely	Yes
Of Concern RE 7.8.7 (BVG:9c)	88.2	Nil	Unlikely	No
Of Concern RE 7.8.10 (BVG:9d)	20.3	Nil	Unlikely	No
Of Concern RE 7.8.18 (BVG:9c)	0.1	Nil	Unlikely	No
Of Concern RE 7.12.52 (BVG:8a)	3,183.2	117.6	Likely	Yes
Of Concern RE 7.12.57 (BVG:9d)	537.3	29	Likely	Yes

⁵ Ground-truthed RE mapping

MSES	Habitat within Project area (ha)	Area of habitat impacted (ha)	Significant residual impact	Offset required?
Of Concern RE 7.12.66 (BVG:28e)	236.4	23.1	Likely	Yes
Remnant vegetation⁶ within the defined distance of a watercourse				
Vegetation within the defined distance of a stream order 2 or higher	1,009.8	10.3	Likely	Yes
Endangered or Of Concern RE, within the defined distance of a watercourse	311.9	4.4	Likely	Yes
REs that intersect a wetland	53.7	nil	Unlikely	No
Essential habitat	6,340.0	262.30	Likely	Yes⁷
Connectivity	Landscape Fragmentation and Connectivity Tool (as assessed by the Queensland Department of Environment and Science) - Not Significant			No

⁶ Regulated Vegetation Mapping v12

⁷ Impacts to Essential habitat are offset through the relevant threatened species

4.0 Offset Delivery Options

4.1 Direct Offsets

Direct offsets are land-based offsets where native vegetation associated with a particular biodiversity value is managed for a period of time to improve its ecological condition and function. Direct offsets are typically larger than the impact area, and are located strategically to enhance existing large patches of vegetation and existing protected areas or to improve connectivity.

The EPBC Act Environmental Offsets Policy requires offsets are built around direct, land-based offsets that protect and enhance threatened ecological communities and species habitats that were impacted. At least 90 % of a total offset requirement should deliver a conservation gain to the impacted MNES (i.e. like for like) through direct measures that are additional to what is already required, including improving condition of existing habitat and reducing threats or creating new habitat. The remaining 10 % of an offset obligation can be indirect or supplementary measures that also relate to the impacted MNES such as research or threat abatement. The Queensland Environmental Offsets Policy also stipulates that direct offsets should contribute at least 90 % of the total offset requirement.

Deviation from the minimum of 90 % direct offset requirement will only be considered where:

- It can be demonstrated that a greater benefit to the protected matter is likely to be achieved through increasing the proportion of other compensatory measures in an offsets package; or
- Scientific uncertainty is so high that it isn't possible to determine a direct offset that is likely to benefit the protected matter. For example, this can be the case in some poorly understood ecosystems in the Commonwealth marine environment (DSEWPC 2012).

A land-based offset needs to be legally secured on title in perpetuity and actively managed to improve ecological condition and provide a conservation gain for the impacted matter. A conservation gain may be achieved by:

- improving existing habitat for the protected matter;
- creating new habitat for the protected matter;
- reducing threats to the protected matter;
- increasing the values of a heritage place; and/or
- averting the loss of a protected matter or its habitat that is under threat.

The offset must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced. Offsets should align with conservation priorities for the impacted protected matter and be tailored specifically to the attribute of the protected matter that is impacted in order to deliver a conservation gain. For instance, if the proposed action is likely to have impacts on foraging habitat for a particular protected matter, then the offset should create, improve, protect and/or manage foraging habitat.

Offsets that deliver social, economic and/or environmental co-benefits are encouraged.

4.2 Indirect Offsets

Indirect offsets are generally seen as supplementary to direct offsets. Indirect offsets need to relate directly to the biodiversity value being impacted. Under the Queensland Environmental Offset Policy, indirect offsets must result in,

or improve the spatial capture of vegetation and wildlife information, or be an action associated with a threatening process identified in a conservation plan or recovery plan.

Indirect offsets may consist of measures such as:

- Implementing priority actions outlined in relevant recovery plans;
- Contributing to relevant research or education programs;
- Habitat mapping / modelling for priority critically endangered, endangered, vulnerable or near threatened species listed under the NC Act or EPBC Act, using a methodology approved by the Regulator.

4.3 Financial Settlement

The use of offset payments as provided for under the Queensland Environmental Offsets Policy is not accepted under the EPBC Act Environmental Offset Policy. It is therefore only applicable for values that are not associated with MNES or able to be co-located in the same patch of vegetation with MNES.

A financial settlement payment can be used to meet an offset requirement for any MSES impacted by a development. The required payment is calculated by applying the Financial Settlement Offset Calculation Methodology set out in the Queensland Environmental Offsets Policy, or the online calculator can also be used to confirm the MSES payment. Financial payments are made up of costs associated with on-ground land management, administration and landholder incentive payment.

Unless agreement has been reached that the impact and offset will be staged, the full amount of the financial settlement offset must be paid to the offset account administered by Department of Environment and Science (DES) prior to commencing the activity to which the offset condition relates.

The intent is that financial payments are made prior to an impact occurring.

5.0 Proposed Offset Delivery

Direct land-based offsets are proposed for all MNES assessed as having significant residual impacts associated with development of the Project (see **Table 5-1**). It is currently intended that at least 100 % of the koala, northern greater glider, magnificent brood frog, spectacled flying-fox and masked owl offsets will be delivered as land-based offsets. In addition, a significant voluntary contribution of up to \$250,000 towards research into the magnificent brood frog is proposed.

Offsets for impacts to fauna habitat values will use the EPBC Act offsets calculator to determine the total area required for each value using data obtained from habitat quality assessments as outlined in the following sections. Data from impact areas will be compared against offset areas to determine the areas required for each value.

Table 5-1 Indicative Offset Requirements

MNES	Threat Status	SRI and Approximate Offset Requirement ⁸ (ha)
Koala (<i>Phascolarctos cinereus</i>)	Endangered ⁹	SRI 843.8 ha Offset required 4,219 ha
Northern greater glider (<i>Petauroides volans minor</i>)	Vulnerable	SRI 887.9 ha Offset required 4,439.5 ha
Magnificent brood frog (<i>Pseudophryne covacevichae</i>)	Vulnerable	SRI 120.5 ha Offset required 602.5 ha
Masked owl (northern) (<i>Tyto novaehollandiae kimberli</i>)	Vulnerable	SRI 1,026.3 ha Offset required 5,131.5 ha
Spectacled flying-fox (<i>Pteropus conspicillatus</i>)	Endangered	SRI 976 ha Offset required 4,880 ha

5.1 Habitat Quality Assessments

Field-based habitat quality assessments are required to be undertaken at both impact and proposed offset sites. A range of site-based habitat quality data will be collected, principally based on the Queensland *BioCondition Assessment Manual Version 2.2* (Eyre et al 2015) and the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (EHP 2017) and incorporating draft guidance provided by DAWE on using modified habitat quality assessment (MHQA) to better reflect the requirements of the EPBC Act Environmental Offsets Policy.

This method is aimed at defining the appropriate field data to be collected during field habitat assessments to allow comparative analysis between sites and subsequently support area calculations for the purposes of acquitting offset requirements for the five MNES identified as being impacted by the Project.

⁸ Indicative offset areas have been calculated at a ratio of 5:1; during the post approvals phase, habitat quality assessments will be undertaken for impact areas and used to formally calculate offset requirements using the EPBC offset calculator

⁹ The koala was up-listed from Vulnerable to Endangered on 12 February 2022. As this was after the Project received its Controlled Action decision, the Project will continue to assess the koala as Vulnerable in line with the requirements of the PER Guidelines issued by DAWE

The following sections describe the data collection approach for each of the MNES requiring offsets. The habitat quality scoring is then discussed further in **Section 5.2**.

5.1.1 Desktop

It is first necessary to assign assessment units and survey zero points for each plot for each MNES at a desktop level, as prescribed in the BioCondition Assessment Manual. This allows navigation and the ability to ground-truth the desktop information for accuracy and relevance to the MNES to be assessed prior to progressing with the collection of more detailed field data. The following steps were undertaken at a desktop level, prior to mobilising for field surveys:

- Spatially locate suitable candidate sites including both remnant and non-remnant vegetation based on pre-clear mapping of REs (where there are known associations between REs and the MNES in question), with reference to historical records, soil types, protected areas, bioregional habitat corridors and/or any other landscape features that might provide additional habitat value to an area.
- Where possible, conduct aerial interpretation of vegetation health and cover, and the accuracy of mapping.
- Assign assessment units based on vegetation, health, cover and any other influences such as weediness, erosion, fire, grazing, clearing etc., that can be inferred from imagery.
- Assign sufficient survey plot locations based on initial assessment units according to Section 3.2 of the BioCondition Assessment Manual, noting that these may require fine tuning in the field.

5.1.2 Field

Before considering BioCondition assessment consideration needs to be given to the optimal timing of the field survey, as explained broadly in Section 3.3 of the BioCondition Assessment Manual and in the recommended survey guidelines for specific MNES.

5.2 Habitat Quality Scoring

DAWE’s modified habitat quality assessment (MHQA) is an adaptation of the Queensland Government’s *Guide to determining terrestrial habitat quality v1.2* (EHP 2017). The MHQA better reflects the requirements of the *EPBC Act Environmental Offsets Policy* (DSEWPC 2012) for determining habitat quality, including consideration of **site condition**, **site context** and **species stocking rate**.

The MHQA can be used to value the quality of habitat at the impact and offset sites. Scores from the MHQA can be transferred into the quality score fields of the EPBC calculator. The proposed data inputs for the habitat quality scoring of the impact and offset sites for the Project area are listed in **Table 5-2**.

Table 5-2 Data input for scoring

Attribute	Methodology	Notes
Site Condition		
Site-based attributes:	Raw data column: <i>Guide to determining terrestrial habitat quality</i>	Benchmarks are specific to the Regional Ecosystem present in the assessment unit (AU).

Attribute	Methodology	Notes
<ul style="list-style-type: none"> Recruitment of woody perennial species in the ecologically dominant layer (EDL) Native plant species richness – trees, shrubs, grasses and forbes Tree canopy height Tree canopy cover Shrub canopy cover Native grass cover Organic litter Large native trees Coarse woody debris Non-native plant cover 	<ul style="list-style-type: none"> Section 5.1.1 How to measure field based attributes <p><i>BioCondition Assessment Manual</i> (Eyre et al 2015)</p> <ul style="list-style-type: none"> Chapter 3 The assessment unit and site selection Chapter 5 Assessment of site-based attributes <p>Benchmarks column:</p> <p><i>Guide to determining terrestrial habitat quality</i></p> <ul style="list-style-type: none"> Section 5.1.1 How to measure field based attributes <p><i>BioCondition benchmarks</i> (DES 2019)</p>	
<p>Species habitat attributes:</p> <ul style="list-style-type: none"> Quality and availability of food and foraging habitat Quality and availability of shelter 	<p><i>Guide to determining terrestrial habitat quality</i> – Section 7.2 Undertaking a species habitat index assessment</p>	<p>These attributes are scored by determining species-specific indicators and developing a rating scale for each indicator.</p>
Site Context		
<p>Landscape-scale attributes:</p> <ul style="list-style-type: none"> Size of patch Connectedness Context 	<p><i>Guide to determining terrestrial habitat quality</i></p> <ul style="list-style-type: none"> Section 6.2 Undertaking a site context assessment <p><i>BioCondition Assessment Manual</i> (Eyre et al 2015)</p> <ul style="list-style-type: none"> Chapter 6 Assessment of landscape-scale attributes (Section 6.1 Fragmented landscapes) 	<p>Apply procedure for fragmented landscapes:</p> <p>The <i>Guide to determining terrestrial habitat quality</i> includes instructions for intact and fragmented landscapes. To score these for the MHQA, apply the procedure for fragmented landscapes.</p> <p>Include all habitat:</p> <p>The <i>Guide to determining terrestrial habitat quality</i> includes only remnant or regrowth vegetation in these measurements.</p> <p>To score these for the MHQA, measurements must include <i>all</i> habitat for the protected matter. E.g. koala habitat includes any forest or woodland containing species that are known koala food trees, or shrubland with emergent food trees as defined in the <i>EPBC Act referral guidelines for the vulnerable koala</i> (DoE 2014).</p> <p>Assess at AU scale:</p> <p>The <i>Guide to determining terrestrial habitat quality</i> states that measurements should be conducted at the overall site level.</p>

Attribute	Methodology	Notes
		<p>To score these for the MHQA, measurements should be conducted at the Assessment Unit (AU) level.</p> <p>Connectivity and absence of barriers to movement:</p> <p>The <i>Guide to determining terrestrial habitat quality</i> measures connectivity based on adjacency to vegetation.</p> <p>To score this for MHQA, connectivity includes any boundaries where the protected matter can move into adjacent habitat (e.g. a boundary adjacent to a narrow strip of cleared land/track which koalas would use to move into adjacent habitat would be considered to be 'connected' to adjacent habitat).</p> <p>Context buffer:</p> <p>The <i>BioCondition Assessment Manual</i> measures context using a 1 km buffer.</p> <p>To score this for MHQA, the following buffers should be used:</p> <ul style="list-style-type: none"> • TECs, plants, magnificent brood frog – 1 km • koala, greater glider – 20 km • masked owl – 10 km
<p>Landscape-scale attributes:</p> <ul style="list-style-type: none"> • Ecological Corridors 	<p><i>Guide to determining terrestrial habitat quality</i></p> <ul style="list-style-type: none"> • Section 6.2 Undertaking a site context assessment <p>For scoring values see <i>Guide to determining terrestrial habitat quality v1.2</i></p> <ul style="list-style-type: none"> • Table 3 – Site Context scoring sheet guide (p. 22) 	<p>Shared boundary and absence of barriers to movement:</p> <p>Similar to Connectivity above, to score this for MHQA, 'sharing a common boundary with' an ecological corridor includes any boundaries where the protected matter can move into adjacent corridors (e.g. a boundary adjacent to a narrow strip of cleared land/track which koalas would use to move into adjacent corridors would be considered to be a shared common boundary).</p>
<p>Species habitat attributes:</p> <ul style="list-style-type: none"> • Threats to the species 	<p><i>Guide to determining terrestrial habitat quality</i></p> <p>– Section 6.2 Undertaking a site context assessment – <i>Threats to species</i></p>	<p>This attribute is scored by identifying and scoring species-specific and site-specific threat factors.</p> <p><i>Proposed threat factors and scoring must be provided, supported by peer reviewed literature, with references provided, or expert opinion.</i></p>
<p>Species habitat attributes:</p> <ul style="list-style-type: none"> • Species mobility capacity 	<p><i>Guide to determining terrestrial habitat quality</i></p>	<p>This attribute is not relevant to plants or TECs.</p> <p>This attribute is scored by determining species-specific indicators and</p>

Attribute	Methodology	Notes
	– Section 6.2 Undertaking a site context assessment – <i>Species mobility capacity</i>	developing a rating scale for each indicator. <i>Proposed scoring and species-specific indicators must be supported by peer reviewed literature, with references provided, or expert opinion. It is recommended that you discuss your proposal with the Department prior to undertaking on-site surveys.</i>
Species habitat attributes: <ul style="list-style-type: none"> • Role of site location to overall population 	<i>Guide to determining terrestrial habitat quality</i> – Section 7.2 Undertaking a species habitat index assessment	This attribute relates to the likelihood that the site contains habitat critical to the survival of the species or community.
Species Stocking Rate (SSR)		
Species presence and usage attributes: <ul style="list-style-type: none"> • Presence detected on or adjacent to site (neighbouring property with connecting habitat) • Species usage of the site (habitat type & evidenced usage) • Approximate density (per ha) 	MHQA spreadsheet provides a suggested scoring matrix	Species usage: To score this attribute, consider whether there are different definitions for habitat used for dispersal, foraging and/or breeding – refer to SPRAT profiles, conservation advices, recovery plans or other relevant EPBC policy documents. Approximate density: For species with sufficient population data, density ranges can be calculated based on local survey records/ sightings; or if comprehensive targeted surveys have been done on the impact and offset sites, ranges could be devised based on the results. Needs to consider species abundance in the same habitat type and carrying capacity. For cryptic species and data-deficient species, calculating density may not be possible, which would also mean that an increase in stocking rate is not feasible.
Role/importance of species population on site*	Score derived from SSR supplementary table (see below)	This attribute is not relevant to TECs.
*SSR Supplementary Table		
Attribute	Methodology	Notes
Key source population for breeding	Refer to available literature on the species (including SPRAT profiles, conservation advices, recovery plans or other relevant EPBC policy documents).	Scoring for these attributes must be supported by scientific evidence, surveys or studies, and species distribution mapping.
Key source population for dispersal		
Necessary for maintaining genetic diversity		

Attribute	Methodology	Notes
Near the limit of the species range		<i>If sufficient information is not available, you should use a conservative approach.</i>

Instructions on scoring are provided in Section 8 of the *Queensland Government Guide to Determining Terrestrial Habitat Quality*. These are listed in **Table 5-3**.

Table 5-3 Scoring calculations

Score	Methodology	Notes
Site Condition		
MAX Site Condition Score	Total the maximum scores for each attribute for Site Condition	For site-based attributes, maximum scores are provided in the relevant scoring tables in the: <ul style="list-style-type: none"> <i>Guide to determining terrestrial habitat quality</i> and/or <i>BioCondition Assessment Manual</i> For each Quality and availability of food and foraging habitat and Quality and availability of shelter, maximum score is 10 for each
Score for sampling site	<i>Guide to determining terrestrial habitat quality</i> – Section 8 Determine the final habitat quality score	For each sampling site: <ul style="list-style-type: none"> Total all site condition attribute scores Divide by <i>MAX Site Condition Score</i>
Score for assessment unit	<i>Guide to determining terrestrial habitat quality</i> – Section 8 Determine the final habitat quality score	For each assessment unit: <ul style="list-style-type: none"> Total all scores for sampling sites Divide by number of sampling sites in the assessment unit
Area-weighted score for assessment unit	<i>Guide to determining terrestrial habitat quality</i> – Section 8 Determine the final habitat quality score	For each assessment unit: <ul style="list-style-type: none"> Multiply <i>Score for assessment unit</i> by area (ha) of assessment unit Divide by total site area (ha)
Score for the site	<i>Guide to determining terrestrial habitat quality</i> – Section 8 Determine the final habitat quality score	For the total site (matter area): <ul style="list-style-type: none"> Add the <i>area-weighted scores for the assessment units</i>
Site Condition Score - out of 3	Convert the score for the site to a score out of 3	To convert the score for the site to a score out of 3: <ul style="list-style-type: none"> Multiply <i>score for the site</i> by 3
Site Context		
Score	Methodology	Notes
MAX Site Context Score	Total the maximum scores for each attribute for Site Context	<ul style="list-style-type: none"> For Size of patch, Connectedness and Context, maximum scores are provided in the relevant

Score	Methodology	Notes
		<p>scoring tables in the <i>BioCondition Assessment Manual</i></p> <ul style="list-style-type: none"> For Ecological corridors, Role of site location to species overall population in the state, Threats to the species and Species mobility capacity, maximum score is provided in the relevant scoring table in the <i>Guide to determining terrestrial habitat quality v.1.2</i>
Score for sampling site	<p><i>Guide to determining terrestrial habitat quality</i></p> <p>– Section 8 Determine the final habitat quality score</p>	<p>For each sampling site:</p> <ul style="list-style-type: none"> Total all site context scores Divide by <i>MAX Site Context Score</i>
Score for assessment unit	<p><i>Guide to determining terrestrial habitat quality</i></p> <p>– Section 8 Determine the final habitat quality score</p>	<p>For each assessment unit:</p> <ul style="list-style-type: none"> Total all <i>scores for sampling sites</i> Divide by number of sampling sites in the assessment unit
Area-weighted score for the assessment unit	<p><i>Guide to determining terrestrial habitat quality</i></p> <p>– Section 8 Determine the final habitat quality score</p>	<p>For each assessment unit:</p> <ul style="list-style-type: none"> Multiply <i>Score for assessment unit</i> by area (ha) of assessment unit Divide by total site area (ha)
Score for the site	<p><i>Guide to determining terrestrial habitat quality</i></p> <p>– Section 8 Determine the final habitat quality score</p>	<p>For the total site (matter area):</p> <ul style="list-style-type: none"> Add the <i>area-weighted scores for the assessment units</i>
Site Context Score – out of 3	Convert the score for the site to a score out of 3	<p>To convert the score for the site to a score out of 3:</p> <ul style="list-style-type: none"> Multiply <i>score for the site</i> by 3
Species Stocking Rate		
Score	Methodology	Notes
Score assigned	Scored using scoring table in MHQA spreadsheet	
Total SRR score – out of 70	Total <i>Score assigned</i> column	
Total SRR score – out of 4	Convert to score out of 4	<p>To convert the score to a score out of 4:</p> <ul style="list-style-type: none"> Divide score by 70 Multiply score by 4
Final Habitat Quality Score (weighted)		
Score	Methodology	Notes
Average/Final	Transfer scores for Site Condition, Site Context and Species Stocking Rate	

Score	Methodology	Notes
Habitat Quality score - out of 10	Total <i>Average/Final</i> column	This score can be transferred into the Quality score fields of the <i>Offsets Assessment Guide</i> (DAWE) spreadsheet

If any of the attributes are not applicable for the species, remove the row from the spreadsheet (ensuring that the value for MAX Site Condition/Context Score updates accordingly).

5.3 Offset Calculator

Impact area habitat quality scores, along with habitat quality scores for offset sites (existing, without the offset, and with the implementation of the OMP) will be entered into the DAWE Offsets Assessment Guide (v1.04) calculator to assess how much of the impact each offset would acquit for each value being offset. Inputs to the calculator will include the following:

- Risk of Loss – numbers applied as per *Guidance for deriving 'Risk of Loss' estimates when evaluating biodiversity offset proposals under the EPBC Act* (DoEE 2017);
- Time Horizon – 20 years for all values;
- Confidence – 90 % where there was a 1 point improvement in habitat quality score, 85 % for a 2 point improvement, and 70 % for a 3 point improvement.

For each offset site, the habitat quality score 'start value' will be the same as the 'future value without offset'. The same values will be applied because there are no legislative requirements for landholders to undertake conservation management actions at the offset sites. Specifically, management of pests is not required under the *Queensland Biosecurity Act 2014*. The *Vegetation Management Act 1999* in conjunction with the *Planning Act 2016* and subordinate legislation jointly forms the vegetation management framework and regulates the clearing of vegetation in Queensland. Under this framework clearing of non-remnant vegetation is permissible for agricultural purposes.

For the purposes of this Offset Management Strategy, preliminary worked examples of the EPBC Act offsets calculator for each relevant MNES are provided in **Appendix A**.

6.0 Offset Availability Analysis

6.1 Methodology

A regional scale desktop analysis has been completed to assess the availability of potential offset sites that could be used as a direct offset for the predicted Project offset requirements. This analysis was intended to establish the total area of forest and regrowth vegetation (associated with each MNES) and potential offset areas available based on tailored ecological criteria within a defined area of the Einasleigh Uplands and Wet Tropics Bioregions. This information provides greater certainty to regulators in assessing the Project that suitable offset areas, in sufficient quantities, are available to acquit the Project's MNES offset requirements.

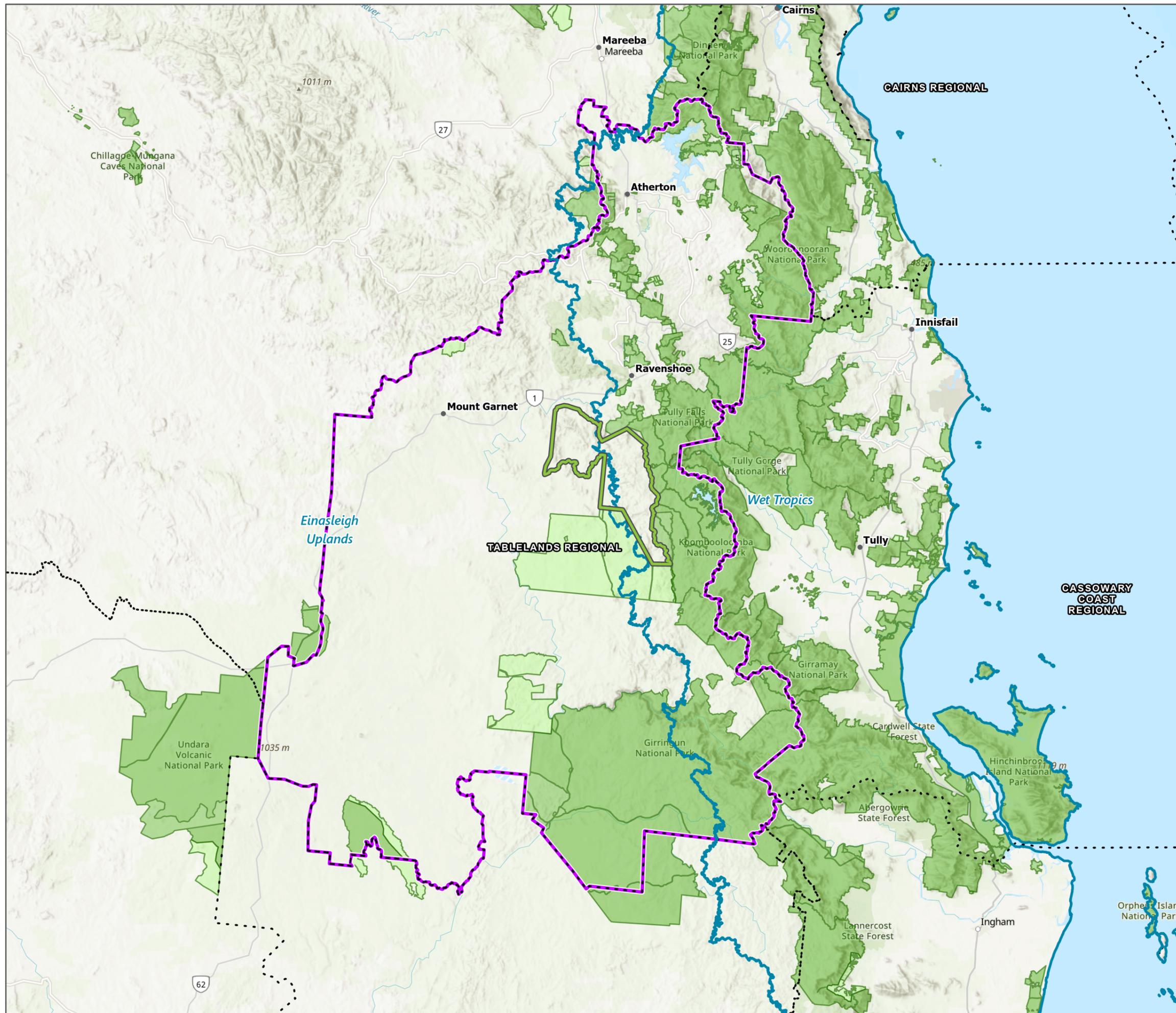
6.1.1 Area of Investigation

The Project area is situated on the boundary of the Einasleigh Uplands and Wet Tropics Bioregions within the local government area of the Tablelands Regional Council (TRC). The TRC boundary was selected as an appropriate Area of Investigation (AOI) for assessing the overall availability of prospective offset sites for the required MNES and MSES values within both bioregions. This AOI is illustrated in **Figure 6-1**.

Chalumbin Wind Farm
Area of Investigation

Figure 6.1

-  Area of Investigation
-  Project Area
-  Local Government Area
-  Biogeographic region
-  Protected Area
-  Nature Refuge



Date: 16/10/2022
 Author: TOD
 Reviewed: NOD
 Project: EPU-004



Scale: 1:750,000@A3

Data Source(s):
 Digital Cadastral Database - Department of Resources (2022)
 Department of Resources, Dept. of Environment and Science,
 Esri, HERE, Garmin, Foursquare, FAO, METI/NASA, USGS, © State
 of Queensland (Department of Resources) 2022, Esri, CGIAR

6.1.2 Data Acquisition

Offset availability analysis was undertaken using the most recent geospatial data available to the public within a desktop GIS environment including:

- Vegetation management pre-clear regional ecosystem map - version 12 (DoR 2021);
- Vegetation management regional ecosystem map - version 12 (DoR 2021);
- Vegetation management regulated vegetation management map - version 5.04 (DoR 2022);
- National Forest and Sparse Woody Vegetation Data – version 4 (DISER 2020);
- Digital Cadastral Database (DoR 2021);
- Local government area boundaries (DoR 2021); and
- Queensland mines permits current web map service (DoR 2021).

6.1.3 Offsettable Vegetation

The National Forest and Sparse Woody Vegetation Data from the National Inventory Reporting derives vegetation mapping using remote sensing analysis techniques from Landsat satellite imagery. Whilst these data are generated primarily for carbon accounting, they provide a robust, consistent, and freely available resource for identifying any remnant or regrowth vegetation across Australia.

Forest woody vegetation is defined as any vegetation with a minimum canopy cover of 20 %, a height of at least 2 m, and minimum patch size of 0.2 ha. Sparse woody vegetation is defined as any vegetation with a canopy cover of 5-19 %, a height of at least 2 m, and minimum patch size of 0.2 ha.

The occurrence of established woody vegetation on a prospective offset site is expected to be in better ecological condition and of an older age, therefore more likely to contain good vegetation community structure and presence of microhabitats such as hollows, leaf litter and woody debris. This in turn reduces the timeframe for the site to provide ecological benefit. Regrowth (sparse woody) vegetation is likely to be in poorer ecological condition (higher level of weeds due to more open canopy) and less likely to have the structural integrity, height, and cover of remnant vegetation. However, over time the sparse vegetation can be enhanced in condition and structure to achieve higher net gains than forest woody vegetation.

A combination of forest and sparse woody vegetation is preferred to achieve a balance between reducing the time to ecological benefit and maximising opportunities to achieve net gains, respectively.

The geospatial intersection of each MNES value's specific search criteria with mapped forest woody and sparse vegetation and cadastral boundaries provides a robust desktop assessment of the abundance and distribution of prospective offset properties that meet the criteria of each value as well as a framework for assessing the opportunities for the co-location of offsets for multiple values within the same property. The total number of properties that satisfy the search criteria for each MNES value is presented in **Section 6.3**.

For each MNES value, a number of specific desktop search criteria were then applied to the vegetation mapping to identify the total availability of offsettable vegetation in the investigation area and the number of individual properties which contain adequate vegetation to acquit an offset liability.

6.2 Limitations

The offset availability analysis has conducted on a DCDB parcel level. It is not practical to aggregate adjacent land parcels owned by the same landholder into a property holding. As such the potential offset sites may over-estimate the number of landholdings available for establishing an offset site. Conversely, additional sites may also be missed if a number of individual lots do not pass the search criteria but aggregated into a single land holding, they do.

The number of potential offset sites is based on the best available desktop criteria. For several MNES values, the criteria are primarily driven by regional ecosystem associations known to contain floristic elements relevant to the MNES value. Additional survey is essential to confirm the suitability of any site to be used as an offset.

6.3 Offset Availability Results

The results of the desktop availability analysis are presented in **Table 6-1** along with the number of land parcels which meet the criteria and the total extent of forest and sparse woody vegetation within these offset sites.

Table 6-1 Offset availability criteria and results

MNES	Search Criteria	Forest Woody Vegetation (ha)	Sparse Woody Vegetation (ha)	Number of Potential Offset Sites
MNES Values				
Koala (<i>Phascolarctos cinereus</i>)	<ul style="list-style-type: none"> Freehold or Lands Lease property within Einasleigh Uplands and Wet Tropics sub-bioregion Canopy height greater than 20m >100 ha of remnant or regrowth vegetation on land zone 3, dominated by eucalyptus woodland (BVG 8-18) Elevation below 800 m AHD 	45,485.4	2,216.3	47
Magnificent brood frog (<i>Pseudophryne covacevicha</i>)	<ul style="list-style-type: none"> Freehold or Lands Lease property within Einasleigh Uplands and Wet Tropics sub-bioregion Glen Gordon Volcanics or similar rhyolite dominated volcanics Up to 50m from stream order 1 watercourse or on watercourse where presence observed during field survey >150 ha of remnant or regrowth vegetation dominated by eucalyptus woodlands (BVG 8 – 18) 	6,214.5	2.9	7
Masked owl (<i>Tyto novaehollandiae</i>)	<ul style="list-style-type: none"> Freehold or Lands Lease property within Einasleigh Uplands and Wet Tropics sub-bioregion Canopy height greater than 20m >110 ha of Remnant or regrowth vegetation on: land zone 3, dominated by eucalyptus woodland (BVG 8-18); OR dominated by eucalyptus woodland (BVG 8-18) within 50 m of a mapped watercourse 	45,170.1	2196.4	44
Northern greater glider (<i>Petauroides minor</i>)	<ul style="list-style-type: none"> Freehold or Lands Lease property within Einasleigh Uplands and Wet Tropics sub-bioregion Canopy height greater than 20m >100ha of remnant or regrowth vegetation on land zone 3, dominated by eucalyptus woodland (BVG 8-18) 	45,485.4	2,216.3	47
MSES Values				
Of Concern RE 7.3.26 (BVG:16a)	<ul style="list-style-type: none"> Freehold or Lands Lease property within Einasleigh Uplands and Wet Tropics sub-bioregion Vegetation Management Status Endangered or Of Concern >20 ha of remnant or regrowth vegetation in BVG:16a 	799.14	1.7	6

MNES	Search Criteria	Forest Woody Vegetation (ha)	Sparse Woody Vegetation (ha)	Number of Potential Offset Sites
Of Concern RE 7.3.43 (BVG:9e)	<ul style="list-style-type: none"> Freehold or Lands Lease property within Einasleigh Uplands and Wet Tropics sub-bioregion Vegetation Management Status Endangered or Of Concern >25 ha of remnant or regrowth vegetation in BVG:9e 	2,100.3	441.8	9
Of Concern RE 7.12.52 (BVG:8a)	<ul style="list-style-type: none"> Freehold or Lands Lease property within Einasleigh Uplands and Wet Tropics sub-bioregion Vegetation Management Status Endangered or Of Concern >100 ha of remnant or regrowth vegetation in BVG:8a 	5141.1	nil	4
Of Concern RE 7.12.57 (BVG:9d)	<ul style="list-style-type: none"> Freehold or Lands Lease property within Einasleigh Uplands and Wet Tropics sub-bioregion Vegetation Management Status Endangered or Of Concern >35 ha of remnant or regrowth vegetation in BVG:9d 	13,354.9	1,476.0	49
Of Concern RE 7.12.66 (BVG:28e)	<ul style="list-style-type: none"> Freehold or Lands Lease property within Einasleigh Uplands and Wet Tropics sub-bioregion Vegetation Management Status Endangered or Of Concern >170 ha of remnant or regrowth vegetation in BVG:28e 	407.2	nil	2
Remnant vegetation within the defined distance of a watercourse	<ul style="list-style-type: none"> Freehold or Lands Lease property within Einasleigh Uplands and Wet Tropics sub-bioregion >45 ha of remnant or regrowth vegetation within the defined distance of a watercourse including: <ul style="list-style-type: none"> >5 ha of BVG:8a vegetation (50% OC RE) >3.5 ha of BVG:9c vegetation (100% End RE) >10 ha of BVG:9d vegetation (1% OC RE) >11 ha of BVG:9e vegetation (10% OC RE) >2.7 ha of BVG:13d vegetation >11 ha of BVG:16a vegetation (10% of OC RE) >3 ha of BVG:16c vegetation >0.2 ha of BVG:24a vegetation >1.3 ha of BVG:28e vegetation (100% OC RE) 	TBC	TBC	TBC

Figures illustrating the overall availability of potential habitat for each MNES value within the AOI as well as identifying potential offset sites which satisfy the search criteria listed in **Table 6-1** are shown in the following maps.

Chalumbin Wind Farm

Desktop Offset Availability
Koala

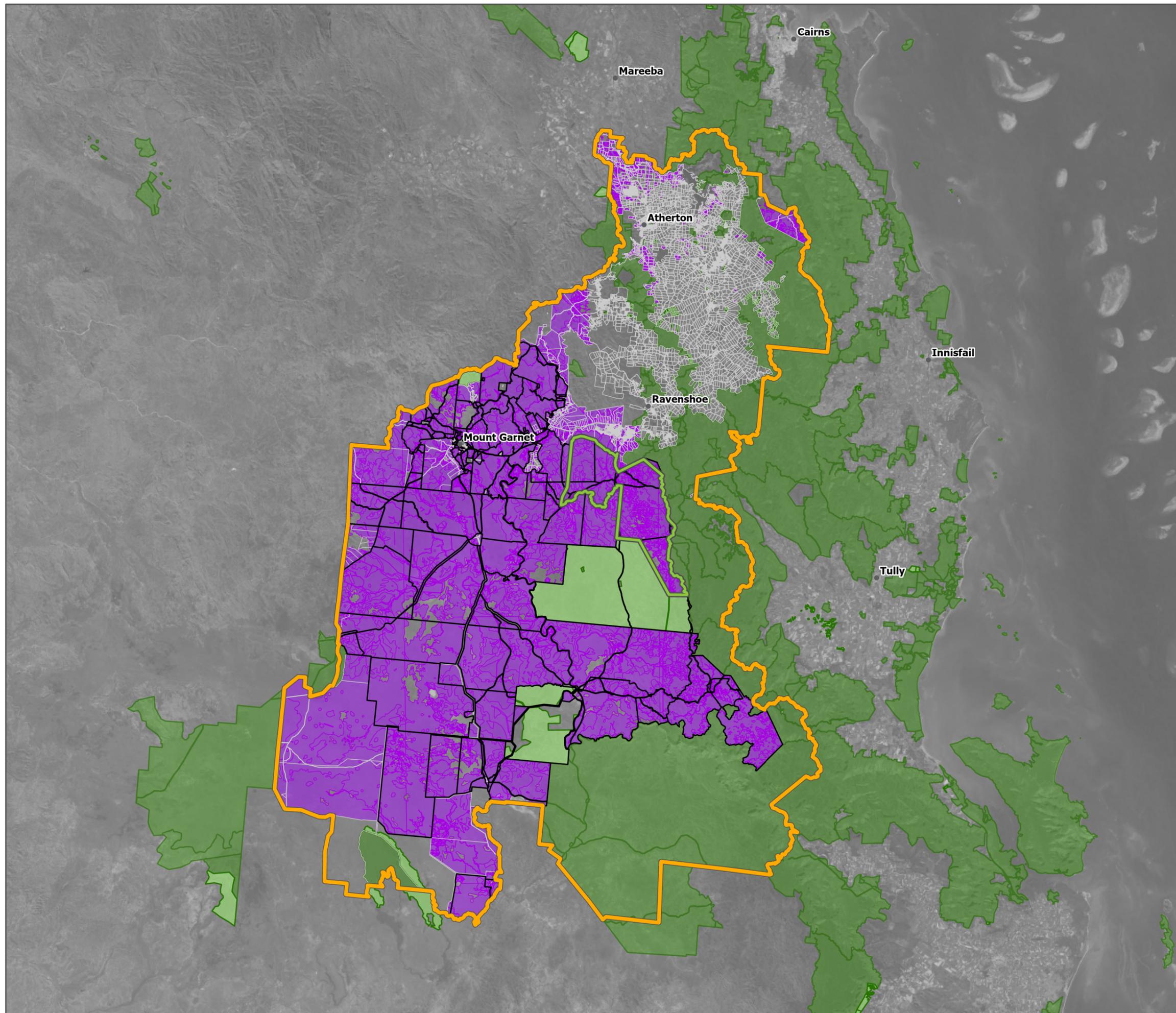
Figure 6.2

-  Project Area
-  Area of Investigation
-  Potential Koala Habitat
-  Potential Offset Site
-  Nature Refuge
-  Protected Area
-  Lot Boundary

Date: 16/10/2022
 Author: TOD
 Reviewed: NOD
 Project: EPU-004



Scale: 1:750,000@A3
 Data Source(s):
 Digital Cadastral Database - Department of Resources (2022)
 Earthstar Geographics, © State of Queensland (Department of Resources) 2022



Chalumbin Wind Farm

Desktop Offset Availability
Magnificent broodfrog

Figure 6.3

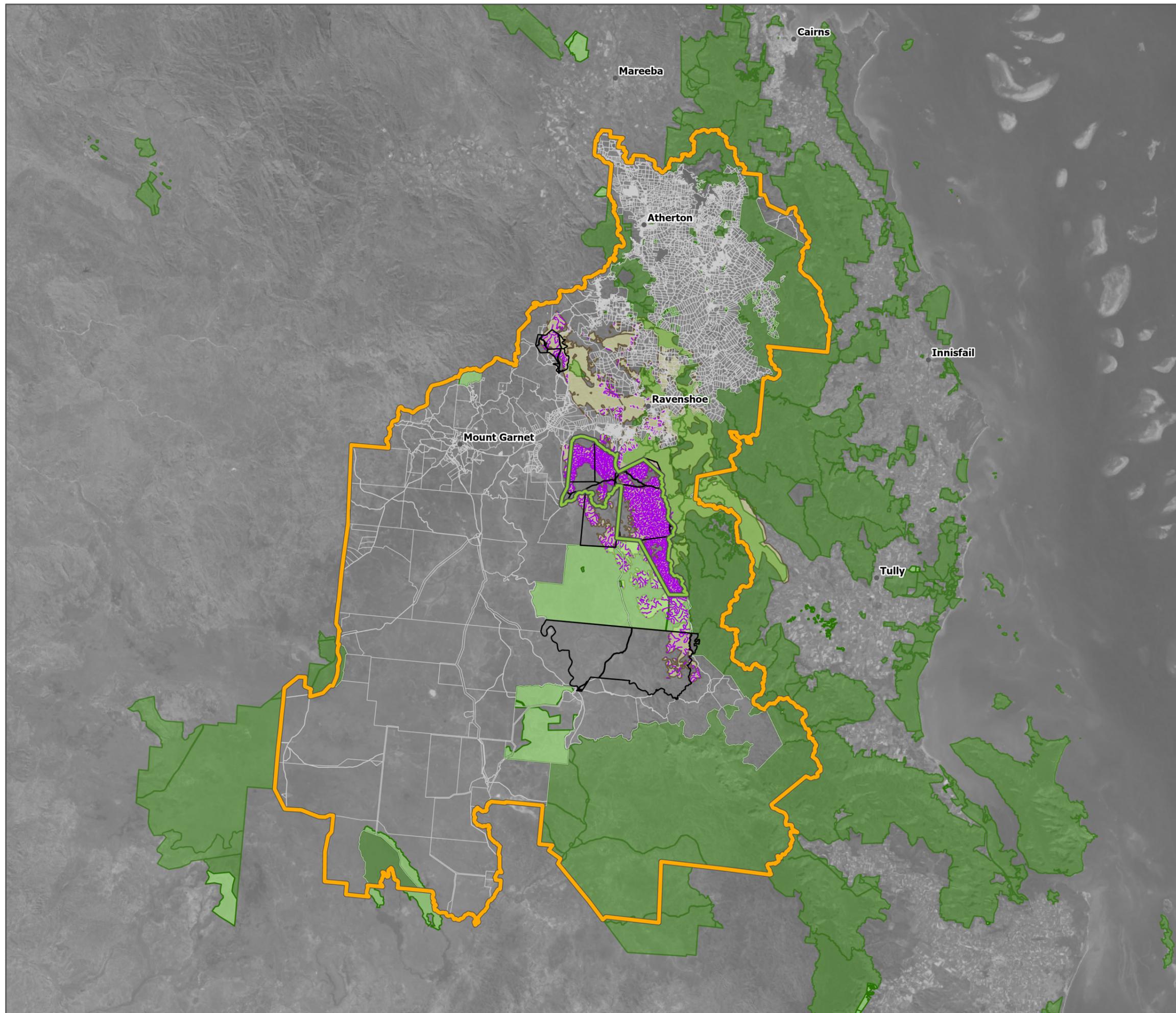
-  Project Area
-  Area of Investigation
-  Potential Offset Site
-  Potential Magnificent Broodfrog Habitat
-  Glen Gordon Volcanics
-  Nature Refuge
-  Protected Area
-  Lot Boundary

Date: 16/10/2022
 Author: TOD
 Reviewed: NOD
 Project: EPU-004



Scale: 1:750,000@A3

Data Source(s):
 Digital Cadastral Database - Department of Resources (2022)
 Earthstar Geographics, © State of Queensland (Department of Resources) 2022



Chalumbin Wind Farm

Desktop Offset Availability
Masked owl

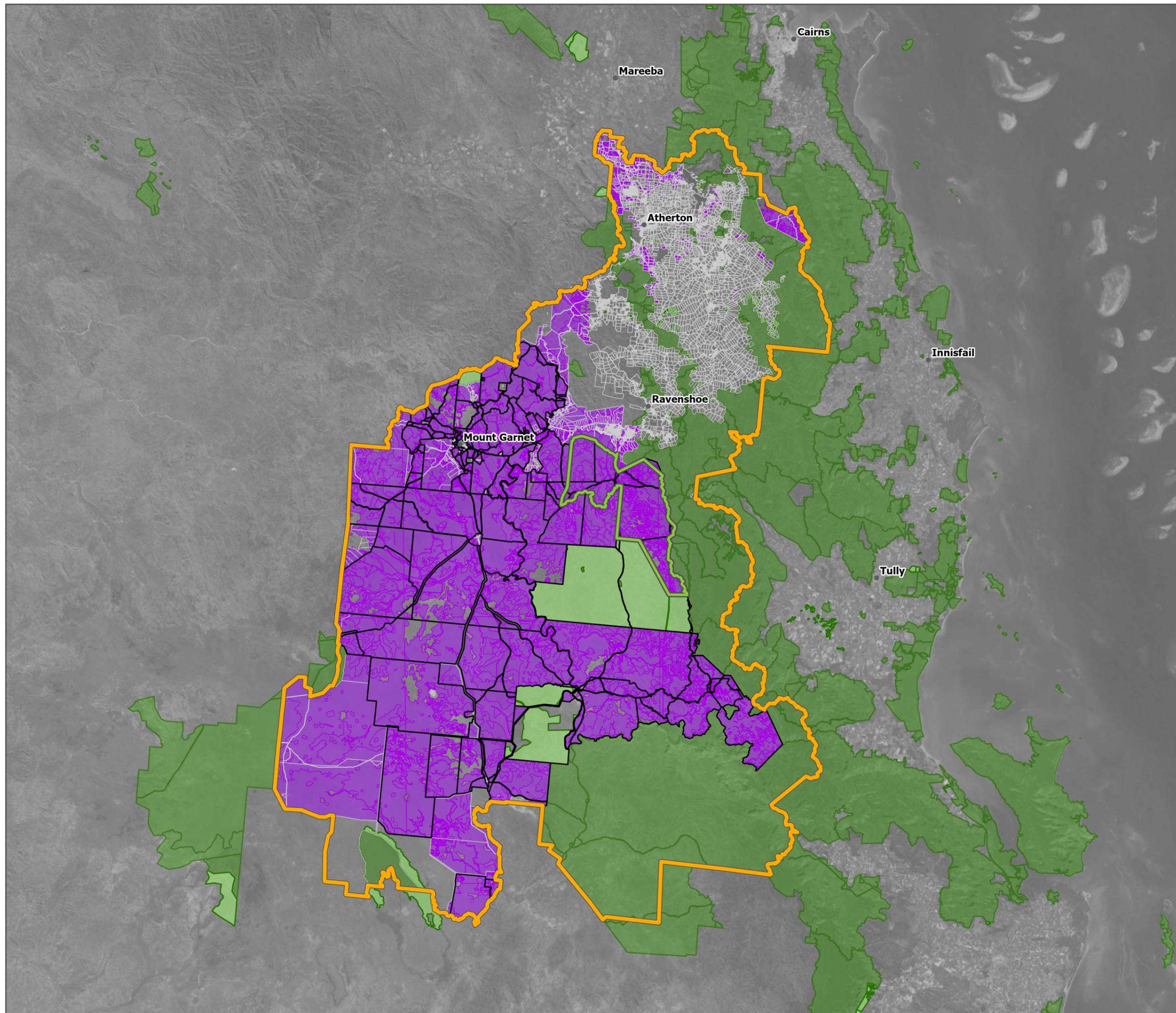
Figure 6.4

-  Project Area
-  Area of Investigation
-  Potential Offset Site
-  Potential Masked Owl Habitat
-  Nature Refuge
-  Protected Area
-  Lot Boundary

Date: 16/10/2022
 Author: TOD
 Reviewed: NOD
 Project: EPU-004



Scale: 1:750,000@A3
 Data Source(s):
 Digital Cadastral Database - Department of Resources (2022)
 Earthstar Geographics, © State of Queensland (Department of Resources) 2022



Chalumbin Wind Farm

Desktop Offset Availability
Northern greater glider

Figure 6.5

-  Project Area
-  Area of Investigation
-  Potential Offset Site
-  Potential Northern Greater Glider Habitat
-  Nature Refuge
-  Protected Area
-  Lot Boundary

Date: 16/10/2022
 Author: TOD
 Reviewed: NOD
 Project: EPU-004



Scale: 1:750,000@A3
 Data Source(s):
 Digital Cadastral Database - Department of Resources (2022)
 Earthstar Geographics, © State of Queensland (Department of Resources) 2022

