Appendix E. Ecology Report 2020

Upper Burdekin Wind Farm – Ecological Assessment

Windlab Pty Ltd

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DOCUMENT TRACKING

Project Name	Upper Burdekin Wind Farm – Ecological Assessment
Project Number	15732
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Status	Draft
Version Number	1
Last saved on	28 August 2020

This report should be cited as 'Eco Logical Australia 2020. *Upper Burdekin Wind Farm – Ecological Assessment*. Prepared for Windlab Pty Ltd.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Windlab. ELA would also like to thank the Leggatt family for their hospitality and assistance.

Template 2.8.1

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Abbreviations

Abbreviation	Description
ALA	Atlas of Living Australia
DAWE	Department of Agriculture, Water and the Environment
DoEE	Department of the Environment and Energy
DEWHA	Department of the Environment, Water, Heritage and the Arts
DERM	Department of Environment and Resource Management
DES	Department of Environment and Science
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
ELA	Eco Logical Australia
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
EVNT	Endangered, Vulnerable and Near Threatened
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NC Act	Nature Conservation Act 1992
PMST	Protected Matters Search Tool
PO	Performance Outcome
Project area	The area of interest for Windlab's Upper Burdekin windfarm project
RE	Regional Ecosystem
Survey area	The ecology survey area for the field surveys (2019 and 2020) based on land access
TEC	Threatened Ecological Community
VM Act	Vegetation Management Act 1999
Windlab	Windlab Development Pty Ltd

Executive Summary

Eco Logical Australia (ELA) has been engaged by Windlab Development Pty Ltd (Windlab) to undertake an ecological assessment (wet season and dry season surveys) of the proposed Upper Burdekin Wind Farm Development Project being undertaken by Windlab. Project design, including siting of wind turbines and associated infrastructure, is still being finalised and Windlab is in the early phases of project planning.

An ecological assessment of the proposed wind turbine survey area was undertaken to gain an understanding of potential ecological constraints and the requirement for further studies. A number of Commonwealth and/or State listed environmental values were recorded within the survey area including:

- known threatened species and habitat for Sharman's rock-wallaby, koala, greater glider, spectacled flying fox, masked owl, red goshawk, diadem leaf-nosed bat, greater large-eared horseshoe bat, bare-rumped sheath-tail bat and *Commersonia reticulata*.
- potential threated species habitat for 21 other Commonwealth and/or State listed species
- potential migratory fauna habitat for nine migratory bird species
- regulated vegetation – prescribed regional ecosystem that are of concern regional ecosystems
- regulated vegetation – prescribed regional ecosystem intersecting a watercourse
- connectivity.

1. Introduction

1.1 Project background

Windlab Development Pty Ltd (Windlab) is pursuing the Upper Burdekin Wind Farm Development Project at a site located in the Seaview Range, approximately 65 km south-west of Ingham in North Queensland (Figure 8-1). The project has the potential to generate 400-600 MW of power and will consist of both civil and electrical works. Associated works will include a new substation to connect to the existing transmission infrastructure to the east.

Project design, including siting of wind turbines and associated infrastructure, is still being finalised and Windlab is in the early phases of project planning.

1.2 Objectives and scope of work

The objective of this study is to undertake baseline seasonal ecological assessments of the proposed wind turbine project area to gain an understanding of ecological values so avoidance and mitigation measures can be implemented during the design of wind turbine and associated infrastructure placement.

The specific scope of this work is to:

- conduct a desktop assessment of relevant environmental databases, maps and policies
- undertake habitat assessments to determine types of species habitat present
- undertake a targeted seasonal (pre-wet and post-wet) fauna surveys using a range of fauna survey methodologies to establish presence and absence of threatened species. Techniques include both active and passive survey techniques
- undertake a targeted flora survey to ground-truth ecological values, including an assessment of the extent and classification of vegetation communities, nature and quality of flora and fauna habitat, and the likelihood of threatened flora and fauna occurrence
- analyse desktop and field data to assess the potential presence of Endangered, Vulnerable or Near Threatened (EVNT) species and other important ecological values
- compile a report (this document) describing and mapping ecological values.

A separate scope for the Upper Burdekin project involved a LiDAR constraints analysis (ELA, 2020). This analysis informed the vegetation mapping and subsequent habitat potential for many key threatened species and is discussed in this report. This analysis was further refined during the field assessment associated with this scope.

This scope of works does not include an impact assessment.

1.3 Project area and survey area definition

In this report, the broader area of interest for the project is called the project area, which is a total of 46,209.2 ha. However, this was restricted by availability of land access, both in terms of landholder agreement and safe access due to the steep and rugged landscape, and client priorities for survey of the most likely areas for turbine construction.

The resulting area available for investigation is called the ecology survey area. This survey area of 29,038 ha is the focus of this report, and comprises of the following lot plans:

- Lot 3918 Plan PH2177
- Lot 2 Plan SP205224
- Lot 3 Plan WG274
- Lot 8 Plan SP104503.

The project area and survey area are outlined in **Figure 8-1**.

2. Legislative context

2.1 Commonwealth legislation

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the key piece of Commonwealth environmental protection legislation. Under the EPBC Act, actions that have or are likely to have, a significant impact on Matters of National Environmental Significance (MNES) require approval from the Australian Government Minister for the Environment and Energy (the Minister). The Minister will decide if approval is required under the EPBC Act.

The provisions of the EPBC Act require a person proposing to take an action that is likely to have a significant impact on MNES values, to refer the proposal to the Minister. If the Minister decides that significant impacts are likely (i.e. the proposed action is a controlled action), then further assessment and approval from the Minister is required under the EPBC Act.

2.2 State legislation

2.2.1 Planning Act 2016

Queensland's planning and development assessment system comprises a hierarchy of planning instruments, starting with the *Planning Act 2016* (Planning Act). The Planning Act is the overarching framework for Queensland's planning and development system. It regulates the process by which development takes place and the effects of development on the environment as well as coordinating and integrating planning at local, regional and state levels.

The Planning Act includes the framework for a material change of use (MCU), which is the provision for wind farm development within Queensland. The Wind Farm State Code (State Code 23) provides an assessment and approval pathway for the material change of use for a new or expanding wind farm.

2.2.1.1 *Wind Farm State Code*

State Code 23 is contained within the State Development Assessment Provisions and is designed to protect individuals, communities and the environment from adverse impacts as a result of the construction, operation and decommissioning of a wind farm. The code has a number of performance outcomes (PO), including PO5 'development ensures that impacts on flora, fauna and associated ecological processes are avoided, or minimised and mitigated, through effective siting, design and operation of the development'.

The Department of Infrastructure, Local Government and Planning provide a planning guideline to assist proponent in meeting the requirements of State Code 23. In order to satisfy PO5, a proponent must undertake an ecological assessment, evaluate alternative locations or mitigation measures should potential risks to flora and fauna be identified, and prepare a preliminary vegetation management plan, preliminary fauna management plan and preliminary bird and bat management plan to support an MCU application.

The planning guideline outlines that the guidance material for wind farm developments predominantly focuses on the local ecological impacts unique to wind farms (e.g. birds and bats), especially as state

regulated vegetation clearing requirements are addressed under separate approvals and permits under the Planning Act.

The code specifies an ecological assessment that identifies and assesses any risk to flora, fauna and associated ecological processes and how this risk may be mitigated or managed through the siting and design of the wind farm. An ecological assessment should accompany the application and include a review of:

- bird and bat flight paths
- fauna habitat and corridors
- on-site vegetation and corridors including worst case scenario impacts to regulated vegetation and locally significant vegetation (for example, where a project layout includes a level of flexibility to allow for final micro-siting).

2.2.2 Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VM Act) and associated policies and codes regulate the clearing of native vegetation in Queensland.

Under the VM Act, most remnant vegetation irrespective of land tenure and all native vegetation on State land (regardless of conservation status) is protected (there are some exemptions e.g. for mining leases). Remnant vegetation (native vegetation that occurs in a mapped Regional Ecosystem (RE) or that meets the structural and species requirements to be mapped as a RE and occurs within the mapped Category B on the Regulated Vegetation Map) and High Value Regrowth are assessed under this process.

Regional Ecosystems are listed as Endangered, Of Concern and Least Concern. These VM Act classes and land zoning determine different restrictions under clearing codes as well as which REs are included as Matters of State Environmental Significance (MSES). REs also have a 'Biodiversity Status' listing (Queensland Herbarium, 2015), which uses different criteria to the VM Act class. However, as the VM Act class is used to define MSES, the Biodiversity Status is not used in this report.

2.2.3 Nature Conservation Act 1992

The object of the *Nature Conservation Act 1992 (*NC Act) is to conserve nature through an integrated and comprehensive conservation strategy for the whole of Queensland involving, amongst other things, the following:

- gathering of information and community education
- dedication and declaration of protected areas
- management of protected areas
- protection of native wildlife and its habitat
- use of protected wildlife and areas to be ecologically sustainable
- recognition of interest of Aboriginal and Torres Strait Islander people in nature and their cooperative involvement in its conservation
- cooperative involvement of landholders.

Any activity that may have the potential to impact on wildlife or its values in an area may be viewed as a threatening process and will be referred to the administering authority as part of the development

approval process. In particular, the effect of activities on threatened species, or the habitat on which that wildlife depends, including tampering with habitat, will be considered by the administering authority under the NC Act. The NC Act requires permits to be obtained for taking of protected plants, moving protected animals and tampering with animal breeding places.

2.2.4 Environmental Offsets Act 2014

The *Environmental Offsets Act 2014* (EO Act) and supporting regulations and policies provide a single framework for the assessment and delivery of environmental offsets where impacts to a prescribed environmental matter occur. The framework also provides a 'one stop shop' for environmental offsets by removing duplication between existing Queensland policies as well as offsets required under the EPBC Act. Section 15 of the EO Act removes the ability for the state and local governments to impose an offset condition in relation to a prescribed activity, if a Commonwealth decision has already been made in relation to the same prescribed environmental matter and area of impact.

The provisions of the EO Act allow for offsets to be conditioned if there is a significant residual impact on a 'prescribed environmental matter' after all avoidance and mitigation measures have been considered. Prescribed environmental matters are described in section 10 of the EO Act and section 5 and Schedule 2 of the *Environmental Offsets Regulation 2014* (EO Reg) and include:

- MSES listed in schedule 2 of the EO Reg
- accredited MNES (subject to the Queensland's offset framework receiving accreditation for the purpose of the EPBC Act).

3. Environmental context

3.1 Bioregions and subregions

The survey area occurs within two bioregions, the Wet Tropics (Bioregion 7) and the Einasleigh Uplands (Bioregion 9). Within the Wet Tropics portion, the survey area occurs in the Paluma-Seaview subregion. The survey area occurs across two subregions in the Einasleigh Uplands bioregion: Herberton-Wairuna and Broken River.

The Wet Tropics bioregion is diverse, with vegetation ranging from rainforest, sclerophyll forests and woodlands to shrublands, heathlands and mangroves. The Einasleigh Uplands consists of rugged hills and ranges, dissected plateaus and alluvial and sand plains, from 410-790 m above sea level. Vegetation is dominated by eucalypt woodlands.

3.2 Climate

The wet tropics bioregion receives very high rainfall, most of which falls over summer (the wet season). Mean annual rainfall ranges from approx. 4000 mm in along the coast to approx. 1200 mm inland. The Einasleigh Uplands also receives most of its rainfall over the summer months, however, the mean annual rainfall is much lower than the wet tropics bioregion, ranging from approximately 730 mm to approximately 1000 mm annually.

The nearest Bureau of Meteorology weather station to the survey area is the Ingham Composite (032078), located close to the coast approximately 40 km to the north-west. A summary of climate statistics for this station is provided in **Table 3-1** . The nearest rainfall gauge to the survey area is Michael Creek Alert (032186), where the mean annual rainfall is 1318.5 mm.

Table 3-1: Climate summary for Ingham Composite

Statistic	Average
Annual max temperature (^{0}C)	29.2
Annual minimum temperature (^{0}C)	18.9
Annual rainfall (mm)	2,140.7

3.3 Geology and soils

Twelve surface rock types occur in the survey area, granite being the dominant rock which forms more than half of the survey area. Overall, rock formations across the site are a combination of composite unit (dominantly stratified), intrusive unit and stratified unit (including volcanic and metamorphic). The lithological summary of each rock unit in the survey area is provided in **Table 3-2.**

Table 3-2 Dominant rock types in survey area

Dominant rock	Formations	Total area (ha)	Proportion in Survey area (%)
ALLUVIUM	Clay, silt, sand and gravel; flood-plain alluvium	49.3	0.2
BASALT	Mostly olivine basalt flows and some plugs; some areas of nephelinite, basanite etc	693.0	2.4

Dominant rock	Formations	Total area (ha)	Proportion in Survey area (%)
BASALT	Olivine basalt	696.3	2.4
COLLUVIUM	Clay, silt, sand, gravel and soil; colluvial and residual deposits (generally on older land surfaces)	2604.6	9.0
DIORITOID	Grey, medium-grained, equigranular hornblende-biotite quartz diorite; some granodiorite and minor gabbro	2468.8	8.5
FELSITES (LAVAS, CLASTICS & HIGH-LEVEL INTRUSIVES)	Dark grey to black trachytic, rhyolitic and dacitic ignimbrite and pale-coloured lava flows	2.4	0.0
FERRICRETE	Duricrusted palaeosols at the top of deep weathering profiles, including ferricrete and silcrete; duricrusted old land surfaces	167.6	0.6
GRANITOID	Cream to grey, fine to medium-grained, seriate to abundantly porphyritic biotite granite; minor biotite-hornblende granite	4039.1	13.9
GRANITOID	Cream to pink, medium to coarse-grained, predominantly equigranular biotite granite	10514.9	36.2
GRANITOID	Grey medium-grained subequigranular pyroxene-hornblende-biotite, hornblende-biotite diorite, quartz diorite and hornblende-biotite tonalite	506.7	1.7
GRANITOID	Pale grey to pale pink, fine to medium-grained porphryritic hornblende-biotite and biotite monzogranite and granodiorite; undivided granites of the northern Ingham Batholith (I-types)	1219.9	4.2
GRANITOID	Pink, orange, or cream, fine to coarse-grained, porphyritic to seriate biotite granite; common microgranite and abundant greisen and chloritic alteration zones	269.3	0.9
GRANITOID	Predominantly pink, medium-grained, equigranular biotite granite	1605.5	5.5
MUDROCK	Maroon, ferruginous mudstone and siltstone	66.2	0.2
POORLY CONSOLIDATED SEDIMENTS	Clayey quartzose sandstone, sandy claystone, claystone, pebble and cobble conglomerate, minor diatomite	343.4	1.2
SEDIMENTARY ROCK	Feldspathic to lithofeldspathic arenite and mudstone local polymictic conglomerate with limestone clasts, allochthonous limestone blocks	3717.0	12.8
SILCRETE	Silcrete and silicified quartz sandstone; duricrust	74.1	0.3

3.4 Watercourses

The survey area is traversed by numerous watercourses comprised of both minor drainage lines (stream order one) through to major watercourses (stream order five). The largest watercourse traversing the survey area is Michael Creek (stream order five). The survey area lies within two separate drainage basins, Burdekin Basin (associated with the Einasleigh Uplands) and Herbert Basin (associated with the Wet Tropics).

3.5 Connectivity

The survey area is predominantly covered by remnant vegetation and contains large tracts of well-connected native vegetation. The combined area of Range View Nature Reserve, Lannercost State Forest and Girringun National Park (part of the Wet Tropics World Heritage Area located approximately 700 m east of the survey area at its closest point) provides an important wildlife corridor within the regional landscape. The survey area is broadly connected to surrounding landscapes and vegetation by a state mapped corridor, which runs north to south throughout the survey area.

3.6 Current land use

As per Queensland Land Use Mapping (QLUMP 2018) there are eight land uses within the survey area:

- production from relatively natural environments (grazing native vegetation)
- production from relatively natural environments (production native forests)
- production from dryland agriculture and plantations (plantation forests)
- production from irrigated agriculture and plantations (irrigated perennial horticulture)
- intensive uses (residential and farm infrastructure)
- intensive uses (services)
- conservation and natural environments (nature conservation)
- conservation and natural environments (other minimal use).

Production from relatively natural environments (grazing of native vegetation) is the dominant land use across the survey area.

4. Methods

4.1 Desktop assessment

A desktop assessment was undertaken prior to the field assessment to identify potential ecological features that may occur within the survey area.

4.1.1 Database searches

To assess potential Commonwealth and State environmental matters that may occur within the survey area, the following key databases and resources were reviewed:

- EPBC Act Protected Matters Search Tool (PMST), undertaken with a 20 km buffer around the survey area (-18.72971 145.71343, -18.72012 145.76544, -18.78205 145.79634, -18.80122 145.7536, -18.72971 145.71326, -18.72971 145.71343) on 17 August 2020
- Wildlife Online Database Search, undertaken with a 20 km buffer around the survey area (-18.4711, 145.4622 to -19.109, 146.0435) on the 17 August 2020 for all fauna and flora species lists and individual records of listed species
- Atlas of Living Australia database using a 20 km buffer from the survey area for all flora and fauna species
- RE mapping version 11 (DES 2020)
- DEHP's Protected Plants Flora Survey Trigger mapping (DES 2020)
- Queensland MSES report (DES 2020)
- VM Act watercourse mapping (DNRM 2012)
- Queensland geological digital data (DNRM, 2012)
- Land-systems mapping (CSIRO, 1967)
- Queensland Land Use Mapping (QLUMP 2018)
- Planning cadastre
- Species Profile and Threats Database (DAWE, 2020), Approved Conservation Advice, National Recovery Plans and Survey Guidelines for MNES and MSES species occurring within the survey area
- Aerial imagery
- LiDAR (Windlab data / ELA Memo sources).

Database search results are provided in **Appendix B**.

4.1.2 Previous studies

No known previous field studies have been undertaken in the survey area; however, one desktop ecology assessment and constraints analysis has been conducted (EMM, 2019). The study involved review of the ecological values of the proposed project location and its surrounds, as well as identification of potential constraints to development, implications for project approvals and recommendations for further work.

4.1.3 Likelihood of occurrence assessment

Database searches identified listed threatened flora and fauna species that may occur within the survey area and surrounding region. An initial likelihood assessment of species potentially occurring in the

survey area was conducted prior to the field assessment, based on current state vegetation mapping and database records.

Likelihood assessments were undertaken using the known distribution and preferred habitat of the species. The criteria used to assess the likelihood of threatened species occurring within the survey area is presented in **Table 4-1.** This assessment provided a targeted list of threatened and migratory species to focus habitat assessments and field effort.

The species database searches were re-run prior to each field survey to ensure any new species were captured in the likelihood assessment and included in the field survey effort, including checking PMST, Wildlife Online and ALA resources. Likelihood assessments were updated after the field survey and analysis of data, when more definitive data about the potential occurrence of on-ground values were available. The results of the likelihood assessment are presented in **Appendix C**.

Table 4-1: Likelihood assessment criteria of occurrence within survey area

Likelihood	Description
Known	Species was positively identified and recorded in the survey area during the field assessment; previous records of occurrence within the survey area.
Likely	Species was not recorded during the field survey or previously, however there are known records within the nearby surrounding area and suitable habitat exists on site.
Potential	Species was not recorded during the field survey or previously, however known records occur within the surrounding area and habitat in the survey area is marginal or degraded.
Unlikely	Habitat in the survey area might be suitable or marginal; however, species was not recorded during the field survey, and no known records of the species exist within the surrounding area.

4.2 LiDAR constraints analysis

In 2019, Windlab acquired high resolution aerial imagery and LiDAR data for the project area. These datasets were used to further refine the constraints mapping for the survey area. The analysis used a range of spatial tools to increase the level of detail around the location of environmental values and updated the mapping accordingly. Priority avoidance areas were selected to inform the project design, by outlining where clearing should be avoided or mitigated from a biodiversity perspective. The datasets allowed for the following spatial analysis;

- pattern analysis of aerial imagery (false colour and enhanced natural colour)
- analysis of the digital terrain model (DTM) to provide spatial layers including topographic position index (TPI) 40 m reclassified into three classes of lower, mid and upper positions (lower 0 to 0.4, mid 0.4 to 0.7, upper 0.7 to 1.0)
- terrain ruggedness index (TRI) 6-square using focal statistics (neighbour rectangle)
- slope generated using the spatial analyst slope tool (degrees) displaying slope in four categories based on natural breaks
- aspect general using the spatial analyst aspect tool.

The constraints analysis informed the target areas for the 2020 field surveys

4.3 Field survey

Field surveys were conducted across two seasons to capture the natural variability and change in species activity and/or likelihood of detection that is experienced in the Wet Tropics and Einasleigh Uplands bioregions across seasons. An early wet season survey (late September 2019) and an early dry season survey (July 2020) were conducted. The survey methods, associated data analysis and survey limitations are detailed below.

4.3.1 Flora survey

The flora assessment consisted of ground-truthing State RE mapping across the survey area. Data on vegetation characteristics (floristic and structural form), ecological condition and extent of the vegetation communities was collected via two methods; secondary and quaternary assessments. Targeted searches for threatened flora species were also undertaken, and incidental observations of weed species across the survey area.

4.3.1.1 Site selection

Site locations for the flora survey are displayed on **Figure 8-2**. Sites were selected to sample as many mapped REs as possible, within time and access constraints. Most sites were chosen close to roads and tracks, with others located in areas close to the indicative turbine designs. The primary objective of the flora survey was to ground-truth the REs across the survey area and as such the survey team targeted their effort along mapped RE boundaries.

4.3.1.2 Secondary surveys

Secondary level surveys were used to identify vegetation communities and REs across the survey area by capturing data on the condition and species composition. Secondary level surveys were undertaken in accordance with the '*Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*' (Neldner et. al. 2019). At least one secondary site was chosen in each RE.

At each survey point, the following information was recorded:

- RE classification
- vegetation condition (remnant, high-value regrowth, regrowth, non-remnant).
- dominant, co-dominant, sub-dominant and associated species, as well as average height and cover at each structure level (emergent, T1, T2, T3, S1, S2, ground)
- ecologically dominant layer (emergent, T1, T2, T3, S1, S2, ground)
- structure (dense, mid-dense, sparse, very sparse)
- landform
- soil texture and colour
- evidence of disturbance (weeds, clearing, grazing etc.) and erosion.

RE classification was determined based on the vegetation, soil and landform characteristics identified in the field, geological mapping for the region, and the Regional Ecosystem Description Database. Condition status for woody vegetation was evaluated utilising the definitions of remnant vegetation under the VM Act.

4.3.1.3 Quaternary surveys

Quaternary surveys were undertaken to validate the extent, classification and condition of ground-truthed vegetation communities and habitat types within the survey area. Quaternary surveys were undertaken in accordance with Neldner et al. (2019). At each survey point, the following information was recorded:

- RE classification
- vegetation condition (remnant, high-value regrowth, regrowth, non-remnant).
- dominant species at each structure level (emergent, T1, T2, T3, S1, S2, ground)
- ecologically dominant layer height (m) and cover (%)
- structure (dense, mid-dense, sparse, very sparse).

In addition to formal secondary and quaternary surveys, incidental observations were made on weed species and their distribution and relative abundance. Incidental records of flora species outside quaternary and secondary sites were also made.

4.3.1.4 Threatened species searches

Targeted threatened species searches were conducted across the survey area throughout the field campaign. Based on the results of the likelihood assessment (**Appendix C**), targeted surveys focused specifically on determining the location and habitat for the following species and one TEC that were identified as likely or potential to occur in the survey area:

Flora group	Species
Trees / shrubs	*Acacia longipedunculata, Acacia tingoorensis* (tingoorensis wattle), *Corymbia leptoloma* (yellowjacket), *Homoranthus porteri, Marsdenia brevifolia*
Grasses	*Aristida granitica*, *Cycas platyphylla, Dichanthium setosum* (Bluegrass)
Orchids and forbs	*Bulbophyllum globuliforme* (miniature moss-orchid), *Corchorus subargenteus*, *Corybas cerasinus* (red helmet orchid), *Drosera adelae* (sundew), *Glossocardia orthochaeta, Phaius pictus* (forest swamp orchid), *Phalaenopsis amabilis* subsp. *rosenstromii* (native moth orchid), *Rhomboda polygonoides* (syn. *Zeuxine polygonoides*) (velvet jewel orchid)
Threatened Ecological Community	Broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland

Targeted threatened species surveys involved knowledge and understanding of the targeted flora species and their potential habitat to direct searches. The flora field teams consisted of two ecologists, one of which was a suitably qualified person for identifying threatened flora in the region.

4.3.2 Fauna survey

The fauna survey consisted of general and targeted habitat assessments and a combination of active and passive fauna detection methods, including area searches, spotlighting and call playback, ultrasonic and acoustic detectors, remote cameras, and scat analysis. Based on the results of the likelihood assessment (**Appendix C**), targeted surveys focused specifically on determining the presence, site usage and habitat value for the following species:

Fauna group	Species
Mammals	Sharman's rock-wallaby, koala, greater glider, spectacled flying fox, grey-headed flying fox, bare-rumped sheath-tailed bat, diadem leaf-nosed bat, greater large-eared horseshoe bat, short-beaked echidna
Birds	Red goshawk, glossy black-cockatoo, southern cassowary, masked owl (northern)
Migratory birds	White-throated needletail, fork-tailed swift, oriental cuckoo, barn swallow, black-faced monarch, spectacled monarch, satin flycatcher, rufous fantail, Latham's snipe

A range of survey locations and techniques were employed to target these threatened species, as detailed in the following sections. Whilst the methods focussed on the target species, other vertebrate fauna species were also recorded incidentally by the field teams. For example, pest species were recorded across the survey area to understand their impact on threatened species and habitat condition.

4.3.2.1 Site selection

Survey effort was focused on assessing habitat values and potential species occurrences in areas surrounding proposed turbine locations. The location of fauna survey sites was selected to allow for sampling of habitat for each threatened or migratory fauna species (target species) having potential to occur, as identified in the desktop assessment (**Section 4.1**). These locations are displayed in Figure 8-3. Survey sites were established in locations that were compliant with species specific survey guidelines and required survey effort for each of the target species, as detailed in **Table 5-4**.

4.3.2.2 General habitat assessments

General habitat assessments were undertaken across each habitat type in the survey area to sample the habitat condition, availability of habitat resources and the capacity to support key fauna groups. Information on general habitat features and condition were collected including:

- soil texture and colour
- presence and abundance of foraging resources such as fleshy fruiting species, seeding grasses, flowering eucalypts and mistletoe
- presence and abundance of sheltering and nesting resources such as decorticating bark, hollow trees and logs, fallen woody debris, leaf litter, soil cracks, rocks, crevices, basking platforms and grass tussocks
- general disturbances.

4.3.2.3 Targeted habitat assessments

Targeted habitat assessments were conducted for species identified in the desktop assessment as potentially occurring in the survey area and for those with specialist habitat requirements. For these species, specific details of habitat features are required to understand their potential occurrence in the survey area. Data collected on habitat features specific to each species were guided by relevant National Recovery Plans, Commonwealth Listing Advice and Survey Guidelines (specific references are provided in Table 5-4). These species and their associated microhabitat features include:

- koala (food tree species)
- greater glider (hollow-bearing trees, size of hollows, tree species)
- spectacled flying fox (fruiting and flowering flora species, evidence of camps)

- Sharman's rock-wallaby (density and structure of rocks, boulders and crevices)
- masked owl (hollow-bearing trees, size of hollows, tree species)
- glossy black-cockatoo (habitat type, food tree species, frequency of hollows)
- cassowary (food tree species)
- red goshawk (tall trees within 1 km to a permanent water source).

4.3.2.4 Fauna detection methods

Active and passive fauna survey methods were used to determine the presence of threatened fauna species, as follows:

- Active methods:
    - bird surveys
    - active searches, including scat and track searches, den and roost site searches
    - drone surveys
    - spotlighting and call playback
    - harp and mist net trapping.

- Passive methods:
    - ultrasonic and acoustic call detectors
    - baited remote cameras.

Each of these methods is described in further detail below. Survey site locations for all survey methods are shown in **Figure 8-2** and **Figure 8-3**. Overall survey effort per method is presented in **Table 5-4**.

4.3.2.5 Diurnal active searches

Diurnal active searches were conducted throughout the survey area in areas of potential species habitat.

Active searching included searching to directly observe threatened species or find indirect evidence of species' presence, such as roost signs, scats, scratches, tracks or nests.

Active diurnal searches for scats of were conducted near potential den sites, in rocky areas and along creek lines. Active diurnal searches for signs of Sharman's rock-wallaby (i.e. scats, smooth worn rock ledges and tracks in sandy substrate on rock ledges / cliff lines). Searches for roost sites of flying foxes were conducted across the survey area. Diurnal active searches for koala focussed on direct sightings of the species or evidence of scratches on trees or scats.

Threatened and migratory birds were actively searched for during bird utilisation surveys (**Section 4.3.2.6**) and opportunistically throughout the day within different habitats. Bird surveys involved walking slowly through site or along established tracks recording all direct observations by sight and sound. Bird species were identified based on their calls, flight patterns, behaviour and visual observations (often through binoculars). The locations of any threatened or migratory bird species were recorded using a GPS (± 5 m accuracy). High bird activity areas were targeted during these bird surveys, such as riparian zones, dams, springs, creeks, dense shrub and woodland areas. Cassowary searches focussed on direct sightings of the bird, or evidence of nests, scats, footprints or cassowary or food

resources (e.g. rainforest fruits). Red goshawk nests were actively searched for in tall trees along watercourses or emergent trees throughout woodlands.

Drone surveys targeted red goshawk nests and Sharman's rock-wallaby habitat. A DJI Mavic Air 2 drone was operated by an ecologist using the DJI Fly application (Version 1.1.6). The drone was flown along riparian zones and over the tree canopy in suitable red goshawk habitat to inspect trees for potential red goshawk nests. Drone flights were also conducted over potential Sharman's rock-wallaby habitat in order to identify boulder stacks that may represent core habitat for the species.

4.3.2.6 Bird Utilisation Survey (BUS)

Bird surveys were conducted at sites representing a range of habitats across the survey area to capture information about the height above the ground at which birds were observed and their direction of flight (refer to State Code 23 PO5 Flora and Fauna and Appendix 3 – Ecological assessment methodology). The surveys followed a 2-ha, 20 min systematic bird survey (BirdLife Australia standard) recording all individuals of all species heard or seen, including those flying over. Information recorded for each survey included:

- location
- habitat description
- date, start and end times
- survey type and observers
- weather – temperature, wind velocity and direction, cloud cover, precipitation
- flower abundance
- species, number of individuals, observation method, microhabitat, behaviour, flight height and direction.

4.3.2.7 Spotlighting and call playback

Spotlighting and call playback surveys targeted nocturnal threatened species such as koalas, greater glider, masked owl, spectacled flying fox, grey-headed flying fox and Sharman's rock-wallaby. Spotlighting included two survey methods by two ecologists: slow driving transects to allow for maximum survey area coverage whilst detecting nocturnal species, and slow walking transects. Spotlighting was complimented with intermittent call playback for target species known to respond (koala and masked owl).

4.3.2.8 Ultrasonic and acoustic detectors

Ultrasonic bat detection devices (Anabat Swifts or Anabat Express) were used to determine species richness of microbats within the survey area. Unattended bat recorders were placed in the vicinity of rocky outcrops or in foraging sites such as vegetation corridors, flyways, over watercourses and adjacent to artificial waterbodies (dams) in representative potential, likely and known habitat. A time delay was programmed into each ultrasonic device such that the Anabats recorded calls from 5 pm to 5 am the next morning.

Acoustic recording devices (Wildlife Acoustics Song Meter SM3 and Frontier Labs BAR) were used to detect the presence of koala, masked owl and red goshawk within the survey area. These were placed in representative potential, likely and known habitat for these species. Acoustic recording devices were programmed to either record all day for diurnal species (red goshawk), or from dusk until dawn for nocturnal species (koala and masked owl).

4.3.2.9 Remote cameras

Remote cameras were deployed across the survey area to detect the presence of threatened fauna. Locations included areas of known or potential habitat, such as adjacent to used fauna tracks, near waterbodies, along ledges in rocky outcrops, near hollow bearing trees, burrows or at the base of fallen logs. To increase the likelihood of attracting fauna, each camera was aimed a bait station containing universal bait (a mixture of peanut butter, oats, honey and sardines). Remote camera locations are displayed in Figure 8-3.

Cameras were either fixed to a bracket and attached to trees pointed directly down at a fixed bait station (**Figure 4-1,** left); or fixed to trees or other habitat features and were directed towards a bait station positioned approximately 2-8 m away on the ground, often amongst boulders or at suspected den sites (**Figure 4-1**, right). Bait stations were baited with either chicken necks or with a universal bait.

Each camera was programmed to take up to three images each trigger event with a one second delay between triggers. Cameras were set to run 24 hours per day. All photographs were downloaded from the cameras and analysed by a fauna ecologist.

Figure 4-1: Remote camera trap design pointing directly down at bait station (left), or pointed at habitat features (right)

4.3.2.10 Harp traps and mist netting

Harp trapping and mist netting were used to supplement ultrasonic data and to sample for the presence of species that cannot be identified by call alone.

Trapping was conducted in areas of suitable habitat for threatened microbat species that are known or have potential to occur in the survey area. Targeted species included bare-rumped sheath-tailed bat, greater large-eared horseshoe bat and diadem leaf-nosed bat.

Traps were set in the vicinity of potential roosts and forest flyways, rocky outcrops, escarpments and riparian zones. Trapping was conducted by two suitably qualified ecologists per the Survey Guidelines for Australia's Threatened Bats (DEWHA, 2010). Trapped bats were identified to species level in the field and were released immediately after identification processing was complete.

Four double bank harp traps were set each trap night and were open from approximately 6:00 pm to 10:00 pm. Traps were set either singly or in double formation, depending on the size of the flyway gap (**Figure 4-2**). Harp traps were checked once at the end of each trapping session, and then were closed down for the remainder of the night.

Figure 4-2: Harp traps in single (left) and double (right) formation

One mist net 12 m long x 4 m high was set each trap night for three hours per trap night. The mist net was usually installed across a waterbody with the aim of catching bats coming to the waterbody to drink (**Figure 4-3**). If no water was present at the trapping location (for example trapping in a woodland), then the mist net was strung across a large gap in a flyway. The mist net was set from approximately 6:30 pm and was monitored constantly until it was closed at 9:30 pm.

Figure 4-3: Mist net preparation

4.3.3 Data collection and analysis

4.3.3.1 GIS analysis

Data was captured in the field using ArcCollector on iPads or smartphones, and this spatial data was imported into ArcGIS Pro (Version 10.2) for analysis. The methodologies for vegetation community mapping and habitat mapping for threatened species are outlined in the following sections.

4.3.3.2 Vegetation community mapping

Flora data was analysed against state vegetation mapping. Where necessary, vegetation community and habitat boundaries were refined and/or verified using spatial data collected in the field to produce final ground-truthed mapping.

Some REs mapped by the state were not surveyed due to access and/or time constraints. To overcome this limitation, a process for validation and quantitative assessment was undertaken in the form of confidence ratings to further understand the spatial and attribute accuracy for each vegetation community polygon (**Figure 8-6**). This method is part of the *Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland* (Neldner et. al. 2019), whereby a confidence rating of A, B or C is given for spatial and attribute accuracy, as follows:

- spatial accuracy of boundaries is defined as the spatial or positional accuracy of the polygon boundary line, with confidence ratings as follows:
    - A = high confidence in accuracy of polygon boundary
    - B = moderate confidence in accuracy of polygon boundary
    - C = low confidence in accuracy of polygon boundary
- attribute accuracy of the polygon regional ecosystem attribute, which includes the regional ecosystem and the proportions of mixed polygons, with confidence ratings as follows:

- A = high confidence in accuracy of polygon attributes
- B = moderate confidence in accuracy of polygon attributes
- C = low confidence in accuracy of polygon attributes.

Certain REs can intrinsically have a low spatial accuracy due to gentle environmental gradients, whereby the boundary between two REs gradually changes across, say, one hundred metres. The presence of field data generally indicated a high confidence in attribute accuracy, depending on the size of the polygon. In this instance, the confidence scoring was primarily utilised to denote ELA's confidence in the spatial and attribute accuracy. This method also allowed for moderate "B" accuracy to be applied in areas not ground-truthed, which were considered analogous with other surveyed areas based on our understanding of the broader survey area, and the relevant consistency of state mapping.

4.3.3.3 Habitat mapping

Habitat mapping within the survey area was undertaken with the guidance of multiple data inputs including habitat assessments collected during the field survey, species records (ALA and survey records), slope and elevation data, LiDAR modelling, geology, ground-truthed vegetation, modelled habitat and Queensland Regional Ecosystem mapping.

4.3.3.4 Flora and fauna field samples

Samples were collected for flora specimens that could not be accurately identified in the field. Samples were inspected further using a microscope and relevant plant keys to identify the species. Scats were collected for confirmation of species by scat expert Georgeanna Story at Scatsabout.

4.3.3.5 Bioacoustic data analysis

Ultrasonic bat calls were analysed by qualified specialist, Greg Ford of Balance! Environmental. The format and content of the analysis summary reports complies with nationally accepted standards for the interpretation and reporting of Anabat data (Reardon 2003). Bat activity was calculated using calls identified to a "definite" and "probable" confidence level. Only species or species groups that have been identified to a definite or probable level have been included within this report.

Analysis of acoustic data recorded during the survey period was undertaken with the use of Kaleidoscope Pro software (Wildlife Acoustics version 5.3.3). Recordings were scanned using signal detection parameters specific to the vocalisation of each target fauna species (koala, red goshawk and masked owl) and detected signals were reviewed by an ecologist for presence at each site.

4.3.4 Survey limitations

Results are intrinsically limited to the snapshot in time the field surveys offered to collect data on presence of species.

4.3.4.1 Flora

The flora survey was limited by access to difficult habitats (mainly rocky cliffs and deep gorges), however this was qualitatively assessed through the application of confidence scores in vegetation mapping.

It should be noted that the detectability of plants and the ability to accurately identify plants to species level may vary greatly with the time of year, prevailing climatic conditions and the presence of reproductive material (e.g. flowers, fruit, and seed capsules). The flora survey may have been limited to the lateness in the flowering season, in particular in the September 2019 survey period when grasses and sedges could not all be readily identified to species level. Additionally, species identified as

potentially occurring in the survey area have very few resources available to aid field identification (i.e. keys and floristic structure). Consequently, the survey conducted for the survey area should not be regarded as conclusive evidence that certain protected plants do not occur within the survey area.

The 2020 survey was delayed due to COVID-19 travel restrictions, which came into place in March 2020. The survey had been planned for the immediate post-wet season (April 2020) but could not be undertaken until July 2020. This resulted in similar constraints to flora survey as in 2019 – grasses and forbs had largely finished flowering and/or fruiting, rendering accurate identifications difficult.

4.3.4.2 Fauna

All fauna assessments are subject to inherent limitations in the detection success of targeted species. These limitations often result in a degree of false-absence records (i.e. a species is present, but not detected). It is important, therefore, that the limitations to surveys are identified and the survey results are viewed with these constraints in mind.

The mapped presence of fauna species was based primarily on a mixture of; vegetation communities grouped into broad habitat types, general and targeted habitat assessments, and LiDAR analysis for habitat features such as riparian zones and granite outcrops (tors) as well as species detection (direct or indirect sightings). A true indication of seasonal habitat utilisation by fauna species is limited by the survey timing and mapping approach, particularly for threatened and migratory species. Species with large home ranges may not be present in this part of their home range during the survey, although surveying across two seasons reduces this limitation. Cryptic species and species present in low densities in the survey area may be difficult to detect regardless of survey methodology.

It is important to understand food availability across the year for some of the targeted species, for example fruiting or flowering plants for the grey-headed flying fox. Few food resources were fruiting or flowering within the survey area during both surveys, so species that respond only to these resources may not have been present at the time of the survey, however, may utilise the survey area at another point in time.

Periodic rain was experienced in the Wet Tropics section of the survey area during week 1 of the 2020 surveys. Rain does not allow for favourable conditions for catching microbats and therefore limited the catch rate during harp and mist-net trapping events. However, given that target species can reliably be detected on Anabats, the species richness of microbats in the survey area is unlikely to be impacted by poor trapping conditions as these species we likely recorded on ultrasonic devices and included in the survey results.

In response to the limitations discussed, the fauna assessment with a suitable survey effort was designed to ensure every chance of detecting the target species, if they were present. For those species not detected and with records nearby, habitat assessments were undertaken to determine the value of the survey area to support such species. Based on the effort and timing of this survey, the absence of a species should not be assumed because it was not detected.

Bird utilisation studies were conducted, bat utilisation studies were not completed (only species richness at the survey area). Windlab are still in the early stages of turbine site locations and therefore flight paths of bird and bats intersecting the proposed turbines could not be conducted. Further, no masts

have been constructed within the survey area to date, therefore, recording of bat-calls are turbine height was not possible. These studies are recommended in the future.

5 Results

5.1 Survey timing and conditions

Field surveys were undertaken across two seasons; early wet season (September 2019) and early dry season (July 2020), totalling 31 field days (Table 5-1). The weather conditions leading up to and at the time of the survey are presented in Figure 5-1 to Figure 5-4. Conditions presented some limitations for undertaking the required surveys, as described in **Section 4.3.4**.

Table 5-1 Field surveys at Upper Burdekin

Season	Survey number	Survey type	Ecologists	Survey period	Survey length (days)
Early wet season	1	Fauna	2	3rd to 7th September 2019	5
	2	Fauna	2	13th to 19th September 2019	7
	3	Flora	4	24th to 28th September 2019	5
Early dry season	4	Flora and Fauna	4	7th to 13th July 2020	7
	5	Fauna	2	23rd to 29th July 2020	7

Rainfall data was obtained from recordings at the Michael Creek Alert which is the closest station to the survey area (BOM, 2020). Rainfall was below average in the preceding month (August) and the month of the early wet season surveys (September) (Figure 5-1). September mean rainfall measures 31 mm, however less than 1 mm was recorded in September 2019, when early wet season field surveys were being conducted.

Temperature data was obtained from recordings taken at Townsville as it was the closest weather station with complete data records. The Townsville weather station (Townsville Aero) is located approximately 80 km south west of survey area. Maximum and minimum daily temperatures were comparable with historical mean temperatures (**Figure 5-2**).

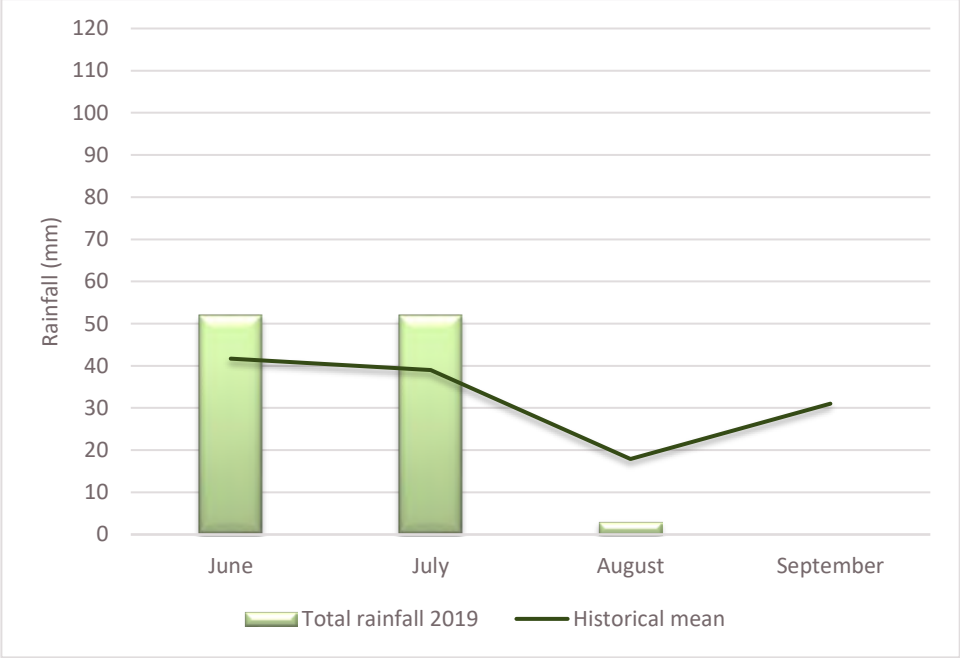

Figure 5-1. Rainfall in the early wet season survey month (September 2019) and the months preceding. The historical mean rainfall for those months is also provided.

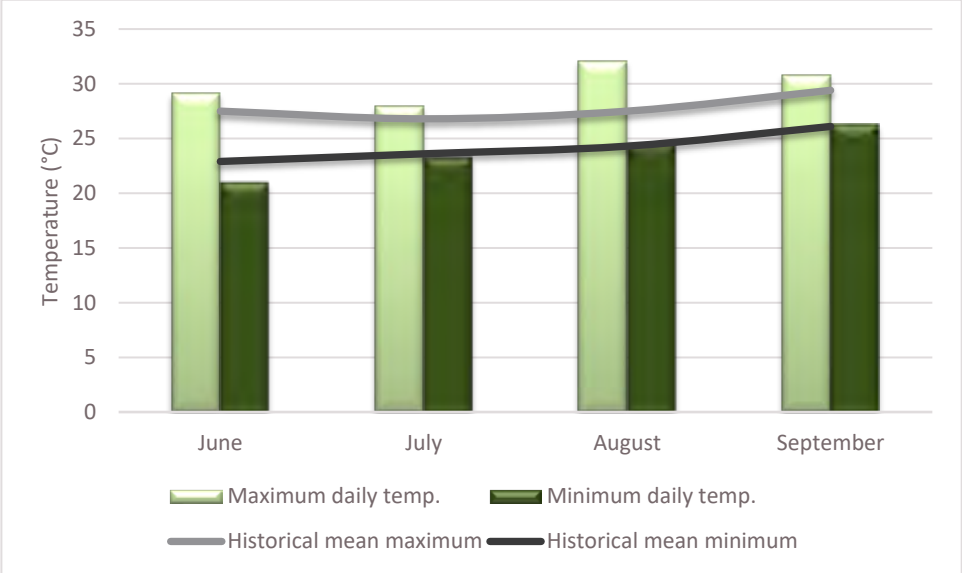

Figure 5-2. Maximum and minimum daily temperatures for the early wet season survey month (September 2019) and the months preceding. The historical mean maximum and minimum temperatures for those months is also provided.

Rainfall conditions for the early dry season surveys were comparable to the historical average in the survey month (July 2020), although May 2020 rainfall was considerably higher than the mean and June 2020 rainfall was drier than usual (**Figure 5-3**). Maximum and minimum daily temperatures were generally comparable with historical mean temperatures (**Figure 5-4**).

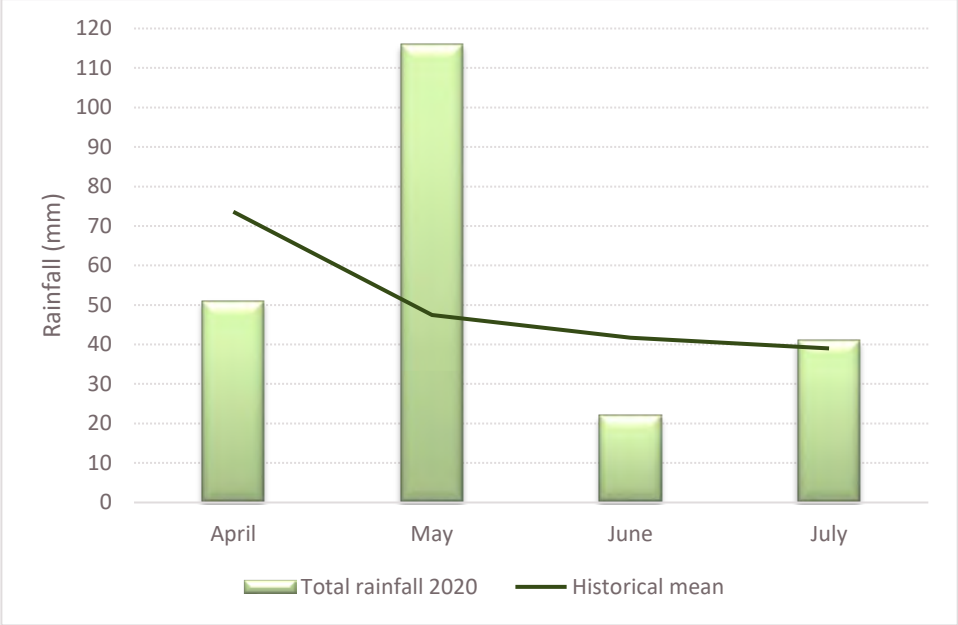

Figure 5-3 Rainfall in the early dry season survey month (July 2020) and the preceding 3 months. The historical means for those months are also shown.

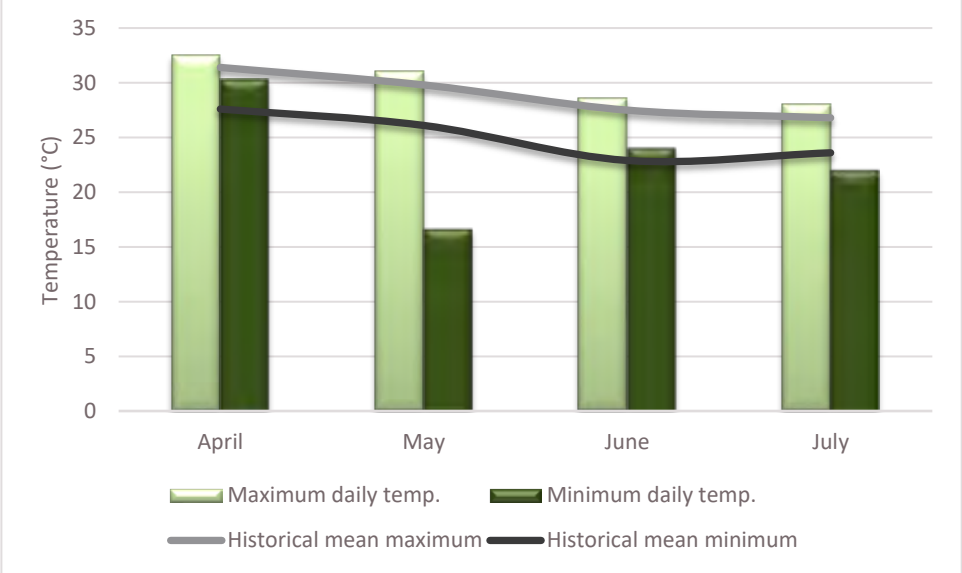

Figure 5-4. Maximum and minimum daily temperatures for the early dry season survey month (July 2020) the preceding 3 months. The historical mean maximum and minimum temperatures for those months are also shown.

5.2 Overall survey effort

The number of flora survey sites for each data collection method are outlined in **Table 5-2** and visually represented in Figure 8-2**.** Fauna survey effort is provided in **Table 5-3** and is presented in Figure 8-3.

Table 5-2: Flora survey effort

Survey type	Number of sites (early wet season 2019)	Number of sites (early dry season 2020)	Total number of sites
Quaternary	316	172	488
Secondary	52	0	52
Vegetation structure	52	6	58
Flora species	4	21	25

Table 5-3: Fauna survey effort

Survey method	Early wet season	Early dry season	Total effort
Ultrasonic detector	10 sites 300 recording nights	15 sites 74 recording nights	25 sites 374 recording nights
Acoustic detector	4 sites 76 recording nights	4 sites 46 recording nights	8 sites 122 recording nights
Remote camera	45 sites 596 trap nights	33 sites 451 trap nights	78 sites 1,047 trap nights
Spotlighting and call playback	10 nights 70 hours	5 nights 15 hours	15 nights 85 hours
Harp traps and mist netting	Not conducted in 2019	4 sites 15 harp trap nights 5 mist net nights	4 sites 15 harp trap nights 5 mist net nights
Bird surveys	Area searches over 12 days	Area searches 60 hours over 14 days. 20 Bird Utilisation Surveys	Area searches over 26 days 20 Bird Utilisation Surveys
Diurnal active searches	Area searches 96 hours over 12 days	Area searches 112 hours over 14 days	208 hours over 26 days
Drone surveys	Not conducted in 2019	2.95 hours flight time over 21.22 km	2.95 hours flight time over 21.22 km
General habitat assessments	81 assessments	13 assessments	94 assessments
Targeted habitat assessments	301 assessments	69 assessments	370 assessments

Table 5-4: Fauna survey effort undertaken

Species	Survey Guideline	Survey Guideline Requirement and Seasonal Considerations	Survey Effort Undertaken	Response to Guidelines
Southern cassowary (*Casuarius casuarius johnsonii*)	Significant impact guidelines for the endangered southern cassowary (*Casuarius casuarius johnsonii)* Wet Tropics population (DEWHA 2010a).	Survey techniques: Guidelines provide recommendations for survey areas of 50 ha or less. The recommended survey methods include: • Area searches / transect surveys • 20 hours over 10 days Seasonal or other considerations: Consideration should be given to the timing, effort, methods and area to be covered in the context of the proposed action. If surveys are conducted outside recommended periods or conditions, survey methods and effort should be adjusted to compensate for the decreased likelihood of detecting the species.	Area searches over 12 days, searching for direct and indirect evidence (scats, footprints etc.). Habitat assessments.	Field surveys were undertaken in appropriate seasonal conditions for surveying this species. Limited suitable habitat was identified in the survey area. Survey recommendations for this species have been met.
Red goshawk (*Erythrotriorchis radiatus*)	Survey guidelines for Australia's threatened birds (DEWHA 2008)	Survey techniques: The survey guidelines for Australia's threatened birds (DEWHA, 2008) recommends the following survey method and effort for the red goshawk: • Area searches • 80 hours over 10 days • Search in groups of tall trees and in trees along riverbanks for nests. Seasonal or other considerations: Red goshawks are very secretive, so scanning for nests is the most effective way to detect the species presence.	Area searches over 26 days, totalling > 60 hours searching for direct sightings or indirect evidence (nests). 20 bird utilisation surveys. Drone surveys over 19.9 km of potential breeding habitat searching for nests. Acoustic recording for 16 days Habitat assessments.	The species was positively identified in the survey area during the early dry season survey. One individual was observed above tall wet forests of the north-east of the survey area. No confirmed or suspected nests were identified within traversable areas of the site. The species is thought to occupy the same breeding territory each year (DERM 2012). Given the species secretive nature and large home ranges, it is uncertain whether a breeding pair occupies the survey area. Further surveys are therefore recommended to further define or detect breeding locations within the survey area.

Species	Survey Guideline	Survey Guideline Requirement and Seasonal Considerations	Survey Effort Undertaken	Response to Guidelines
Masked owl (Northern) (*Tyto novaehollandiae kimberli*)	Survey guidelines for Australia's threatened birds (DEWHA 2008)	Survey techniques: • Broadcast call-playback in suitable habitat Seasonal or other considerations: Uncertain, but probably March-October (breeding season)	Spotlighting and call playback conducted over 15 nights totalling 85 hrs of survey effort. Acoustic recording for 122 nights	The field survey met appropriate seasonality considerations this species and species was positively identified in the survey area. Survey recommendations for this species have been met.
Glossy black-cockatoo (*Calyptorhynchus lathami*)	Targeted species survey guidelines: Glossy black-cockatoo (Hourigan 2012)	Survey techniques (per 50 ha site): • Diurnal surveys – 5 hours over 1 day • Search for foraging and nesting signs – 20 hours over 4 days Seasonal or other considerations: Surveys can be carried out at any time of the year but may be most successful in the peak breeding season (March to August).	Area searches over 26 days looking for direct sightings or indirect evidence (nests & foraging resources). 20 Bird Utilisation Surveys	Suitable survey methods (area searches and bird utilisation surveys) for the species were undertaken in suitable seasonal conditions for this species. Survey recommendations for this species have been met.
Latham's snipe (*Gallinago hardwickii*)	Species Profile and Threats Database (DoEE 2019)	Survey techniques: The Species Profile and Threats Database (Queensland Government) recommends the following survey techniques: • Area searches • Line transects on foot • Mist netting Seasonal or other considerations: This species is migratory: surveys should only be conducted between October and February.	Area searches over 26 days looking for direct sightings Habitat assessments.	Area searches undertaken in September and July which is outside the recommended survey period, nevertheless the species was detected during field surveys.
Satin flycatcher (*Myiagra cyanoleuca*)	Species Profile and Threats Database (DoE 2020)	No specific guidelines. Seasonal or other considerations: Species travels to northern Queensland for the winter months.	Area searches over 26 days looking for direct sightings Habitat assessments.	Area searches undertaken in September and July which satisfies the recommended survey period. The species was detected during field surveys.

Species	Survey Guideline	Survey Guideline Requirement and Seasonal Considerations	Survey Effort Undertaken	Response to Guidelines
Sharman's rock-wallaby *(Petrogale sharmani*)	Targeted species survey guidelines - Sharman's rock-wallaby *Petrogale sharmani* (Venz & Rowland 2013).	Survey techniques: Survey guidelines for the species recommend the following is conducted by a minimum of two observers with prior experience of surveying rock-wallabies: • Searching for signs (2 hrs per survey day) • Infra-red camera trapping (5 cameras, at least 14 nights) • Observation surveys (4 hrs per survey day) • Other inferential evidence (1 hr per survey day). Seasonal or other considerations: A secretive species, surveys are best undertaken during cooler weather and encompassing a dawn and/or dusk period when the species is most likely to be active. Surveys should avoid the summer months or hot weather.	Deployment of 78 remote cameras over 1,047 trap nights. Active diurnal searches for signs of the species (i.e. scats, smooth worn rock ledges and tracks in sandy substrate on rock ledges / cliff lines) over 26 days. Drone surveys over 21.2 km of potential habitat searching for potential shelter sites (boulder piles). Spotlighting surveys over 15 nights.	Suitable survey methods for the species (area searches) were undertaken in September and July. The species was positively identified in the survey area. Recommend targeted surveys to further refine species habitat across the survey area once a development footprint has been established.
Greater glider (*Petauroides volans*)	Species-specific guidelines for survey for the greater glider are not currently available, however, the species is readily detectable by spotlighting (Lindenmayer et. al. 2001). Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre *et. al.* 2014) were utilised in the absence of species-specific guidelines.	Survey techniques: In the absence of species-specific survey guidelines, Eyre et. al. 2014 was used to determine suitable survey techniques. Survey methods include: • Spotlighting transects (100 x 100 m) per 30-person minutes. Survey effort not specified Seasonal or other considerations: The greater glider is known to have high site fidelity with relatively small home ranges. There are no seasonal considerations for this species.	Spotlighting was conducted over 15 nights, totalling 85 hrs of survey effort. Habitat assessments.	Suitable survey methods for the species (spotlighting and habitat assessments) were undertaken across two seasons (early dry season and early wet season). The species was positively identified in the survey area. Survey recommendations for this species have been met.
Koala (*Phascolarctos cinereus*)	Survey guidelines for Australia's threatened mammals (DSEWPaC, 2011b)	Survey techniques: The EPBC Act referral guidelines for the koala (DoE, 2014) do not prescribe specific survey effort requirements due to the high level of variation of this species across its distribution. Although, both this document and the survey guidelines for	Spotlighting with call playback Deployment of 78 remote cameras over 1,047 trap nights.	Suitable survey methods for the species (spotlighting, remote cameras, acoustic devices and habitat assessments, active searches) were undertaken in appropriate seasonal conditions for

Species	Survey Guideline	Survey Guideline Requirement and Seasonal Considerations	Survey Effort Undertaken	Response to Guidelines
	EPBC Act referral guidelines for the vulnerable koala (DoE, 2014)	threatened mammals (DSEWPaC 2011b) recommend the following key survey techniques: • Spotlighting with call playback: • Spotlighting within suitable habitat. • Survey effort determined on a case-by-case basis. • Remote camera Survey effort determined on a case-by-case basis. • SATs (Philips & Callaghan 2011) – sampling of a minimum of 30 koala food trees within suitable habitat. Survey effort determined on a case-by-case basis. Seasonal or other considerations: Optimal time period for direct observation surveys is between August and January, as this is when koala activity is generally at a peak, and resident breeding females with back-young are most easily observed. Direct observation surveys conducted outside of this period must take into account the potential for lower koala activity (reduced detectability) and other relevant seasonal considerations. Presence/absence surveys in the inland context, conducted during dry periods, should be centred on riparian areas, upper/mid-slope areas and other dry period refugia in order to maximise detectability	Acoustic recording for 122 days Active searches for direct sightings and indirect evidence (scats and scratches) over 26 days. Habitat assessments.	this species. The species was positively identified in the survey area Survey recommendations for this species have been met.
Spectacled flying fox (*Pteropus conspicillatus*)	Survey guidelines for Australia's threatened bats (DEWHA 2010b)	Survey techniques: The Survey guidelines for Australia's threatened bats (DEWHA 2010b) recommends the following survey methods and effort for the spectacled flying fox: • Day surveys – 6 hrs per 50 ha • Night surveys – 5 hrs per 50 ha Seasonal or other considerations:	Active surveys for foraging resources over 26 days. Surveys for roosts over 26 days. Spotlighting transects totalling 85 hours over 15 nights Habitat assessments	Suitable survey methods for the species were undertaken in early dry season and early wet season surveys. The species was positively identified in the survey area. Survey recommendations for this species have been met. Due to highly seasonal camp movements in response to fruiting and flowering

Species	Survey Guideline	Survey Guideline Requirement and Seasonal Considerations	Survey Effort Undertaken	Response to Guidelines
		The occupation of camps is highly seasonal, with camp movements dependent upon seasonal fruiting and flowering of food plants		events, surveys for camps are recommended prior to any construction activity.
Grey-headed flying fox (*Pteropus poliocephalus*)	Survey guidelines for Australia's threatened bats (DEWHA 2010b)	Survey techniques: • No minimum survey effort specified Seasonal considerations: The occupation of camps is highly seasonal, with camp movements dependent upon seasonal fruiting and flowering of food plants	Active surveys for foraging resources over 26 days. Surveys for roosts over 26 days. Spotlighting transects totalling 85 hours over 15 nights Habitat assessments	Suitable survey methods for the species were undertaken in early dry season and early wet season surveys. Due to highly seasonal camp movements in response to fruiting and flowering events, surveys for camps are recommended prior to any construction activity.
Bare-rumped sheath-tailed bat (*Saccolaimus saccolaimus nudicluniatus*)	Survey guidelines for Australia's threatened bats (DEWHA 2010)	Survey techniques: The Survey guidelines for Australia's threatened bats (DEWHA 2010) recommends the following survey methods and effort for the bare-rumped sheath-tailed bat: • Mist nets: 16 mist-net nights over a minimum of 4 nights in areas <50 ha. • Unattended bat detectors: 16 detector nights over a minimum of 4 nights in areas <50 ha. • Tree roost survey/inspection: 1-2 hours per survey day Seasonal or other considerations: Little is known about the seasonal movements of the species, however most records are collected during the period of August to April. Consequently, surveys should be conducted between August and April.	Spotlighting over 15 nights totalling 85 hours. Ultrasonic detection over 374 nights. 15 harp trap nights and 5 mist net trap nights. Note that this species is notoriously difficult to detect and has proven problematic at several wind farms.	Suitable survey methods for the species were undertaken in appropriate seasonal conditions. The species was positively identified in the survey area. Survey recommendations for this species have been met.

Species	Survey Guideline	Survey Guideline Requirement and Seasonal Considerations	Survey Effort Undertaken	Response to Guidelines

Greater large-eared horseshoe bat (*Rhinolophus robertsi*)	Survey guidelines for Australia's threatened bats (DEWHA 2010)	Survey techniques:
		The Survey guidelines for Australia's threatened bats (DEWHA 2010) recommends the following survey methods and effort for the greater large-eared horseshoe bat:
		• Harp traps:
		  ○ 16 harp trap nights
		• Unattended bat detectors:
		  ○ 16 detector nights over a minimum of 4 nights
		• Attended bat detectors:
		  ○ 6 detector hours
		• Roost searches:
		Evening watches at potential roost sites to identify species as it emerges.
		Seasonal or other considerations:
		There are no known seasonal considerations for this species.
			Spotlighting over 15 nights totalling 85 hours.
			Ultrasonic detection over 374 nights.
			15 harp trap nights.
			5 mist net trap nights.
				Suitable survey methods for the species were undertaken in early dry season and early wet season surveys. The species was positively identified in the survey area. Survey recommendations for this species have been met.

Diadem leaf-nosed bat (*Hipposideros diadema reginae*)	Targeted species survey guidelines – Diadem leaf-nosed bat *Hipposideros diadema reginae* (Hourigan, 2011)	Survey techniques: The targeted species survey guidelines for diadem leaf-nosed bat recommends the following survey methods and effort: • Passive monitoring: 16 detector nights over a minimum of 4 nights • Active monitoring: 8 detector nights over a minimum of 4 nights • Harp traps: 8 trap nights over a minimum of 4 nights • Mist netting: 8 mist net hours over a minimum of 4 nights • Roost searches: 2 hours per survey day	Spotlighting over 15 nights totalling 85 hours. Ultrasonic detection over 374 nights. 15 harp trap nights. 5 mist net trap nights. Habitat assessments over 26 days.	Suitable survey methods for the species were undertaken in early dry season and early wet season surveys. Ultrasonic calls of this species were recorded in the survey area. Survey recommendations for this species have been met.

Species	Survey Guideline	Survey Guideline Requirement and Seasonal Considerations	Survey Effort Undertaken	Response to Guidelines
		Seasonal or other considerations: There are no seasonal considerations for this species, however, trapping should be conducted on warm, calm, dry nights		
Migratory birds: Fork-tailed swift (*Apus pacificus*) Oriental cuckoo (*Cuculus optatus*) White-throated needletail (*Hirundapus caudacutus*) Barn swallow (*Hirundo rustica*) Spectacled Monarch (*Monarcha trivirgatus*) Black-faced monarch (*Monarcha melanopsis*) Rufous fantail (*Rhipidura rufifrons*)		No specific guidelines	Area searches over 26 days looking for direct sightings. 20 Bird Utilisation Surveys Incidental sightings Habitat assessments	Suitable survey methods for the species were undertaken early dry season and early wet season surveys.

5.3 Flora

5.3.1 General flora observations

A total of 379 plant species were recorded from the survey area, representing 96 families. The dominant families were:

- Poaceae (grasses) – 36 species
- Myrtaceae (*Eucalyptus, Corymbia, Melaleuca*) – 34 species
- Mimosaceae (wattles) – 23 species
- Asteraceae (daisies) – 22 species
- Fabaceae (legumes) – 20 species.

A full list of species in each ground-truthed RE within the survey area is provided in **Appendix E**. *Corymbia intermedia*, *Lophostemon suaveolens* and *Eucalyptus crebra* sens. lat. were the most frequent canopy tree species, and *Acacia flavescens*, *Denhamia oleaster* and *Persoonia falcata* were frequently encountered in the shrub layer. The most common ground layer species included *Lomandra longifolia*, *Themeda triandra*, *Heteropogon contortus* and *Praxelis clematidea*.

Many REs in both bioregions 7 and 9 contain ironbark species, including *Eucalyptus crebra, E. granitica, E. drepanophylla, E. paedoglauca, E, xanthoclada* and *E. exilipes*. Some taxonomies do not distinguish between species such as *E. crebra* and *E. drepanophylla* or describe differences as being very minor e.g. *E. xanthoclada* and *E. exilipes*. In this survey, *E. crebra*, *E. granitica* and *E. drepanophylla* were identified wherever possible, but field time did not permit consistent differentiation of ironbarks. For this reason, nomenclature in this report refers to *Eucalyptus crebra* sens. lat. to include *E. crebra, E. granitica, E. drepanophylla, E. exilipes* and *E. xanthoclada*. These subsumed species are all listed as Least Concern under the NC Act. *Eucalyptus portuensis* has been retained in preference to *E. acmenoides*, as this species is recognised in the REDD and by the Queensland Herbarium as a distinct taxon.

These constraints do not substantively affect the attribution of REs as most include a number of ironbark species that may or may not be present. All affected REs are also of Least Concern (VM Act status).

5.3.2 Vegetation communities

The geology of the area is complex, due to the intrusive granites uplifting and deforming older Devonian metamorphics and both with younger overlays of basaltic lava flows. These patterns, and the erosional topographies and surfaces that have resulted are reflected in the distribution of vegetation communities. There is also a pronounced rainfall gradient from the drier west (Einasleigh Uplands) to the wetter and higher east (Wet Tropics): in the period January to May 2020, Kangaroo Hills Station to the west of the survey area received 197.0 mm of rainfall, whilst 1,151.6 mm fell at Upper Stone, just to the east.

State RE mapping of the survey area depicts primarily remnant vegetation, with large mixed polygons consisting of up to three REs, effectively mapping the distinct changes in geology. The REs of these mixed polygons are comprised of similar species with different dominants.

The ground-truthed vegetation within the survey area comprises 69 REs on six land zones in two bioregions (Figure 8-4). Generally, ground-truthing of vegetation proved the spatial boundaries of state

RE polygons to be accurate, with field surveys able to refine the attributed RE. In some instances, the REs were not refined as the combination of REs accurately described the area, and/or mapping changes in RE was not possible due to similar aerial imagery signatures of each RE.

The survey area was ground-truthed to be predominately open forests and woodlands dominated by various mixes of *Eucalyptus* and *Corymbia* species. Shrub layers (dominated by *Acacia* species) are highly variable in density (soil and fire history are major determinants), and ground layers are dominated by grasses (mainly *Themeda triandra* and *Heteropogon* species). Small areas of species-rich vine thicket and simple notophyll vine forests occur, and major watercourses support well-developed riparian woodland communities with *Casuarina cunninghamii* and *Melaleuca* species.

In addition to these communities, the presence of abundant exposed granite provides additional environments on prominent granite tors and rock pavements. Tors support species from the surrounding land zone 12 REs, plus a number of vine thicket species that take advantage of the protection from fire that the rocks provide (e.g. *Ficus* spp., *Euroschinus falcata*, *Rhodamnia costata*). On rock pavements, the vegetation is sparse and includes grasses, ferns (e.g. *Cheilanthes* spp.) and Asteraceae spp. on the exposed rock surfaces, with trees and shrubs around the margins and in deeper cracks and fissures where soil accumulates. These woodlands are of shorter stature than surrounding REs due to the limited soil development and associated rooting depths.

Two interesting REs were detected during surveys:

- RE 7.3.8x *Melaleuca viridiflora* (broad leaf tea tree) +/- *Eucalyptus* spp. +/- *Lophostemon suaveolens* (swamp mahogany) open forest to open woodland
- RE 9.8.7x Semi-evergreen vine thicket on cones, craters and rocky basalt flows with little soil development.

RE 7.3.8 is largely a group of lowland coastal plain communities, dominated by *Melaleuca viridiflora*. In the survey area, a small area of wet paperbark swamp forest was mapped, occupying a narrow alluvial zone along an upland creek. The species composition and structure are analogous to the described RE 7.3.8. The tree canopy is dominated by a mixture of *M. viridiflora* and *M. quinquenervia*, with *Allocasuarina littoralis* on the higher and drier margins and scattered *Acacia auriculiformis* and *A. aulacocarpa*. There is a discontinuous shrub layer consisting of *Banksia aquilonia*, *Melastoma malabathricum, Sticherus flabellatus* and *Acacia flavescens*, and a dense ground layer dominated by sedges (*Rhynchospora corymbosa, R. brownii, Schoenoplectiella mucronata, Fimbristylis nutans, Gahnia aspera* and *Cyperus exaltatus*) and the grass *Ischaemum australe*.

This RE, when present in a lowland setting and dominated by *M. viridiflora*, is a constituent of the Threatened Ecological Community Broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland. However, in the survey area example *M. viridiflora* does not dominate the canopy, and so the area does not meet the criteria for inclusion in the TEC.

RE 9.8.7x in the survey area conforms broadly to the broad description of RE 9.8.7, but differs in having a distinct, tall (to 26 m) emergent layer of *Argyrodendron trifoliolatum*. It was found on on a steep, fire-protected slope with basalt rocks at the surface and dark brown friable soil. The structure is a variable (4-15 m), dense canopy of a number of species with abundant vines, with a virtually absent ground layer.

Dominant species in the main canopy layer include *Lysiphyllum hookeri, Bridelia leichhardtii, Alectryon connatus, Alectryon tomentosus, Drypetes deplanchei, Elaeodendron melanocarpum, Ficus virens, Gossia bidwillii, Jagera pseudorhus, Mallotus philippinensis, Pleiogynium timorense, Polyscias elegans* and *Timonius timon*.

A shrub layer is present, especially at the margins, comprising *Acacia flavescens, Alphitonia excelsa, Alyxia ruscifolia, Drypetes* sp.*, Exocarpos latifolius, Larsenaikia ochreata, Myoporum montanum, Myrsine* sp. and *Pipturus argenteus*. Dominant vines include *Austrosteenisia blackii, Cissus oblonga, Cayratia clematidea* and *Tetrastigma nitens*. The sparse ground layer includes *Aristida* sp., *Coleus* sp., and *Ancistrachne uncinulata*.

Ground-truthed REs broadly aligned with state mapped REs over most of the survey area, however some vegetation was consistently ground-truthed as different to the state mapping. State mapping included Brigalow Belt (Bioregion 11) outliers of RE 11.12.13a within Bioregion 7 (Wet Tropics). In the field this RE was determined to be RE 7.12.34 where *C. citriodora* var. *citriodora* was present, and 7.12.35 where there was no *C. citriodora* var. *citriodora*. Land zones 5 and 8 were found to be incorrectly assigned in some places. The complex geological history and geography of the survey area has led to misinterpretation of the origins of soil types. For instance, areas mapped as land zone 5 (deeply weathered Tertiary surfaces) were often found to have basalt rocks and stones at the surface and to have richly chocolate coloured loamy soils (Ferrosols). These are more analogous to land zone 8, where intrusive igneous rocks (in this case basalts) overlay the basic granitic bedrock layer. Land zone 5 was retained where the survey team could not detect rock intrusions, and where soils were red coloured (red Ferrosols). Land zone 3 communities have been more accurately mapped to extend further upstream from the state-mapped limits and mapped in areas which were previously not identified as land zone 3.

Ground-truthed REs are mapped in Figure 8-4 and listed in **Appendix D**. Of the ground-truthed REs, 2,223.33 ha are listed as Of Concern under the VM Act, with a further 573.23 ha containing Of Concern REs either dominant or sub-dominant in mixed polygons. Together these REs occupy 9.6% of the survey area. These are mapped in Figure 8-5, noting that the area is calculated using a proportion of the mixed polygons, and therefore the map displays a larger area than is ground-truthed. Non-remnant was mapped along the powerline, roads, known tracks, large dams, and around the homesteads, quarries and borrow sites.

Confidence scores were applied to the vegetation mapping to understand spatial and attribute accuracy (Figure 8-6**,** Table 5-5). The majority of low confidence areas are in the south of the survey area where surveys are yet to be conducted.

Table 5-5. Areas and percentage of survey area mapped to three confidence levels

Component	Measure	A (high)	B (medium)	C (low)
Spatial	Area (ha)	13,072.5	9610.6	6355.1
	% of total	45.0	33.1	21.9
Attribute	Area (ha)	13,455.1	8980.3	6602.9
	% of total	46,3	30.9	22.7

5.3.3 Potential threatened ecological communities

One potential TEC was identified; Broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland.

This community is mapped by the state in the survey area as RE 7.12.60a, which is not a component of the TEC. Further survey in 2020 established that it does occur on alluvium, and has been ground-truthed as RE 7.3.8x, which is a community analogous with the TEC; however it does not meet the criteria for inclusion (see 5.3.2). RE 7.3.8x occupies 1.8 ha and is Least Concern under the VM Act.

5.3.4 Threatened flora

One threatened flora species was detected during the surveys (**Figure 8-8**). *Commersonia reticulata* (Byttneriaceae, syn. *Androcalva reticulata*) was found in two populations in RE 9.12.2/9.12.1a. Populations were comprised of approximately 50 and 20 plants respectively, both in single dense clusters. This species is Vulnerable under the NC Act and has only been recorded from four localities in North Queensland. The occurrence in the survey area lies between the southernmost known locations (Hervey and High Ranges west of Townsville) and that in Girringun National Park. This species was not included in the desktop searches.

5.3.5 Weed species

Twenty-seven weed species were found during flora surveys. Most of these have limited distributions in the survey area (i.e. only occur in a few places/habitats), or are at low density; however some are more widespread and occur either in dense infestations or at consistently moderate density (Table 5-6).

Praxelis clematidea and *Mesosphaerum suaveolens* are the most pervasive species, having invaded most habitats and REs. The riparian environments in land zone 3 have a higher proportion of introduced species than other communities, especially the larger steams in bioregion 9.

Table 5-6: Widespread weed species found in survey area

Species	Common name	Biosecurity Act restricted matter class	WoNS	Occurrence	Relative density
Ageratum conyzoides	bluetop	N/A	No	habitat limited	low
Argemone ochroleuca	Mexican poppy	N/A	No	habitat limited	low
Asclepias curassavica	red cotton bush	N/A	No	habitat limited	low
Lantana camara	lantana	3	Yes	widespread	low to high
Mesosphaerum suaveolens	hyptis	N/A	No	widespread	high
Phytolacca octandra	inkweed	N/A	No	habitat limited	low
Praxelis clematidea	praxelis	N/A	No	very widespread	moderate
Sporobolus jacquemontii	American rat's tail grass	3	Yes	limited	low
Themeda quadrivalvis	grader grass	N/A	No	limited	high

5.3.6 Disturbance

Disturbances to vegetation within the survey area are from cattle grazing, weeds and roads/tracks. Despite the relatively free access of stock to most of the survey area, grazing disturbance is concentrated on the lower, very open woodland habitats on the more fertile soil types (e.g. land zone 8 soils) in the south of the survey area. Evidence of grazing was very limited in all other habitats.

Weeds are present throughout the survey area (Table 5-6 above). Praxelis is especially insidious, occurring at low to high densities in all habitats except rock pavements and rocky streams. Lantana is most frequent on the heavier soils of land zones 5 and 8.

Roads and tracks have undoubtedly allowed the movement of weeds to the more remote parts of the survey area. Hyptis (*Mesosphaerum suaveolens*) is likely carried by native animals as well as stock, and has penetrated most of the survey area.

Other forms of disturbance are rare. There is very little evidence of recent fire, and the area is generally free of litter.

5.4 Habitat values

Ten broad habitat types were identified in the survey area. These habitats provide a range of resources for native fauna species, including threatened species. These broad habitat types include:

- riparian forest
- very open woodland on metamorphic rock
- very open woodland on basalt plains and low hills
- open forest to woodlands on uplands
- open woodland to open forest on granite, basalt and tertiary surfaces
- rock pavement
- open forest with *Allocasuarina* spp.
- simple notophyll vine forest
- vine thicket
- *Melaleuca* swamp.

A vegetation description and microhabitat features available for fauna species associated with each habitat type are described in **Table 5-7** and shown in Figure 8-7.

Table 5-7: Broad habitat types

Broad habitat type	Description	Constituent REs	Area in survey area (ha)	Representative photo
Riparian forest	**Vegetation description** Tall forest (20-25 m) fringing major watercourses, on narrow alluvial flats and benches constrained by steep banks. Dominant species include *Casuarina cunninghamiana, Melaleuca leucadendra, M. fluviatilis, Eucalyptus tereticornis* and *Lophostemon grandiflorus*. There may be a fringing shrub layer of *Melaleuca viminalis* and a ground layer of predominantly *Lomandra hystrix* and *L. longifolia*. **Microhabitat features** Hollow-bearing trees of varying sizes, providing shelter for various arboreal mammals and microbats, including the threatened greater glider. Permanent water provides a continual water source for fauna species. The eucalypts growing in proximity to this permanent water source provide good quality refuge and foraging habitat for koala during the dry season and the tall eucalypts adjacent to this permanent water provide potential habitat for nesting red goshawk. Flowering *Eucalyptus* and *Melaleuca* spp. provide food resources for foraging flying fox species, including threatened species.	7.3.19a 7.3.26a 7.3.28d 7.3.39 7.3.43a 9.3.1 9.3.13 9.3.8x	253.7	

Very open woodland on metamorphics and basalt plains and low hills	**Vegetation description** Very open woodland dominated by *Eucalyptus crebra* sens. lat., with no shrub layer and a ground layer of *Heteropogon contortus* and *Themeda triandra*. **Microhabitat features** Infrequent hollow-bearing trees of ironbarks with small hollows, providing potential roosts for microbats and some arboreal mammals. Areas of large-hollow density provide habitat for greater glider. *Eucalyptus crebra* provides food for koala.	9.8.4a 9.8.4c 9.11.2a 9.11.4a 9.11.5	7,520.5	
Open woodland to open forest on granite, basalt and tertiary surfaces	**Vegetation description** Open woodland to open forest of sparse structure with mixtures of *Corymbia citriodora* var. *citriodora, Eucalyptus portuensis, Corymbia clarksoniana* and/or *Corymbia intermedia, Eucalyptus tereticornis* and mixed woodlands of *Eucalyptus crebra* with other *Corymbia* and *Eucalypt* species. Open shrub layer contains *Callitris*, and *Acacia* or *Melaleuca* species. Ground cover is open, with predominantly native grasses including *Themeda triandra*, *Heteropogon* spp. Large boulders and boulder stacks are common throughout. **Microhabitat features** Boulders provide shelter for various mammals and reptile species. Areas with greater complexity of stacked boulders, with various crevices provide denning and shelter habitat for Sharman's rock-	7.8.10 7.12.30a 7.12.34 7.12.35 9.5.5 9.5.5a 9.5.5f 9.7.3b 9.12.19 9.12.1a 9.12.1e 9.12.2 9.12.4c 9.12.21 9.12.22	16,659.7	

	wallaby. *Corymbia* and *Eucalyptus* species provide food trees for koala and greater glider. Large hollows provide suitable den sites for greater glider. Scattered fruiting species such as *Ficus rubiginosa* provide foraging opportunities for frugivorous species such as spectacled flying fox. Open woodlands provide habitat for the diadem leaf-nosed bat. Also habitat for the vulnerable *Commersonia reticulata*.			
Open forest to woodlands on uplands	**Vegetation description** Open forest to tall open forest and woodland of *Eucalyptus portuensis, Corymbia intermedia* and / or *Eucalyptus tereticornis*. The variably dense shrub layer contains *Acacia* spp. (*A. flavescens* and *A. calyculata* dominant). Ground cover is dense and moist, dominated by ferns (*Pteridium esculentum*), blady grass (*Imperata cylindrica*). Rocky outcrops also support vine forest species such as *Ficus rubiginosa*, *Denhamia cunninghamii* and *Pleiogynium timorense*. **Microhabitat features** Tall forest and woodland areas provide foraging and breeding habitat (where within 1 km of a permanent water source) for red goshawk, and foraging and denning habitat for masked owl. Abundant *Allocasuarina* provides habitat for glossy black-cockatoo. Dense understory of *Allocasuarina* provides flyways and foraging opportunities for greater large-eared horseshoe bat. Scattered fruiting species such as *Ficus rubiginosa* provide foraging opportunities for frugivorous species such as spectacled flying fox. *Eucalyptus* and *Corymbia* species provide food and shelter for koala and denning opportunities for greater glider where large hollows are abundant. Boulders provide shelter for various mammals and reptile species. Thick grass cover provides habitat for small mammals such as bandicoots.	7.5.2a 7.5.2b 7.5.2c 7.5.2e 7.12.24a 7.12.29 7.12.29a 7.12.29b 7.12.29c 7.12.30 7.12.30a 7.12.34 7.12.60a 7.12.60b 7.12.61a 7.12.69b	6,599.3	

Rock pavements	**Vegetation description** Sparse shrubby and grassy vegetation around the margins of pavements, with a low tree and shrub cover of *Eucalyptus portuensis*, *Corymbia leichhardtii, C. intermedia, Lophostemon suaveolens, Acacia* spp. *(A. leptostachya, A. calyculata, A. flavescens), Denhamia cunninghamii*. Grasses include *Themeda triandra, Arundinella setosa* and *Aristida* sp. **Microhabitat features** Rocks provide shelter and basking habitat for various mammals and reptile species. Areas with greater complexity of stacked boulders, with deep and abundant crevices provide potential habitat for Sharman's rock-wallaby.	7.12.65b 7.12.65c	438.2	
Open forest with *Allocasuarina* spp. dominant or co-dominant in the canopy	**Vegetation description** Open forest to 24 m comprising *Corymbia intermedia*, *Eucalyptus portuensis* and *Allocasuarina torulosa* and/or *A. littoralis*. Shrub layer (dominated by *Acacia flavescens*) and ground layer (*Imperata cylindrica*, *Heteropogon triticeus*) often dense except under *Allocasuarina* stands. **Microhabitat features** Forest she-oaks (*Allocasuarina torulosa, A. littoralis*) fruit provide food resources for glossy-black-cockatoo. The variety of sizes and abundance of hollow-bearing trees provide denning habitat for an array of arboreal mammals and bird species, including the threatened greater glider and masked owl.	7.5.4a 7.5.4b 7.5.4c 7.8.18a 7.8.18c	520.8	

Simple notophyll vine forest	**Vegetation description** Species-rich rainforest with well-developed structure, dominated by *Archontophoenix alexandrae, Elaeocarpus* spp., *Buckinghamia celsissima*, *Cardwellia sublimis* and *Syzygium* spp. The ground layer is comprised of tree and vine seedlings. **Microhabitat features** Fruiting trees providing potential foraging habitat for southern cassowary and a range of closed forest dwelling birds, frogs, reptiles and mammals, including bare-rumped sheath-tailed bat. A rocky stream of fresh water provides a water source for fauna species.	7.12.2e 7.12.16a	4.2	

Vine thicket	**Vegetation description** Dense low (5-10 m) species-rich vine thicket with tall emergent trees in fire-protected gullies near major watercourses (Michael Creek, Four-Mile Creek). **Microhabitat features** The dense vegetation and rock crevices provide shelter for various small mammals and reptiles. Fruiting flora species provide foraging habitat for flying foxes and insect prey for microbats, including the threatened spectacled flying fox and diadem leaf-nosed bat.	9.11.9 9.8.7 9.8.7x	12.7	

Melaleuca swamps	**Vegetation description** *Melaleuca* spp. dominated vegetated swamps with sedge dominated ground layers. *Melaleuca quinquenervia* and *M. viridiflora* are common, with *Acacia* spp., *Banksia aquilonia*, *Melastoma malabathricum* and *Xanthorrhoea johnsonii* in a sparse shrub layer, and *Ischaemum australe, Rhynchospora corymbosa, R. brownii, Blechnum parrisiae, Cyperus exaltatus* and *Schoenoplectiella mucronata* in the ground layer. **Microhabitat features** Permanent water affords good frog habitat. Dominance of *Melaleuca* spp. provides feeding resource for arboreal mammals (sugar glider, squirrel glider), flying foxes (e.g. spectacled, little red), microbats (including diadem leaf-nosed bat) various bird species.	7.3.8x	1.8	

5.5 Fauna

Fauna results are derived from a combination of different detection methods as outlined in Methods. The field survey allowed for better understanding of the presence of threatened species across the survey area, which has informed updates to the likelihood of occurrence for these species (**Appendix C**). The relevant survey effort for each targeted threatened species is outlined in Table 5-4.

5.5.1 General fauna observations

A total of 204 fauna species were identified throughout the survey area, as summarised in **Table 5-8**. A complete list of fauna species detected in the survey area is presented in **Appendix E**.

Table 5-8: General fauna observations

Animals	Observations
Birds	One hundred and thirty bird species were detected comprising raptors, nocturnal species, aquatic species and forest and woodland species. Two threatened species were detected: red goshawk and masked owl. One migratory species was detected, the satin flycatcher. Raptors and owls are more susceptible to wind turbine strike than the more common bird assemblages observed, such as canopy or ground dwelling passerines. The majority of bird species observed are canopy or sub-canopy dwellers.
Bats	Two flying fox species were observed, including the threatened spectacled flying fox. Twenty-five microbat species were recorded on ultrasonic bat detection devices, including three threatened microbat species (greater large-eared horseshoe bat, bare-rumped sheath-tailed bat and diadem leaf-nosed bat). Recorded microbats represent forest dwelling and roosting species as well as cave/crevice roosting species. The majority of species recorded are below the canopy foragers such as *Hipposideros* spp. and *Nyctophilus* sp. However, species of *Saccolaimus,* including the threatened *Saccolaimus saccolaimus* are known to be high-flyers, making them more susceptible to potential turbine strike.
Terrestrial mammals	Sixteen species identified, including seven small mammal species, eight macropod species and one monotreme. Conservation significant terrestrial mammals that were recorded included the threatened Sharman's rock-wallaby and the special least concern short-beaked echidna.
Arboreal mammals	Six arboreal mammals were detected, including threatened species koala and greater glider.
Reptiles	Twelve reptile species were observed on an incidental basis and included lizards, snakes and turtles.
Amphibians	Five amphibian species were observed on an incidental basis.
Pest fauna	Eight exotic fauna species were observed throughout the survey area. A high presence of feral predators such as cats and dogs were detected on remote cameras, with wild dogs also detected in acoustic recordings.

5.5.2 Known threatened fauna

Nine threatened fauna were confirmed within the survey area (**Figure 5-3**). These include:

- Sharman's rock-wallaby (*Petrogale sharmani*) (EPBC Act vulnerable; NC Act vulnerable)
- koala (*Phascolarctos cinereus*) (EPBC Act vulnerable; NC Act vulnerable)
- greater glider (*Petauroides volans*) (EPBC Act vulnerable; NC Act vulnerable)
- spectacled flying fox (*Pteropus conspicillatus*) (EPBC Act endangered; NC Act endangered)
- masked owl (northern) (*Tyto novaehollandiae kimberli*) (EPBC Act vulnerable; NC Act vulnerable)

- red goshawk (*Erythrotriorchis radiatus*) (EPBC Act vulnerable; NC Act endangered)
- greater large-eared horseshoe bat (*Rhinolophus robertsi*) (EPBC Act vulnerable; NC Act endangered)
- bare-rumped sheath-tailed bat (*Saccolaimus saccolaimus nudicluniatus*) (EPBC Act vulnerable; NC Act endangered)
- diadem leaf-nosed bat (*Hipposideros diadema reginae*) (NC Act near threatened).

Each species and its specific habitat within the survey area are discussed below. Species records are presented in Figure 8-8.

*5.5.2.1 Sharman's rock-wallaby (*Petrogale sharmani*)*

Sharman's rock-wallaby is restricted to the Seaview and Coane Ranges, west of Ingham in north-eastern Queensland (Woinarski et al. 2014). The species was detected on several occasions across both surveys. Within the survey area, species observations were limited to the central and south-western extent of the survey area in riparian or open woodland habitat with abundant granite boulders and boulder stacks. The previously reported extent of Sharman's rock-wallaby habitat within the survey area has been amended (decreased) based on evidence collected across the seasonal surveys, LIDAR analysis, and a review of published literature and species conservation advice. The species is now considered unlikely to inhabit the moist or wet forested parts of the north and east of the survey area (mostly in the wet tropics bioregion). These areas either lack the complex granite rock structures preferred by Sharman's rock-wallaby, or the ground cover is considered too high and dense, whereby it would likely inhibit Sharman's movements.

Shelter areas are comprised of complex arrangements of stacked granite or basalt boulders with an abundance of crevices and basking platforms, providing ample entry and exit routes and areas to bask in the sun (e.g. **Figure 5-5**). Vine thicket vegetation along Michael Creek with cliffs and escarpments also form suitable shelter areas. These shelter areas are surrounded by grassy woodlands to open forests, with native grasses and forbs comprising the ground layer where the species is likely to forage. During one spotlighting survey, the species was observed on multiple occasions along a creek line surrounded by basalt and granite boulders. Females with joeys were also observed during the day in both the wet and dry season survey events, indicating there is an active breeding population and breeding may occur year-round.

The species is sociable with aggregations or colonies of more than 40 individuals present at some sites (Venz & Rowland 2013). No estimates of Sharman's rock-wallaby population were attempted, although It is considered to be abundant throughout suitable habitat in the survey area, given the high-detection rate of the species, both via direct observation (active searches and remote cameras) and indirect evidence of the species (i.e. scats).

Suitable habitat within the survey area includes any areas of abundant granite boulders and boulder stacks within open woodland to open forest on granite, basalt and tertiary surfaces, vine thicket, riparian forest, rock pavements and open forest to woodland on uplands where the groundcover is open and dry.

Figure 5-5: Sharman's rock-wallaby observed on granite boulders

*5.5.2.2 Koala (*Phascolarctos cinereus*)*

Koala was recorded on 20 occasions during field surveys through spotlighting, acoustic recorders and remote camera surveys. The species was widely distributed across the survey area (Figure 8-10).

The koala population in the survey area is part of the species' north Queensland sub-population. There is no published data available on koala population size or density for the northern sub-population, however the available (only occasional) anecdotal sightings suggest the species is uncommon and present in low densities in the northern regions. This trend was not observed during the field surveys, with 16 koalas detected over 15 spotlighting nights, two detected on acoustic recorders and a further two koalas detected on remote cameras. This would indicate that the koala population at Upper Burdekin is potentially abundant for this region. Furthermore, female koalas with joeys were observed on three occasions during the dry season surveys and mating bellows were recorded in the dry and wet season surveys, indicating this is an active breeding population.

Habitat for this species within the survey area includes riparian forest, open woodland basalt plains, low hills and open forest to woodland on granite hills and open forest to woodlands on uplands. Koalas were observed during spotlighting surveys in *Eucalyptus tereticornis*, *E. crebra*, *E. moluccana*, and *Corymbia citriodora*. These are all known food trees for koalas (Ellis et al. 2002). No koalas were observed during diurnal surveys.

Home range estimates for koalas vary depending on location and habitat quality and males generally have a larger home range than females. In Blair Athol in central Queensland (approx. 600 km south of Mount Fox) koala home ranges were estimated to be greater than 100 ha (Ellis et al. 2002), however on the north coast of New South Wales koala home ranges are as small as 10 ha (DoEE 2019). The high quality of habitat and frequency of detection suggests a high-density population of koalas in the survey area, however, given the variability of home range estimates for this species, further study is required to properly determine koala density in the survey area and to determine the importance of shelter (non-food) trees and the home ranges of koalas in the survey area.

*5.5.2.3 Greater glider (*Petauroides volans*)*

Greater glider was the most frequently observed arboreal mammal species during the field survey. The species was widely distributed across the survey area and was observed on 22 occasions, in both wetter and drier habitat types (Figure 8-11). The high detection rate of greater glider observed during the field survey is consistent with previous studies (Comport et al. 1996) that have described a high population density of the northern tropical subspecies, *Petauroides volans minor,* west of the Paluma Range, northern Queensland (approximately 55 km south-east of the survey area).

Greater glider was observed during spotlighting on *Eucalyptus portuensis* (previously *E. acmenoides*), *E. crebra, E. tereticornis, E. crebra, Corymbia citriodora* and *Corymbia intermedia*. Once spotlighted, the species usually remained still, and no direct observations of foraging or use of hollows was observed. However, tree species the gliders were observed in are consistent with the preferred den trees discussed in Comport et al. (1996). In the study of the 56 known den sites, all were hollows in trees and 28.5% were *E. acmenoides* (now *E. portuensis*), 25% in *E. citriodora,* 14% in *E. tereticornis*, 12.5% in *E. intermedia,* 12.5% in *E. crebra* and 7.2% in dead trees of undetermined species.

Home range estimates from the Paluma Range study suggested that home ranges were 1.3 to 4.2 ha for males and from 0.9 to 1.7 ha for females (Comport et al. 1996). Given the relatively small home range of the species, the abundance of suitable habitat supporting preferred den and foraging species and the high detection rate of the species, it is likely that the survey area supports a high-density population of greater glider.

*5.5.2.4 Spectacled flying fox (*Pteropus conspicillatus*)*

The species was detected foraging on two occasions throughout the survey area. No colonies of spectacled flying fox were detected. Studies have shown the species roosts within 6.5 km and 16 km from rainforests (Richards 1990; Shilton et al. 2008). The survey area is within approximately 10 km of large areas of known rainforest, therefore, there is potential for roosting habitat within the survey area, although this is limited to a small area of rainforest on the eastern side of the survey area (Figure 8-12).

The largest known population of spectacled flying fox is known from the Wet Tropics Areas, between Townsville and Cooktown (DoEE 2019). The survey area is situated to the west of the Wet Tropics Region and into drier forest, where the species is also known to forage (DoEE 2019).

Although spectacled flying fox prefers to roost in or near rainforest habitat, their foraging habitat is much more diverse, incorporating a variety of rainforest and non-rainforest species of fruits and blossoms and occasionally leaves, bark and insects (Parsons et al. 2006). Foraging habitat is driven by food and encompasses basically the entire survey area - anywhere where trees are fruiting (e.g. fig trees or Burdekin plum trees) or flowering (e.g. *Melaleuca* spp., *Eucalyptus* spp. or *Corymbia* spp.). Spectacled flying fox was observed foraging in Burdekin plum on one occasion and in fig trees on a second occasion. These two tree species are scattered across the survey area. Spectacled flying foxes are highly mobile, and studies have shown that spectacled flying fox will travel more than 20 km to forage on fig trees (Parsons et al. 2006).

Given the variety of food resources available it is likely the survey area provides important foraging resources for spectacled flying foxes, however utilisation will vary with seasonal availability of food.

5.5.2.5 *Masked owl (*Tyto novaehollandiae*)*

Masked owl was observed on one occasion inside the survey area and on a second occasion just outside of the survey area as ecologists were leaving the site (Figure 8-13). The species was detected during a spotlighting survey by the sound of its call, which was subsequently responded to by another individual. The call playback technique was then employed to entice the species close enough that a positive identification could be made. Masked owl was also detected at three acoustic recorder sites.

The distribution of masked owl is poorly understood in Queensland as the species has not been well studied (DoEE 2019). Habitat for the species includes rainforest, riparian forest, open forest, Melaleuca swamps and margins of sugar cane fields. The species nests in hollow trees in heavy forest and hunts over open woodlands and farmland (DoEE 2019).

Masked owls are territorial and occupy a home range of 1,017 to 1,178 ha, with a core area of approximately 155 ha (DoEE 2019). As the species is sedentary with a large home range it is likely the survey area is encompassed by one pair or family group.

Suitable habitat for this species that occurs within the survey area includes riparian forest, open woodland to open forest on granite, basalt and tertiary surfaces, open forest to woodland on uplands, melaleuca swamps and open forest of *Allocasuarina torulosa.*

5.5.2.6 *Greater large-eared horseshoe bat (*Rhinolophus robertsi*)*

Greater large-eared horseshoe bat was detected on five nights at six locations (Figure 8-14). The species was confirmed by calls that were recorded on ultrasonic recorders (see **Appendix G** for results of bat call analysis). The species was recorded in early-wet and early-dry season surveys.

This species is distributed throughout most of the Wet Tropics bioregion, Cape York Peninsula and the Einasleigh Uplands bioregion. It inhabits rainforests, riparian forests, eucalypt open forests and woodlands. At night the species forages in open forest and woodland, preferring areas of thicker vegetation, such as riparian zones. There are also occasional observations of greater large-eared horseshoe bat foraging along the edge of rainforest and road clearings. The species' diet consists mainly of moths, beetles, lacewings, crickets and grasshoppers. Because the species has not been well studied, information on foraging range is not available.

Daytime roost sites include caves and mines, tree hollows, creek banks, rockpiles and road culverts. The species roosts alone or in small groups (usually less than 10 individuals). The two main causes of the species' decline are disturbance of roost sites and collapse/closure of old mines. Movement patterns of greater large-eared horseshoe bat are not well understood, but it is not known to be migratory. Population size and gene flow have not been studied, although the species is considered scarce.

Suitable habitat for this species that occurs within the survey area includes open forest to woodlands on uplands and open forest with *Allocasuarina* spp.

*5.5.2.7 Bare-rumped sheath-tailed bat (*Saccolaimus saccolaimus*)*

Bare-rumped sheath-tailed bat was detected on three nights at two locations (Figure 8-15). Confirmed calls for the species were recorded on ultrasonic recorders (see **Appendix G** for results of bat call analysis). The species was recorded in early-wet and early-dry season surveys.

This species is restricted to a coastal strip approximately 40 km wide extending inland from the east coast of Queensland. The species occurs in a range of woodland, forest and open environments. Foraging may occur over rainforest edges and forest clearings, although no formal studies into foraging habitat have been undertaken. Bare-rumped sheath-tailed bat is insectivorous and mainly forages above the canopy and is known to fly at altitudes above 400 m. It is unknown if foraging habitat shifts in response to seasonality.

Although the roosting ecology of this species has not been studied formally, anecdotal evidence suggests that the bare-rumped sheath-tailed bat roosts in tree hollows. Deep tree hollows are also used as maternity roosts. Clearing hollow trees is therefore considered a threat to this species.

Suitable habitat for this species that occurs within the survey area includes riparian forest, very open woodland on metamorphic and basalt plains and low hills, open woodland to open forest on granite, weathered basalt and tertiary surfaces, open forest to woodland on uplands and simple notophyll vine forest.

*5.5.2.8 Diadem leaf-nosed bat (*Hipposideros diadema*)*

Diadem leaf-nosed bat was detected at one location in the early-wet season survey (September 2009) (Figure 8-16). Confirmed calls for the species were recorded on ultrasonic recorders (**Appendix G**).

This species is restricted to north Queensland, with its range extending southward from Cape York Peninsula to Townsville and approximately 150 km inland to Chillagoe. This species occurs in a range of habitats, including lowland rainforest, *Melaleuca* forests, eucalypt woodland, deciduous vine thickets, and open woodland. The species primarily roosts in caves and abandoned mines, although they have also been recorded roosting in buildings and culverts and may also roost among foliage (however, this is unconfirmed in Australia). Preferred roost features include large chambers with high domed ceiling and multiple entrances (Hourigan, 2011).

Diadem leaf-nosed bats forage within 2.5 km of their roost site. Foraging typically occurs along the edge of vegetation or in vegetation gaps adjacent to open space. The diet consists mainly of beetles, moths, weevils, ants and plant bugs.

Suitable habitat for this species in the survey area includes riparian forest, open forest to woodlands on uplands, open forest with *Allocasuarina* species, open woodland to open forest on granite, basalt and tertiary surfaces, vine thicket and melaleuca swamps.

*5.5.2.9 Red goshawk (*Erythrotriorchis radiata*)*

One red goshawk was observed flying low over a *Corymbia intermedia* in the open forest to woodland on uplands habitat type (Figure 8-17). The species was positively identified by two suitably qualified ecologists via visual examination on the afternoon of the 7th July 2020. The area surrounding the sighting is characterised by extensive areas of intact, tall (>25m) vegetation (mostly of the Corymbia and Eucalyptus genus), and in proximity to permanent water (Michael Creek and associated large order streams). Known records of the species are located in Australian Wildlife Conservancy's (AWCs) properties, Brooklyn approx. 260 km to the north, and Mt Zero-Taravale approx. 35 km to the south. These properties also straddle both the Einasleigh Uplands and Wet Tropics bioregions and are likely to provide similarly high biodiversity as the survey area.

Area searches and drone surveys for nests or additional direct sightings were conducted throughout the duration of the survey, however, no nests or additional red goshawks sightings were observed. The species has a large home range, with breeding and non-breeding home ranges thought to differ. Radio-telemetry of breeding red goshawks identified females up to 5 km from the nest during the day, and males over 10 km away (out of signal range). The species spends large amounts of time flying just above the canopy.

The species is solitary and sparsely dispersed across Australia (DoEE 2019) and inhabits coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia (Marchant & Higgins 1993). In northern Queensland red goshawk is most commonly found over rugged terrain with extensive, intact, mosaics of native vegetation. Preferred vegetation includes riparian vegetation, open forest and woodland that feature a mix of bloodwoods, ironbarks and other eucalypt species (DERM, 2012). All known red goshawk nests have been recorded within 1 km of permanent water and are usually constructed in emergent trees (mean tree height 31 m).

Potential foraging habitat within the survey area includes all riparian, woodland and open forest habitat types. Potential nesting habitat includes riparian zones and all woodland and open forest habitat types with tall tree species within 1 km of a permanent water source.

5.5.3 Potential threatened fauna

Although not detected during the field survey, the following species have potential to occur in the survey area due to the presence of suitable habitat:

- grey-headed flying fox (*Pteropus poliocephalus*) (EPBC Act vulnerable; NC Act least concern)
- glossy black-cockatoo (*Calyptorhynchus lathami erebus*) (EPBC Act not listed; NC Act vulnerable)
- white-throated needletail (*Hirundapus caudacutus*) (EPBC Act vulnerable and migratory; NC Act vulnerable)
- southern cassowary (*Casuarius casuarius johnsonii)* (EPBC Act endangered; NC Act endangered)
- Atherton delma (*Delma mitella*) (EPBC Act vulnerable; NC Act near threatened).

5.5.3.1 Grey headed flying fox (Pteropus poliocephalus)

The species has a diverse native diet, feeding on nectar and pollen from flowers of eucalypts (genera *Eucalyptus, Corymbia* and *Angophora*). The species is highly mobile, and the national population is fluid and moves in search of food. The species is capable of nightly flights of up to 50 km from their roost to different feeding areas as food resources change (DoEE 2019). Given this, and the abundance of suitable habitat, the species has potential to occur in the survey area, especially during flowering events.

Potential habitat for the species is all vegetation communities dominated by eucalypts.

5.5.3.2 Glossy-black-cockatoo (Calyptorhynchus lathami erebus)

The species prefers woodland areas dominated by she-oak (*Allocasuarina* spp.), or open forests and woodlands with a stratum of she-oak occurring beneath *Eucalyptus, Corymbia* or *Angophora* (Hourigan 2012).

Areas to the north-east of the survey area provide suitable habitat for this species. This habitat is limited to habitat type open forest of *Allocasuarina torulosa,* and open forest to woodlands on uplands.

5.5.3.3 White-throated needletail (Hirundapus caudacutus)

Most white-throated needletails spend the non-breeding season in Australia. Each year, the species arrives in Australia in September and departs again between mid-March to April (DoEE 2019). The species almost always forage aerially, and often forages along low-pressure systems (DoEE 2019). Given the species is almost exclusively aerial, no defined habitat is provided. However, the species is widespread across the eastern coast when in Australia (DoEE 2019).

The species has potential to occur in the survey area during September to April and is expected to be largely aerial.

5.5.3.4 Southern cassowary (Casuarius casuarius johnsonii)

The Wet Tropics population of the southern cassowary is distributed widely from Cooktown to Paluma Range. The species requires a large amount of food to sustain their large size, requiring a high diversity of fruiting trees to provide a year-round supply of fleshy fruits (DES, 2019). The species primarily occurs in rainforests where their preferences for fruiting flora occur.

Potential habitat for this species in the survey area is limited to a small area of simple notophyll vine forest. This habitat type connects more broadly to larger areas of rainforest outside of the survey area (to the east).

5.5.3.5 *Atherton delma* (Delma mitella)

Little information is known about this species, other than its preference for occurring in tall open forests and rainforest interfaces. The species occurs within the Wet Tropics Management Authority, with records known from Herberton, Ravenshoe and Paluma districts. Given the presence of tall open forests within the Wet Tropics bioregion of the survey area and no dedicated reptile surveys conducted, the precautionary principle has been applied and the species has been assumed a potential occurrence.

5.5.4 Migratory and/or special least concern fauna

5.5.4.1 Likely migratory fauna

Two EPBC Act migratory species, satin flycatcher and Latham's snipe were observed just outside the survey area (approximately 4km west). Whilst these species were not directly observed inside the defined survey area, their close proximity and the occurrence of suitable habitat inside the survey area make these species relevant to this assessment.

Satin flycatcher migrates to northern Australia for the winter months. As a non-breeding visitor to northern Australia they may be found in an array of habitat types, however, they mainly inhabit eucalypt forests. Wet sclerophyll forests are typically preferred, especially where there is a tall shrubby understory near wetlands or watercourses. They occasionally also occur in dry sclerophyll forests and woodlands, usually dominated by eucalypts. Potential habitat for this species within the survey area includes open forest to woodlands on uplands, rainforest, riparian zones and open woodland to open forest on granite, basalt and tertiary surfaces.

Latham's snipe was observed at a farm dam just close by the survey area. The species is a non-breeding visitor to Australia and arrives in northern Australia from July to November. Most birds depart northern Queensland by mid-April (DoEE 2019). The species occurs in a wide variety of permanent and ephemeral wetlands, including modified or artificial habitats (DoEE 2019). Potential habitat for the species in the survey area includes dams, wetlands and swamps.

5.5.4.2 Potential migratory fauna

A suite of migratory bird species has the potential to occur in the survey area. This includes:

- spectacled monarch, black-faced monarch, oriental cuckoo and rufous fantail, which all have potential to occur in habitat type simple notophyll vine forest.
- fork-tailed swift and white-throated needletail have potential to occur above the survey area, however these species are almost exclusively aerial and they occur over a wide variety of habitats.
- barn swallow has potential to occur in paperbark woodland.

6 Matters of national environmental significance

There are a number of MNES present within the survey area as detailed in **Table 6-1** below.

Table 6-1: Summary of MNES within survey area

Protected matter	Presence in the survey area
World Heritage Properties	Not present, although the Wet Tropics World Heritage Area (WTWHA) boundary is <1 km from the edge of the survey area
National Heritage Places	Not present, although there are two National Heritage Places associated with the WTWHA
Wetland of International Importance (Ramsar sites)	Not present
Great Barrier Reef Marine Park	Not present
Commonwealth Marine Areas	Not present
Threatened Ecological Communities	Not present
Threatened Species	Present as: • Known habitat for Sharman's rock-wallaby, koala, greater glider, spectacled flying fox, greater large-eared horseshoe bat, bare-rumped sheath-tailed bat, red goshawk and masked owl • Potential habitat for additional endangered and vulnerable species
Threatened Migratory Species	Present as: • Potential habitat for various migratory species

7 Matters of state environmental significance

There are a number of MSES present within the survey area as detailed in **Table 7-1** below.

Table 7-1: Summary of MSES within the survey area

Protected matter	Presence in the survey area
Protected areas	Not present, although the boundary of Girringun National Park is located <1 km from the survey area
Marine Parks	Not present
Management A or B Areas within declared fish habitat areas	Not present
Protected wildlife habitat: • An area containing endangered of vulnerable plants • An area of habitat for an animal that is endangered, vulnerable or special least concern	Present as: • Known habitat for Sharman's rock-wallaby, koala, greater glider, spectacled flying fox, greater large-eared horseshoe bat, bare-rumped sheath-tailed bat, red goshawk, masked owl, diadem leaf-nosed bat, short-beaked echidna and *Commersonia reticulata*. • Potential habitat for additional endangered and vulnerable species
Regulated vegetation under the Vegetation Management Act: • Prescribed regional ecosystem that are endangered and of concern regional ecosystems • Prescribed regional ecosystem intersecting a watercourse or drainage features • Prescribed regional ecosystem intersecting a mapped wetland • Containing essential habitat for near threatened species on an essential habitat map	Present as: • Of concern regional ecosystems • Regional ecosystems intersecting a watercourse or drainage features
Strategic Environmental Areas	Not present
Wetlands in a wetland protection area of wetlands of high ecological significance shown on the Map of Referable Wetlands	Not present
Wetlands and watercourses in high ecological value waters	Not present
Legally secured offset areas	Not present
Water providing fish passage	Not present
Marine plants	Not present

8 Summary and recommendations

Windlab is pursuing the Upper Burdekin Wind Farm Development Project at a site approximately 65 km south-west of Ingham in North Queensland. Project design, including siting of wind turbines and associated infrastructure, is still being finalised and Windlab is in the early phases of project planning. Regardless of design, the project has the potential to impact a number of threatened and migratory species listed under both state and Commonwealth environmental legislation.

Seasonal baseline surveys (early wet season and early dry season) surveys have been conducted to gain an understanding of the environmental values within the survey area and the associated potential ecological constraints. These surveys were generally comprehensive and adhered to available survey guidelines. A number of MNES and MSES have been identified within the survey area that should be considered during project design. The methods and associated survey effort conducted has allowed for a sound level of confidence in understanding the ecological values within the survey area and therefore the confidence in areas to avoid when siting wind turbines.

The findings of the surveys have indicated a number of Commonwealth and/or State listed environmental values within the survey area, including:

- known threatened species habitat for Sharman's rock-wallaby, koala, greater glider, spectacled flying fox, greater large-eared horseshoe bat, bare-rumped sheath-tailed bat, diadem leaf-nosed bat, red goshawk, masked owl and *Commersonia reticulata*
- potential threated species habitat for 21 other Commonwealth and/or State listed species
- Potential migratory fauna habitat for nine migratory bird species
- Regulated vegetation – prescribed regional ecosystem that are of concern regional ecosystems
- Regulated vegetation – prescribed regional ecosystem intersecting a watercourse
- Connectivity.

It is recommended that the information from this report be used to inform wind farm detailed design through an updated ecological constraints analysis layer (ELA, 2020) incorporating the values refined during the 2020 field surveys.

An impact assessment is required once the wind farm design is finalised to ascertain the species-specific and project level impacts, and to determine outcomes for these environmental values. This impact assessment will ensure that key habitat values for threatened and migratory species will continue to be present at the project area and the development and presence of the project will not prevent species from utilising the area. Further surveys in the form of site-specific assessments of wind-turbine placement (micrositing and preclearance surveys) and further surveys to define breeding areas for red goshawk and core habitat for Sharman's rock-wallaby will be required during this process.

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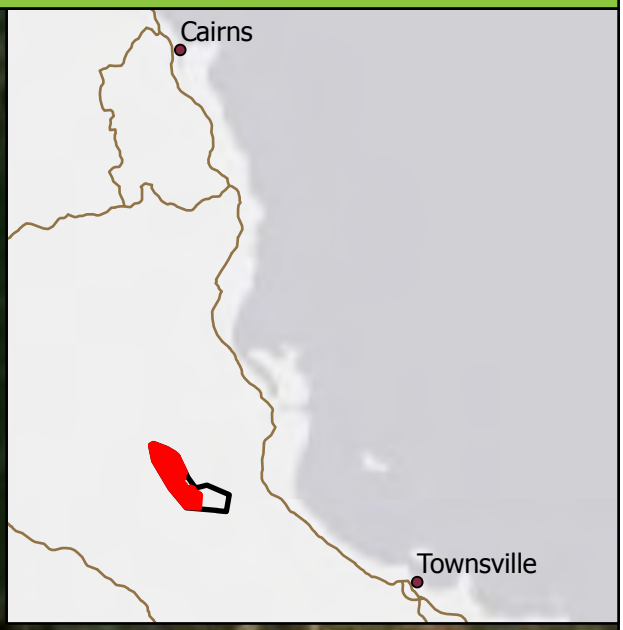
Appendix A Figures

Upper Burdekin Wind Farm: project area and survey area, with indicative locations of wind turbines



Legend

- 150 MW Turbines
- 300 MW Turbines
- 600 MW Turbines
- Survey Area
- Project Area

0 1.25 2.5 5
Kilometers
Datum/Projection:
GDA 1994 MGA Zone 55

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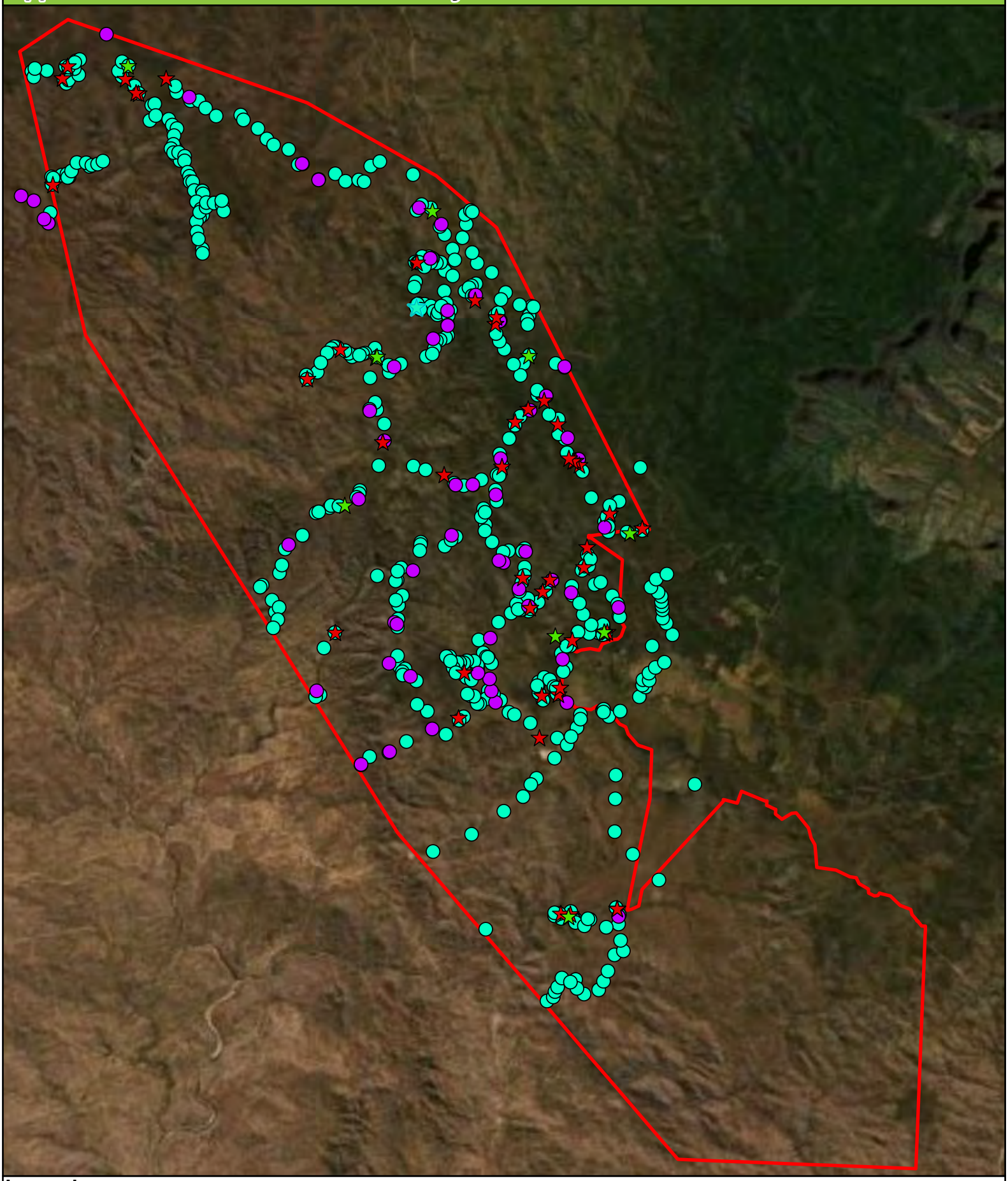
Prepared by: KB Date: 28/08/2020

Upper Burdekin Wind Farm: flora survey sites



Legend

Vegetation Assessment

- Secondary site
- Quaternary site

Flora

- Native species point
- Exotic species point
- Survey Area

0 1.25 2.5 5
Kilometers

Datum/Projection:
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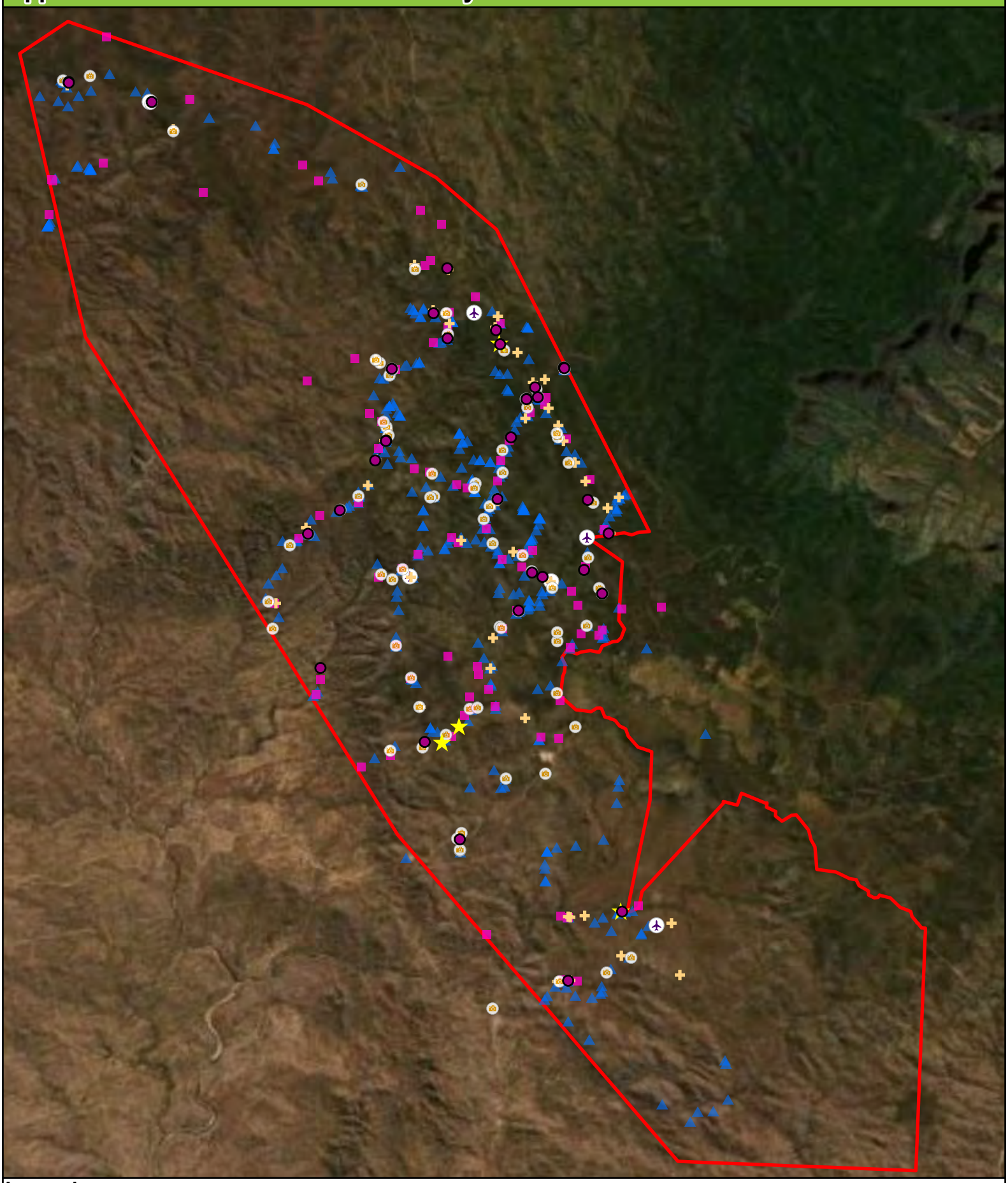
Upper Burdekin Wind Farm: fauna survey sites



Legend

- Targeted habitat assessments
- General habitat assessments
- Remote cameras
- Bioacoustic devices
- Harp trap and mistnet locations
- Drone surveys
- Bird Survey
- Survey Area

0 1.25 2.5 5
Kilometers
Datum/Projection:
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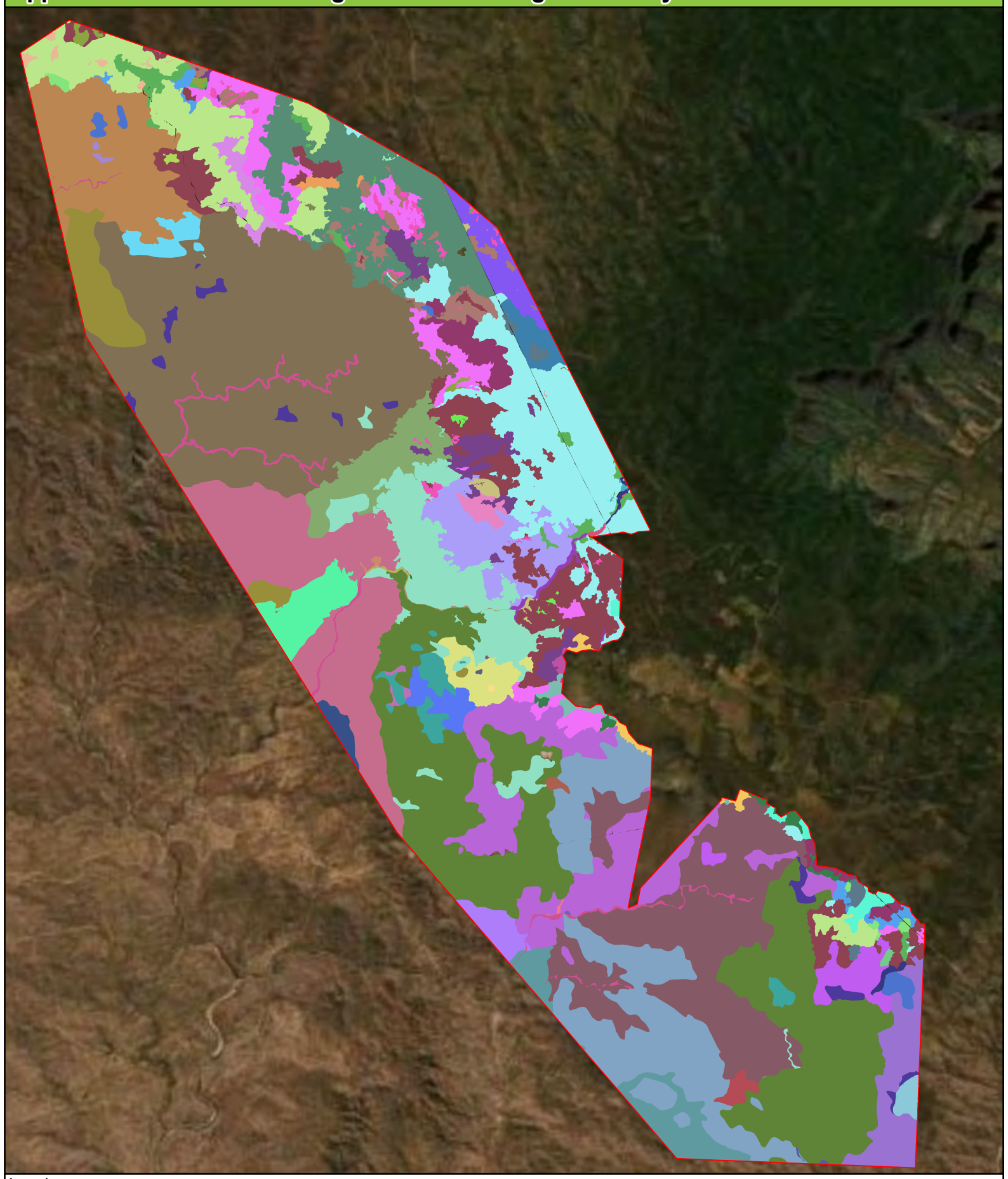
Upper Burdekin Wind Farm: ground-truthed regional ecosystems



Legend

Survey Area

Regional Ecosystem

- 7.12.16a
- 7.12.24a
- 7.12.29
- 7.12.29a
- 7.12.29b
- 7.12.29c
- 7.12.2e
- 7.12.30a
- 7.12.30a/7.12.34/7.12.35
- 7.12.34
- 7.12.34/7.12.24a
- 7.12.34/7.12.29
- 7.12.34/7.12.29/7.12.24a
- 7.12.35
- 7.12.35/7.12.24a
- 7.12.60a
- 7.12.60b
- 7.12.61a
- 7.12.65b
- 7.12.65c
- 7.12.65k
- 7.12.66b
- 7.12.69b
- 7.3.19a
- 7.3.26a
- 7.3.28d
- 7.3.39a
- 7.3.39c
- 7.3.43a
- 7.3.49a
- 7.3.8x
- 7.5.2
- 7.5.2a
- 7.5.2a/7.5.2d
- 7.5.2b
- 7.5.2c
- 7.5.2e
- 7.5.3
- 7.5.3a
- 7.5.4a
- 7.5.4b
- 7.5.4c
- 7.5.4f
- 7.8.10
- 7.8.18a
- 7.8.18c
- 9.11.2
- 9.11.2a
- 9.11.2a/9.11.4a
- 9.11.2a/9.11.5
- 9.11.4a
- 9.11.5/9.11.1a/9.11.2a
- 9.11.9
- 9.12.19
- 9.12.19/9.12.2
- 9.12.19/9.12.22
- 9.12.19/9.12.22/9.12.2
- 9.12.19/9.12.8a
- 9.12.1a
- 9.12.1a/9.12.2
- 9.12.1a/9.12.2/9.12.22
- 9.12.1a/9.12.22
- 9.12.1e
- 9.12.2
- 9.12.2/9.12.19
- 9.12.2/9.12.1a
- 9.12.21
- 9.12.22
- 9.12.22/9.12.19
- 9.12.4c
- 9.12.8
- 9.12.X
- 9.3.1
- 9.3.13
- 9.5.5
- 9.5.5a
- 9.5.5f
- 9.7.3b
- 9.8.13
- 9.8.4a
- 9.8.4b
- 9.8.4c
- 9.8.7
- 9.8.7x
- Non-remnant

0 1.25 2.5 5

Kilometers

Datum/Projection:
GDA 1994 MGA Zone 55

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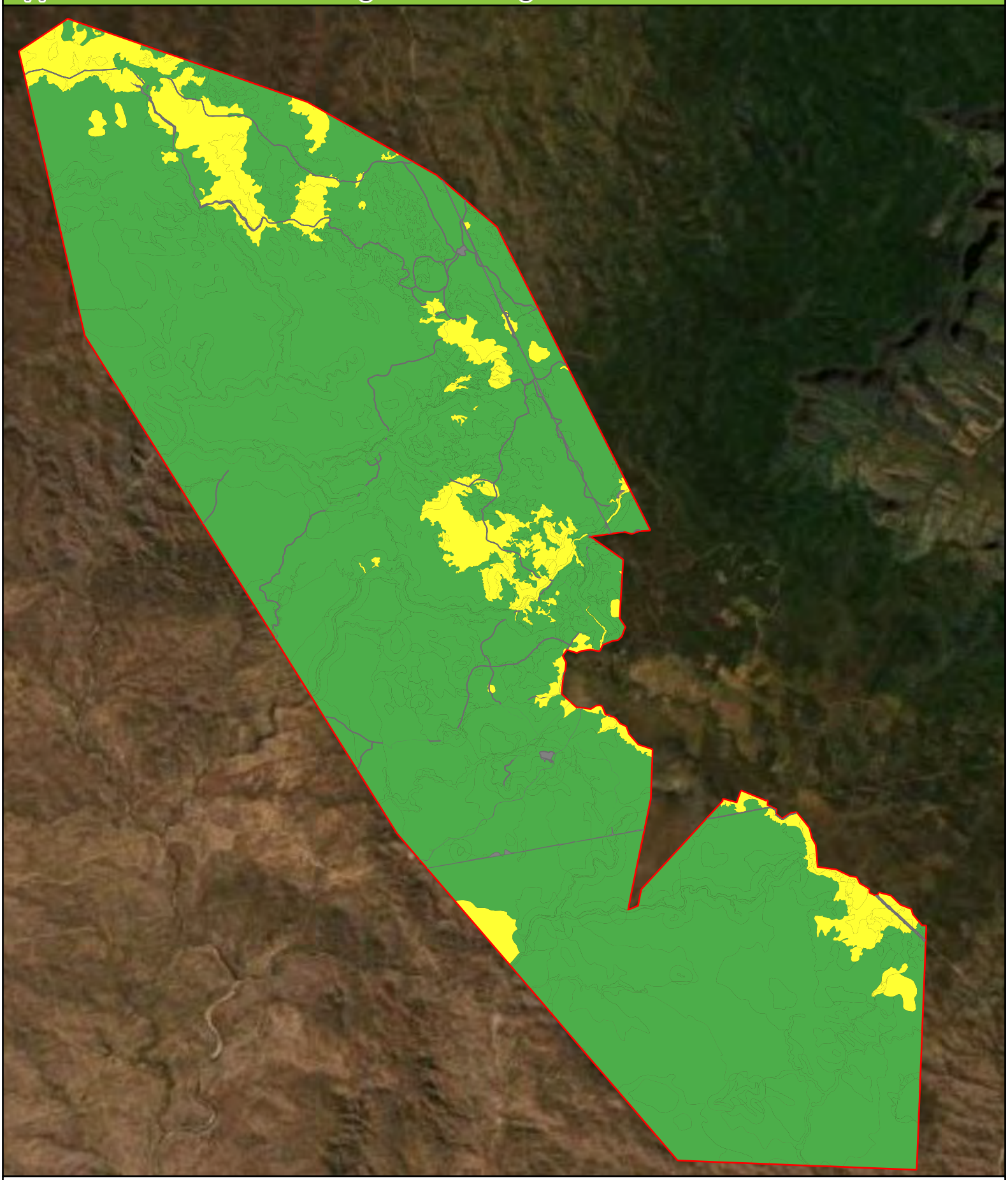
Upper Burdekin Wind Farm: Vegetation Management Act status



Legend

Vegetation Management Act Status

- Least Concern regional ecosystem
- Containing an Of Concern regional ecosystem
- Non-remnant
- Survey Area

0 1.25 2.5 5

Kilometers

Datum/Projection:
GDA 1994 MGA Zone 55

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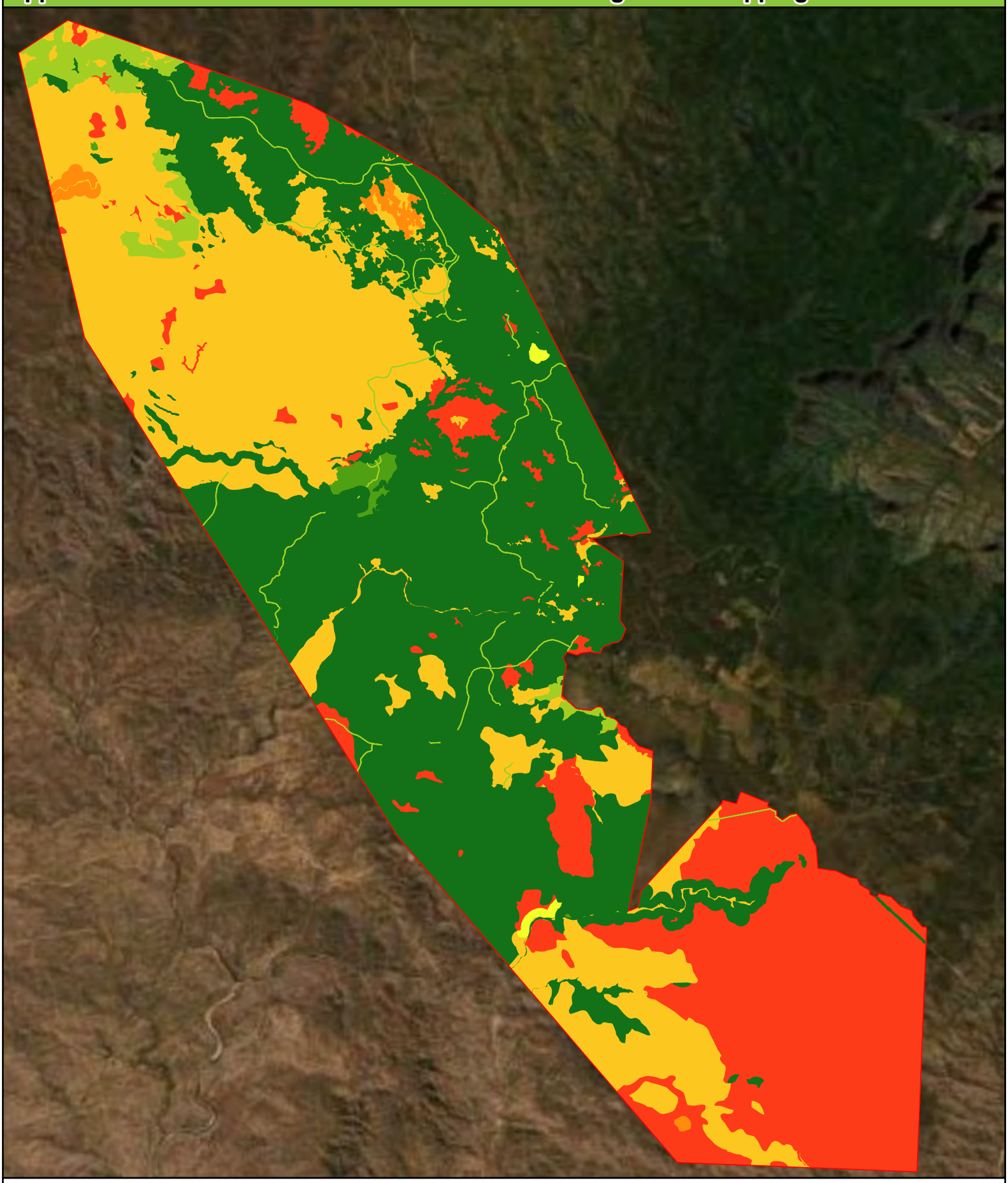
Upper Burdekin Wind Farm: confidence scores for vegetation mapping



Legend

Spatial and attribute accuracy

- A,A
- A,B
- B,A
- A,C
- B,B
- B,C
- C,C
- Survey Area

0 1.25 2.5 5

Kilometers

Datum/Projection:
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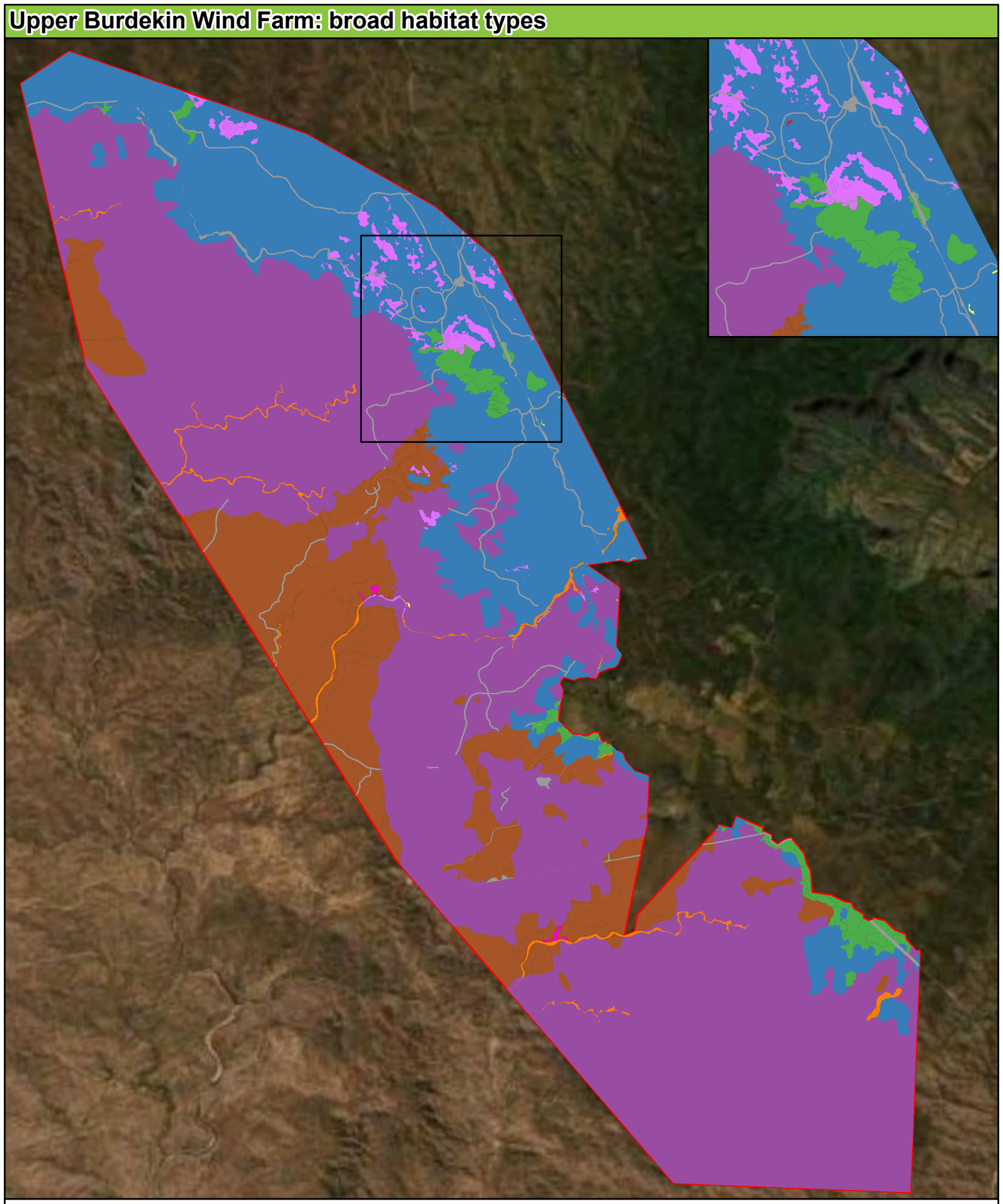
Upper Burdekin Wind Farm: broad habitat types



Legend

Broad Habitat Types

- Melaleuca swamps
- Open forest to woodland on uplands
- Open forest with Allocasuarina spp.
- Open woodland to open forest on granite, basalt and tertiary surfaces
- Riparian forest
- Rock pavements
- Simple notophyll vine forest
- Very open woodland on metamorphics and basalt plains and low hills
- Vine thicket
- Non-remnant
- Survey Area

0 1.25 2.5 5

Kilometers

Datum/Projection:
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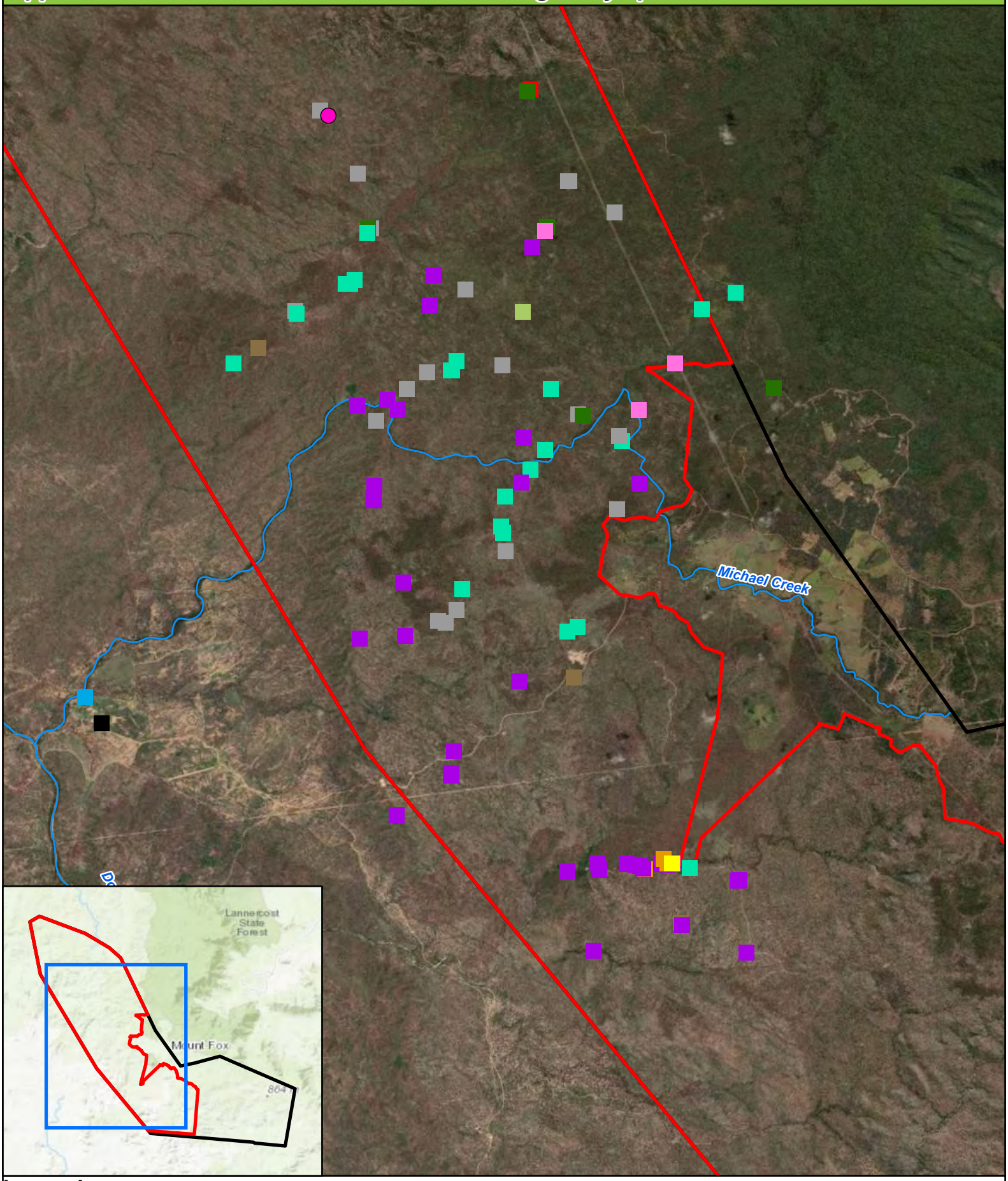
Upper Burdekin Wind Farm: threatened and migratory species records



Legend

- Red Goshawk
- Satin flycatcher
- Greater glider
- Sharman's rock-wallaby
- Koala
- Greater large-eared horseshoe bat
- Bare-rumped sheath-tailed bat
- Short-beaked echidna
- Masked owl (northern)
- Latham's snipe
- Diadem leaf-nosed bat
- Spectacled flying-fox
- Commersonia reticulata
- Named watercourses
- Survey Area
- Project Area

0 0.75 1.5 3
Kilometers

Datum/Projection:
GDA 1994 MGA Zone 55

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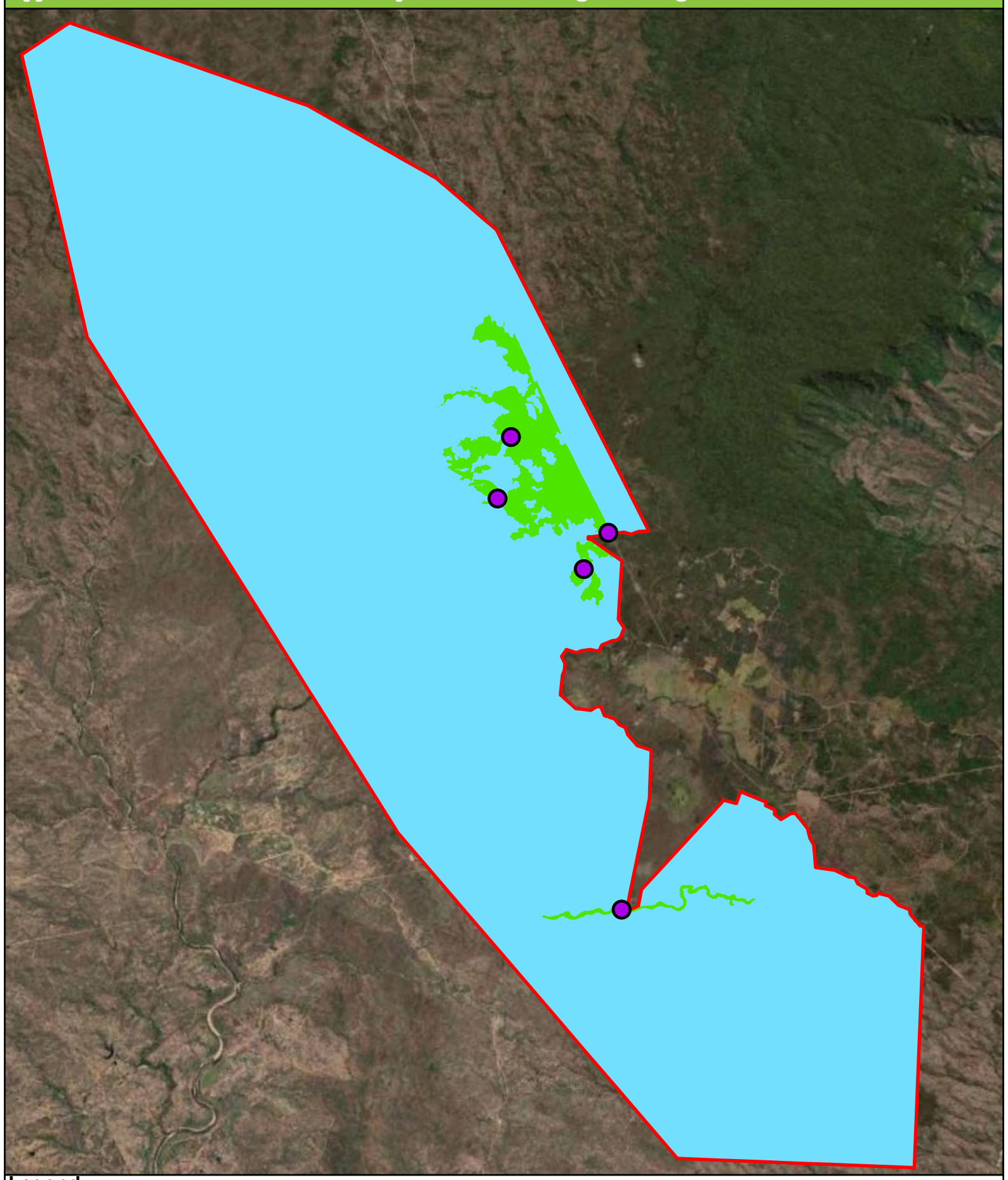
ELA Figure Removed to reduce file size	Refer Figure in 2rog MNES Significant Impact Report
Figure 8-9: Sharman's rock-wallaby habitat and records	Figure 9 1: Sharman's rock-wallaby records and habitat within the project area
Figure 8-10: Koala habitat and records	Figure 9 2: Koala records and habitat within the project area
Figure 8-11: Greater glider habitat and records	Figure 9 3: Greater glider records and habitat within the project area
Figure 8-12: Spectacled flying fox habitat and records	Figure 9 4: Spectacled-flying fox records and habitat within the project area
Figure 8-13: Masked owl habitat and records	Figure 9 8: Masked owl records and habitat within the project area
Figure 8-15: Bare-rumped sheath-tailed bat habitat and records	Figure 9 6: Bare-rumped sheathtail bat records and habitat within the project area
Figure 8-17: Red goshawk habitat and records	Figure 9 7: Red goshawk records and habitat within the project area

Upper Burdekin Wind Farm: known and potential habitat – greater large-eared horseshoe bat



Legend

- Greater large-eared horseshoe bat records (ELA)
- Known habitat
- Potential habitat
- Survey Area

0 1.25 2.5 5
Kilometers
Datum/Projection:
GDA 1994 MGA Zone 55

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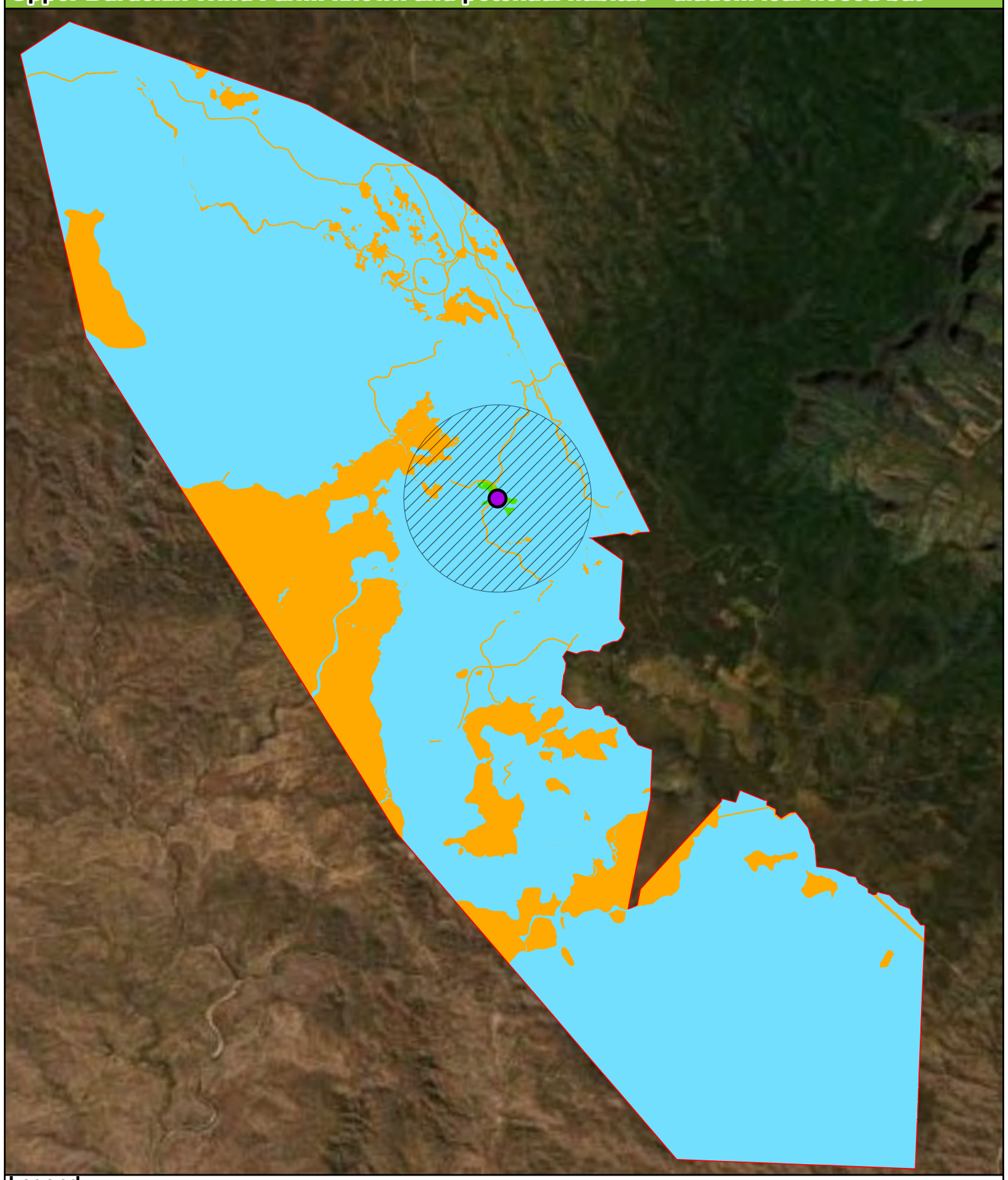
Upper Burdekin Wind Farm: known and potential habitat – diadem leaf-nosed bat



Legend

- Diadem leaf-nosed bat records (ELA)
- Potential roost area
- Known habitat
- Potential habitat
- Unlikely habitat
- Survey Area

0 1.25 2.5 5

Kilometers

Datum/Projection:
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Appendix B Database searches

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

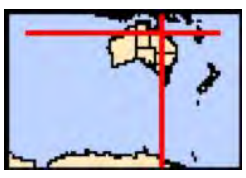
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 20/07/20 14:01:23

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 20.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	1
National Heritage Places:	2
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	44
Listed Migratory Species:	20

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	25
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	5
Regional Forest Agreements:	None
Invasive Species:	21
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

World Heritage Properties		[Resource Information]
Name	State	Status
Wet Tropics of Queensland	QLD	Declared property

National Heritage Properties		[Resource Information]
Name	State	Status
Natural		
Wet Tropics of Queensland	QLD	Listed place
Indigenous		
Wet Tropics World Heritage Area (Indigenous Values)	QLD	Within listed place

Listed Threatened Ecological Communities		[Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Broad leaf tea-tree (Melaleuca viridiflora) woodlands in high rainfall coastal north Queensland	Endangered	Community likely to occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Casuarius casuarius johnsonii		
Southern Cassowary, Australian Cassowary, Double-wattled Cassowary [25986]	Endangered	Species or species habitat known to occur within area
Erythrotriorchis radiatus		
Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Falco hypoleucos		
Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Poephila cincta cincta		
Southern Black-throated Finch [64447]	Endangered	Species or species habitat likely to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Turnix olivii		
Buff-breasted Button-quail [59293]	Endangered	Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat likely to occur within area
Fish		
Stiphodon semoni Opal Cling Goby [83909]	Critically Endangered	Species or species habitat may occur within area
Frogs		
Litoria dayi Australian Lace-lid, Lace-eyed Tree Frog, Day's Big-eyed Treefrog [86707]	Vulnerable	Species or species habitat likely to occur within area
Litoria nannotis Waterfall Frog, Torrent Tree Frog [1817]	Endangered	Species or species habitat likely to occur within area
Litoria rheocola Common Mistfrog [1802]	Endangered	Species or species habitat may occur within area
Pseudophryne covacevichae Magnificent Brood Frog [64385]	Vulnerable	Species or species habitat may occur within area
Mammals		
Bettongia tropica Northern Bettong [214]	Endangered	Species or species habitat may occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area
Dasyurus maculatus gracilis Spotted-tailed Quoll (North Queensland), Yarri [64475]	Endangered	Species or species habitat likely to occur within area
Hipposideros semoni Semon's Leaf-nosed Bat, Greater Wart-nosed Horseshoe-bat [180]	Vulnerable	Species or species habitat may occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Breeding likely to occur within area
Mesembriomys gouldii rattoides Black-footed Tree-rat (north Queensland), Shaggy Rabbit-rat [87620]	Vulnerable	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petaurus gracilis Mahogany Glider [26775]	Endangered	Species or species habitat known to occur within area
Petrogale sharmani Mount Claro Rock Wallaby, Sharman's Rock Wallaby [59281]	Vulnerable	Species or species habitat known to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus conspicillatus Spectacled Flying-fox [185]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Rhinolophus robertsi Large-eared Horseshoe Bat, Greater Large-eared Horseshoe Bat [87639]	Vulnerable	Species or species habitat likely to occur within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Bulbophyllum globuliforme Miniature Moss-orchid, Hoop Pine Orchid [6649]	Vulnerable	Species or species habitat likely to occur within area
Corymbia leptoloma Yellowjacket [64101]	Vulnerable	Species or species habitat may occur within area
Cycas platyphylla a cycad [55796]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat known to occur within area
Lindsaea pulchella var. blanda [20842]	Vulnerable	Species or species habitat likely to occur within area
Marsdenia brevifolia [64585]	Vulnerable	Species or species habitat likely to occur within area
Myrmecodia beccarii Ant Plant [11852]	Vulnerable	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat likely to occur within area
Phaius pictus [22564]	Vulnerable	Species or species habitat likely to occur within area
Phalaenopsis amabilis subsp. rosenstromii Native Moth Orchid [87535]	Endangered	Species or species habitat may occur within area
Tephrosia leveillei [16946]	Vulnerable	Species or species habitat known to occur within area
Zeuxine polygonoides Velvet Jewel Orchid [46794]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Delma mitella Atherton Delma, Legless Lizard [25931]	Vulnerable	Species or species habitat likely to occur within area
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat likely to occur within area
Sharks		
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River	Vulnerable	Species or species

Name	Status	Type of Presence
Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]		habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Marine Species		
Crocodylus porosus		
Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Hirundo rustica		
Barn Swallow [662]		Species or species habitat may occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus		
Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area
Reptiles		
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Girringun	QLD
Girringun	QLD
Liefway	QLD
Messmate	QLD
Range View	QLD

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat may occur within area

Name	Status	Type of Presence
Andropogon gayanus Gamba Grass [66895]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Reptiles		
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-18.72971 145.71343,-18.72012 145.76544,-18.78205 145.79634,-18.80122 145.7536,-18.72971 145.71326,-18.72971 145.71343

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Defined Area
Species: All
Type: All
Status: Rare and threatened species
Records: All
Date: All
Latitude: 18.4711 to 19.109
Longitude: 145.4622 to 146.0435
Email: kateb@ecoaus.com.au
Date submitted: Monday 17 Aug 2020 11:43:39
Date extracted: Monday 17 Aug 2020 11:50:02

The number of records retrieved = 24

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Hylidae	*Litoria serrata*	tapping green eyed frog		V		4/4
animals	amphibians	Hylidae	*Litoria dayi*	Australian lacelid		E	V	4/3
animals	amphibians	Hylidae	*Litoria nannotis*	waterfall frog		E	E	1/1
animals	birds	Apodidae	*Hirundapus caudacutus*	white-throated needletail		V	V	3
animals	birds	Cacatuidae	*Calyptorhynchus lathami erebus*	glossy black-cockatoo (northern)		V		1
animals	birds	Casuariidae	*Casuarius casuarius johnsonii (southern population)*	southern cassowary (southern population)		E	E	49
animals	birds	Columbidae	*Geophaps scripta scripta*	squatter pigeon (southern subspecies)		V	V	1
animals	birds	Psittacidae	*Cyclopsitta diophthalma macleayana*	Macleay's fig-parrot		V		5
animals	insects	Lycaenidae	*Hypochrysops apollo apollo*	Apollo jewel (Wet Tropics subspecies)		V		5
animals	mammals	Macropodidae	*Petrogale sharmani*	Sharman's rock-wallaby		V	V	58/34
animals	mammals	Petauridae	*Petaurus gracilis*	mahogany glider		E	E	64/2
animals	mammals	Phascolarctidae	*Phascolarctos cinereus*	koala		V	V	15
animals	mammals	Pseudocheiridae	*Petauroides volans minor*	northern greater glider		V	V	20
animals	mammals	Pteropodidae	*Pteropus conspicillatus*	spectacled flying-fox		E	E	2
plants	land plants	Apiaceae	*Oenanthe javanica*			NT		1/1
plants	land plants	Apocynaceae	*Marsdenia brevifolia*			V	V	1/1
plants	land plants	Asteraceae	*Glossocardia orthochaeta*			E		1/1
plants	land plants	Mimosaceae	*Acacia tingoorensis*			V		4/4
plants	land plants	Myrtaceae	*Corymbia leptoloma*			V	V	1/1
plants	land plants	Orchidaceae	*Corybas cerasinus*			NT		4/4
plants	land plants	Orchidaceae	*Bulbophyllum globuliforme*			NT	V	1/1
plants	land plants	Orchidaceae	*Habenaria rumphii*			NT		1/1
plants	land plants	Sapindaceae	*Dodonaea uncinata*			NT		2/2
plants	land plants	Sparrmanniaceae	*Corchorus subargenteus*			V		1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.* The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.* The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Queensland Government

Department of Environment and Science

Environmental Reports

Biodiversity and Conservation Values

Biodiversity Planning Assessments and Aquatic Conservation Assessments

For the selected area of interest
Lot: 3198 Plan: PH2177

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or Area of Interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "Central co-ordinates" option, the resulting assessment area encompasses an area extending from 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: biodiversity.planning@des.qld.gov.au

Disclaimer

Table of Contents

Summary Information

Tables 1 to 8 provide an overview of the AOI with respect to selected topographic and environmental values.

Table 1: Area of interest details: Lot: 3198 Plan: PH2177

Size (ha)	51,794.36
Local Government(s)	Charters Towers Regional
Bioregion(s)	Einasleigh Uplands, Wet Tropics
Subregion(s)	Paluma - Seaview, Herberton - Wairuna, Broken River
Catchment(s)	Herbert, Burdekin

The following table identifies available Biodiversity Planning Assessments (BPAs) and Aquatic Conservation Assessments (ACAs) with respect to the AOI.

Table 2: Available Biodiversity Planning and Aquatic Conservation Assessments

Assessment Type	Assessment Area and Version
Biodiversity Planning Assessment(s)	Einasleigh Uplands v1.1, Wet Tropics v1.1
Aquatic Conservation Assessment(s) (riverine)	Great Barrier Reef Catchments v1.3
Aquatic Conservation Assessment(s) (non-riverine)	Great Barrier Reef Catchments v1.3

Table 3: Remnant regional ecosystems within the AOI as per the Qld Herbarium's 'biodiversity status'

Biodiversity Status	Area (Ha)	% of AOI
Endangered	89.39	0.17
Of concern	2,506.03	4.84
No concern at present	47,866.20	92.42

The following table identifies the extent and proportion of the user specified area of interest (AOI) which is mapped as being of "State", "Regional" or "Local" significance via application of the Queensland Department of Environment and Science's *Biodiversity Assessment and Mapping Methodology* (BAMM).

Table 4: Summary table, biodiversity significance

Biodiversity significance	Area (Ha)	% of AOI
State Habitat for EVNT taxa	3.24	0.01
State	31,526.95	60.87
Regional	4,299.90	8.3
Local or Other Values	13,778.23	26.6

Table 5: Non-riverine wetlands intersecting the AOI

Non-riverine wetland types intersecting the area of interest	#
Number of Palustrine wetlands	0
Number of Lacustrine wetlands	6
Total number of non-riverine wetlands	6

NB. The figures presented in the table above are derived from the relevant non-riverine Aquatic Conservation Assessment(s). Later releases of wetland mapping produced via the Queensland Wetland Mapping Program may provide more recent information in regards to wetland extent.

Table 6: Named waterways intersecting the AOI

Name	Permanency
BLACK COW CREEK	Non-perennial
DOUGLAS CREEK	Non-perennial
MICHAEL CREEK	Non-perennial

Refer to **Map 1** for general locality information.

The following two tables identify the extent and proportion of the user specified AOI which is mapped as being of "Very High", "High", "Medium", "Low", or "Very Low" aquatic conservation value for riverine and non-riverine wetlands via application of the Queensland Department of Environment and Science's *Aquatic Biodiversity Assessment and Mapping Method* (AquaBAMM).

Table 7: Summary table, aquatic conservation significance (riverine)

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
Very High	12,899.46	24.91
High	7,082.17	13.67
Medium	31,812.09	61.42
Low	0.0	0.0
Very Low	0.0	0.0

Table 8: Summary table, aquatic conservation significance (non-riverine)

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
Very High	0.0	0.0
High	0.0	0.0
Medium	39.38	0.08
Low	0.0	0.0
Very Low	2.86	0.01

Biodiversity Planning Assessments

Introduction

The Department of Environment and Science (DES) attributes biodiversity significance on a bioregional scale through a Biodiversity Planning Assessment (BPA). A BPA involves the integration of ecological criteria using the *Biodiversity assessment and Mapping Methodology* (BAMM) and is developed in two stages: 1) **diagnostic criteria**, and 2) **expert panel criteria**. The diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion, while the expert panel criteria allows for the refinement of the mapped information from the diagnostic output by incorporating local knowledge and expert opinion.

The BAMM methodology has application for identifying areas with various levels of significance solely for biodiversity reasons. These include threatened ecosystems or taxa, large tracts of habitat in good condition, ecosystem diversity, landscape context and connection, and buffers to wetlands or other types of habitat important for the maintenance of biodiversity or ecological processes. While natural resource values such as dryland salinity, soil erosion potential or land capability are not dealt with explicitly, they are included to some extent within the biodiversity status of regional ecosystems recognised by the DES.

Biodiversity Planning Assessments (BPAs) assign three levels of overall biodiversity significance.

- **State significance** - areas assessed as being significant for biodiversity at the bioregional or state scales. They also include areas assessed by other studies/processes as being significant at national or international scales. In addition, areas flagged as being of State significance due to the presence of endangered, vulnerable and/or near threatened taxa, are identified as "State Habitat for EVNT taxa".
- **Regional significance** - areas assessed as being significant for biodiversity at the subregional scale. These areas have lower significance for biodiversity than areas assessed as being of State significance.
- **Local significance and/or other values** - areas assessed as not being significant for biodiversity at state or regional scales. Local values are of significance at the local government scale.

For further information on released BPAs and a copy of the underlying methodology, go to:

http://www.qld.gov.au/environment/plants-animals/biodiversity/planning/

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

http://qspatial.information.qld.gov.au/geoportal/

The following table identifies the extent and proportion of the user specified AOI which is mapped as being of "State", "Regional" or "Local" significance via application of the BAMM.

Table 9: Summary table, biodiversity significance

Biodiversity significance	Area (Ha)	% of AOI
State Habitat for EVNT taxa	3.24	0.01
State	31,526.95	60.87
Regional	4,299.90	8.3
Local or Other Values	13,778.23	26.6

Refer to **Map 2** for further information.

Diagnostic Criteria

Diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion. These criteria are diagnostic in that they are used to filter the available data and provide a "first-cut" or initial determination of biodiversity significance. This initial assessment is then combined through a second group of other essential criteria.

A description of the individual diagnostic criteria is provided in the following sections.

Criteria A. Habitat for EVNT taxa: Classifies areas according to their significance based on the presence of endangered, vulnerable and/or rare (EVNT) taxa. EVNT taxa are those scheduled under the *Nature Conservation Act 1992* and/or the

Environment Protection and Biodiversity Conservation Act 1999. It excludes highly mobile fauna taxa which are instead considered in Criterion H and brings together information on EVNT taxa using buffering of recorded sites or habitat suitability models (HSM) where available.

Criteria B. Ecosystem value: Classifies on the basis of biodiversity status of regional ecosystems, their extent in protected areas (presence of poorly conserved regional ecosystems), the presence of significant wetlands; and areas of national importance such as the presence of Threatened Ecological Communities, World Heritage areas and Ramsar sites. Ecosystem value is applied at a bioregional (**B1**) and regional (**B2**) scale.

Criteria C. Tract size: Measures the relative size of tracts of vegetation in the landscape. The size of any tract is a major indicator of ecological significance, and is also strongly correlated with the long-term viability of biodiversity values. Larger tracts are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller tracts.

Criteria D. Relative size of regional ecosystems: Classifies the relative size of each regional ecosystem unit within its bioregion (**D1**) and its subregion (**D2**). Remnant units are compared with all other occurrences with the same regional ecosystem. Large examples of a regional ecosystem are more significant than smaller examples of the same regional ecosystem because they are more representative of the biodiversity values particular to the regional ecosystem, are more resilient to the effects of disturbance, and constitute a significant proportion of the total area of the regional ecosystem.

Criteria F. Ecosystem diversity: Is an indicator of the number of regional ecosystems occurring within an area. An area with high ecosystem diversity will have many regional ecosystems and ecotones relative to other areas within the bioregion.

Criteria G. Context and connection: Represents the extent to which a remnant unit incorporates, borders or buffers areas such as significant wetlands, endangered ecosystems; and the degree to which it is connected to other vegetation.

A summary of the biodiversity status based upon the diagnostic criteria is provided in the following table.

Table 10: Summary of biodiversity significance based upon diagnostic criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
State	Remnant contains an RE that is one of the largest of its type in the bioregion (D1) & Remnant has Ecosystem diversity in the top quartile (F)	419.03	0.81
State	Remnant contains an RE that is one of the largest of its type in the bioregion (D1) & Remnant has high connectivity or buffers an endangered RE or Sig. Wetland (G)	1,506.47	2.91
State	Remnant contains at least 1 Endangered or 2 Vulnerable or Near Threatened species (A)	3.24	0.01
State	Remnant contains at least 1 Endangered RE (B1)	89.34	0.17
State	Remnant contains at least one Of Concern RE (B1) & Is part of moderately large Tract (C) & Contains a RE that is a moderately large RE of its type in the bioregion (D1) & Has high connectivity or buffers an endangered RE or Significant Wetland (G)	223.89	0.43
State	Remnant contains at least one Of Concern RE (B1) & Remnant contains an RE that is one of the largest of its type in the bioregion (D1)	1,250.89	2.42
State	Remnant contains at least one Of Concern RE (B1) & Remnant is part of moderately large Tract (C) & Remnant contains a RE that is a moderately large RE of its type in the bioregion (D1) & Remnant has Ecosystem diversity in the top quartile (F)	69.81	0.13
Regional	Remnant contains an RE that is one of the largest of its type in the subregion (D2)	5,467.17	10.56
Regional	Remnant contains at least 1 RE with <10 pc extent remaining or rare in subregion (B2)	12.25	0.02
Regional	Remnant contains at least 1 RE with 10-30 percent extent remaining in the subregion (B2) & Remnant is part of moderately large Tract (C) & Remnant has high connectivity or buffers an endangered RE or Significant Wetland (G)	560.94	1.08
Regional	Remnant contains at least 1 Vulnerable or Near Threatened species (A)	206.22	0.4
Regional	Remnant contains at least one Of Concern RE (B1)	1,727.59	3.34
Local or Other Values	Refer to diagnostic data for additional information	37,763.59	72.91

Assessment of diagnostic criteria with respect to the AOI

The following table reflects an assessment of the individual diagnostic criteria noted above in regards to the AOI.

Table 11: Assessment of individual diagnostic criteria with respect to the AOI

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
A: Habitat for EVNT Taxa	3.24		215.43	0.4	20,043.90	38.7	29,037.82	56.1
B1: Ecosystem Value (Bioregion)	89.32	0.2	3,274.67	6.3	40,033.41	77.3	5,902.99	11.4

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
B2: Ecosystem Value (Subregion)	119.47	0.2			40,959.47	79.1	8,221.45	15.9
C: Tract Size			49,300.39	95.2				
D1: Relative RE Size (Bioregion)	3,176.42	6.1	7,065.47	13.6	9,578.57	18.5	29,479.93	56.9
D2: Relative RE Size (Subregion)	8,858.32	17.1	3,261.53	6.3	10,588.11	20.4	26,592.43	51.3
F: Ecosystem Diversity	10,893.72	21.0	30,627.88	59.1	7,748.53	15.0	30.26	0.1
G: Context and Connection	44,389.11	85.7	4,832.56	9.3	78.72	0.2		

Other Essential Criteria

Other essential criteria (also known as expert panel criteria) are based on non-uniform information sources and which may rely more upon expert opinion than on quantitative data. These criteria are used to provide a "second-cut" determination of biodiversity significance, which is then combined with the diagnostic criteria for an overall assessment of relative biodiversity significance. A summary of the biodiversity status based upon the other essential criteria is provided in the following table.

Table 12: Summary of biodiversity significance based upon other essential criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
State	Remnant contains Core Habitat for Priority Taxa (H) & Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I)	3.2	0.01
State	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I)	8,102.17	15.64
State	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I) & Remnant forms part of a bioregional corridor (J)	20,215.22	39.03
State	Remnant forms part of a bioregional corridor (J)	1,477.38	2.85
Regional	Refer to Expert Panel data for additional information	652.35	1.26
Regional	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I)	4,797.79	9.26

A description of each of the other essential criteria and associated assessment in regards to the AOI is provided in the following sections.

Criteria H. Essential and general habitat for priority taxa: Priority taxa are those which are at risk or of management concern, taxa of scientific interest as relictual (ancient or primitive), endemic taxa or locally significant populations (such as a flying fox camp or heronry), highly specialised taxa whose habitat requirements are complex and distributions are not well correlated with any particular regional ecosystem, taxa important for maintaining genetic diversity (such as complex spatial patterns of genetic variation, geographic range limits, highly disjunct populations), taxa critical for management or monitoring of biodiversity (functionally important or ecological indicators), or economic and culturally important taxa.

Criteria I. Special biodiversity values: areas with special biodiversity values are important because they contain multiple taxa in a unique ecological and often highly biodiverse environment. Areas with special biodiversity values can include the

following:

- Ia - centres of endemism - areas where concentrations of taxa are endemic to a bioregion or subregion are found.
- Ib - wildlife refugia (Morton *et al*. 1995), for example, islands, mound springs, caves, wetlands, gorges, mountain ranges and topographic isolates, ecological refuges, refuges from exotic animals, and refuges from clearing. The latter may include large areas that are not suitable for clearing because of land suitability/capability.
- Ic - areas with concentrations of disjunct populations.
- Id - areas with concentrations of taxa at the limits of their geographic ranges.
- Ie - areas with high species richness.
- If - areas with concentrations of relictual populations (ancient and primitive taxa).
- Ig - areas containing REs with distinct variation in species composition associated with geomorphology and other environmental variables.
- Ih - an artificial waterbody or managed/manipulated wetland considered by the panel/s to be of ecological significance.
- Ii - areas with a high density of hollow-bearing trees that provide habitat for animals.
- Ij - breeding or roosting sites used by a significant number of individuals.
- Ik - climate change refuge.

The following table identifies the value and extent area of the Other Essential Criteria H and I within the AOI.

Table 13: Relative importance of expert panel criteria (H and I) used to access overall biodiversity significance with respect to the AOI

Expert Panel	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
H: Core Habitat Priority Taxa	3.2		785.16	1.5	1,114.12	2.2		
Ia: Centres of Endemism	558.3	1.1	24,793.63	47.9				
Ib: Wildlife Refugia	27,575.53	53.2	5,542.84	10.7				
Ic: Disjunct Populations	23,983.16	46.3	1,368.77	2.6				
Id: Limits of Geographic Ranges	23,818.39	46.0	1,533.54	3.0				
Ie: High Species Richness	27,575.53	53.2						
If: Relictual Populations			558.3	1.1				
Ig: Variation in Species Composition	3,686.13	7.1	12,178.55	23.5				
Ih: Artificial Wetland								
Ii: Hollow Bearing Trees	23,818.39	46.0	2,261.20	4.4				
Ij: Breeding or Roosting Site	26,079.59	50.4						
Ik: Climate Refugia								

NB. Whilst biodiversity values associated with Criteria I may be present within the site (refer to tables 12 and 15), for the New England Tableland and Central Queensland Coast BPAs, area and % area figures associated with Criteria Ia through to Ij cannot be listed in the table above (due to slight variations in data formats between BPAs).

Criteria J. Corridors: areas identified under this criterion qualify either because they are existing vegetated corridors important for contiguity, or cleared areas that could serve this purpose if revegetated. Some examples of corridors include riparian habitats, transport corridors and "stepping stones".

Bioregional and subregional conservation corridors have been identified in the more developed bioregions of Queensland through the BPAs, using an intensive process involving expert panels. Map 3 displays the location of corridors as identified under the Statewide Corridor network. The Statewide Corridor network incorporates BPA derived corridors and for bioregions where no BPA has been assessed yet, corridors derived under other planning processes. *Note: as a result of updating and developing a statewide network, the alignment of corridors may differ slightly in some instances when compared to those used in individual BPAs.*

The functions of these corridors are:

- **Terrestrial** Bioregional corridors, in conjunction with large tracts of remnant vegetation, maintain ecological and evolutionary processes at a landscape scale, by:

  • Maintaining long term evolutionary/genetic processes that allow the natural change in distributions of species and connectivity between populations of species over long periods of time;

  • Maintaining landscape/ecosystems processes associated with geological, altitudinal and climatic gradients, to allow for ecological responses to climate change;

  • Maintaining large scale seasonal/migratory species processes and movement of fauna;

  • Maximising connectivity between large tracts/patches of remnant vegetation;

  • Identifying key areas for rehabilitation and offsets; and

- **Riparian** Bioregional Corridors also maintain and encourage connectivity of riparian and associated ecosystems.

The location of the corridors is determined by the following principles:

- Terrestrial

  • Complement riparian landscape corridors (i.e. minimise overlap and maximise connectivity);

  • Follow major watershed/catchment and/or coastal boundaries;

  • Incorporate major altitudinal/geological/climatic gradients;

  • Include and maximise connectivity between large tracts/patches of remnant vegetation;

  • Include and maximise connectivity between remnant vegetation in good condition; and

- Riparian

  • Located on the major river or creek systems within the bioregion in question.

The total extent of remnant vegetation triggered as being of "State", "Regional" or "Local" significance due to the presence of an overlying BPA derived terrestrial or riparian corridor within the AOI, is provided in the following table. For further information on how remnant vegetation is triggered due to the presence of an overlying BPA derived corridor, refer to the relevant landscape BPA expert panel report(s).

Table 14: Extent of triggered remnant vegetation due to the presence of BPA derived corridors with respect to the AOI

Biodiversity Significance	Area (Ha)	% of AOI
State	21,692.61	41.88
Regional	0.0	0.0
Local	0.0	0.0

NB: area figures associated with the extent of corridor triggered remnant vegetation are only available for those bioregions where a BPA has been undertaken.

Refer to **Map 3** for further information.

Threatening process/condition (Criteria K) - areas identified by experts under this criterion may be used to amend (upgrade or downgrade) biodiversity significance arising from the "first-cut" analysis. The condition of remnant vegetation is affected by threatening processes such as weeds, ferals, grazing and burning regime, selective timber harvesting/removal, salinity, soil erosion, and climate change.

Assessment of Criteria K with respect to the AOI is not currently included in the "Biodiversity and Conservation Values" report, as it has not been applied to the majority of Queensland due to data/information limitations and availability.

Special Area Decisions

Expert panel derived "Special Area Decisions" are used to assign values to Other Essential Criteria. The specific decisions which relate to the AOI in question are listed in the table below.

Table 15: Expert panel decisions for assigning levels of biodiversity significance with respect to the AOI

Decision Number	Description	Panel Recommended Significance	Criteria Values
brbn_l_17a	None	None	None
eiu_fa_24	Eastern ecotone	State	Ia (centre of endemism): HIGH Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): VERY HIGH Id (taxa at the limits of their ranges): VERY HIGH Ie (high species richness): VERY HIGH Ii (high density of hollow-bearing trees): VERY HIGH Ij (significant breeding or roosting sites): VERY HIGH
eiu_fa_30	High precision records for priority taxa of Regional significance are contained within the remnant.	Regional	Criterion H: HIGH
eiu_fa_31	Low precision records for priority taxa of Regional significance are contained within the remnant.	None	Criterion H: MEDIUM
eiu_fl_12	Western Lumholtz - Princess Hills area	Regional	Ib (wildlife refugia): VERY HIGH Ie (high species richness): VERY HIGH
eiu_fl_25	Low precision records for priority taxa of State significance are contained within the remnant.	None	Criterion H: MEDIUM
eiu_fl_26	High precision records for priority taxa of Regional significance are contained within the remnant.	Regional	Criterion H: HIGH
eiu_l_03	Riparian ecosystems and associated areas.	State	Ib (wildlife refugia): VERY HIGH Ie (high species richness): VERY HIGH Ig (RE's with distinct variation): VERY HIGH Ii (high density of hollow-bearing trees): HIGH Ij (significant breeding or roosting sites): VERY HIGH
eiu_l_10	Landscapes of least disturbance	State	Ia (centre of endemism): HIGH Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): HIGH Id (taxa at the limits of their ranges): HIGH Ie (high species richness): VERY HIGH Ig (RE's with distinct variation): HIGH K (Condition): State
eiu_l_11	Vine Thickets	State	Ia (centre of endemism): VERY HIGH Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): VERY HIGH Id (taxa at the limits of their ranges): HIGH Ie (high species richness): VERY HIGH If (relictual populations): HIGH
eiu_l_15	Ecosystems with a Biodiversity status of Endangered or Of Concern and a current extent of less than 10,000ha	State	Ib (wildlife refugia): HIGH Ig (RE's with distinct variation): VERY HIGH
eiu_l_32	Bioregional Terrestrial Corridors	State or Regional	J (corridors): State or Regional
eiu_l_33	Bioregional Riparian Corridors	State	J (corridors): State

Decision Number	Description	Panel Recommended Significance	Criteria Values
wet_l_25	Core areas	Regional	Ib (refugia): H
wet_l_30a	Terrestrial bioregional corridors (landscape connections) .	State	Criterion J (terrestrial corridor): STATE
wet_l_31b	Riparian bioregional corridors (landscape connections)	Regional	Criterion J (riparian corridor): REGIONAL

Expert panel decision descriptions:

brbn_l_17a

None

eiu_fa_24

The Eastern ecotone of the Einasleigh Uplands is a band of eucalypt forest separating the rainforest of the Wet Tropics from the dry tropical woodlands that characterize the bioregion. These better developed forests support a number of species that are endemic to the ecotone, or are isolated populations of species more widely distributed in the wet sclerophyll forest of south-east Queensland. These species include the northern bettong (**Bettongia tropica**), eastern yellow robin (**Eopsaltria australis**), yellow thornbill (**Acanthiza nana**), greater glider (**Petauroides volans**), Squirrel glider (**Petaurus norfolcensis**), crested shrike-tit (**Falcunculus frontatus**) and the yellow-faced honeyeater (**Lichenostomus chrysops**). Disjunct tree species that have the major part of their North Queensland distribution in the ecotone include **Eucalyptus resinifera, E. pellita, E. grandis, E. moluccana, E. reducta, E. cloeziana, E. citriodora** and **Angophora floribunda.**

eiu_fa_30

Remnant contains Core Habitat for Priority taxa with high precision records.

eiu_fa_31

Remnant contains Core Habitat for Priority taxa with low precision records.

eiu_fl_12

This area is centred on the southern part of the Herberton-Wairuna Subregion, south of the Herbert River. In the north and east the area is characterized by open forests of **Corymbia citriodora** (lemon-scented gum), **Eucalyptus crebra** (narrow-leaved ironbark), **C. intermedia** (pink bloodwood) and **E. portuensis** (white mahogany) on deeper soils of the largely intact plateau surface, most of which lies between 600 and 800m ASL. It includes small areas of granite and metamorphic hills, alluvial valleys and wetlands. In the south west the plateau has been largely stripped and has shallow soils and a low open woodland of **Allocasuarina inophloia** (stringybark sheoak), with **Eucalyptus exserta** (Queensland peppermint) and **Melaleuca nervosa** (woodland paperbark), and mostly lies between 550 and 600m ASL. The area straddles the ecotone between the Wet Tropics and the Einasleigh Uplands.

Significant flora known to occur in the area include **Acacia ramiflora** (E), **Cartonema brachyantherum** (R), **Eucalyptus howittiana** (R), **Eucalyptus atrata**, **Eucalyptus lockyeri subsp. exuta** (R), **Hibbertia** sp. (Girraween NP D.Halford+ Q1611), **Leptospermum pallidum** (R), **Peripleura scabra** (R), and a diversity of **Stylidium** (trigger plants) including **S. eriorhizum**, **S. floodii**, **S. oviflorum**, **S. rotundifolium**, **S. tenerum** and Sty**lidium velleioides**.

eiu_fl_25

Remnant contains Core Habitat for Priority taxa with low precision records.

eiu_fl_26

Remnant contains Core Habitat for Priority taxa with high precision records.

eiu_l_03

Most of the Einasleigh Uplands is dominated by open vegetation on shallow or skeletal soils. Riparian RE's associated with the larger river systems function as important refuges for many species of flora and fauna because of the relatively high nutrient levels associated with most of these areas, their better moisture balance and their generally well developed vegetation. These mesic ribbons of habitat provide an important seasonal refuge and resources for a variety of species, in particular arboreal mammals, woodland birds, hollow-roosting species and amphibians. Many raptor species preferentially nest in tall riparian trees.

Riparian areas are also biogeographically significant habitat as they allow inland incursions of many east coast species into drier areas on the edge of their geographic range.

Riparian areas were given a 200m buffer with the same significance rating to ensure that adjacent habitat used opportunistically by species using the riparian areas was also included.

This decision includes Landscape decision 4.

eiu_l_10

Parts of the Einasleigh Uplands, due to ruggedness, remoteness or the absence of permanent surface water, have had little impact from grazing by domestic stock or the associated infrastructure. These are areas where the landscapes have been little disturbed and the biodiversity values within them have the greatest chance of being maintained in the long term. The major threatening process to these areas is the intensification of grazing through development of infrastructure such as watering points and fencing. The current condition of the ground layer and soil is considered to be very good and they provide a refuge for sensitive plant and animal species from the impacts of grazing.

These are predominantly areas of very low land capability, with skeletal, infertile and droughty soils, steep slopes and much rock outcrop. Any increase in land use intensity in these areas is likely to result in rapid land degradation and consequent loss of biodiversity values.

The extent of these areas in the Einasleigh Uplands, compared with other parts of the state, makes them of State Significance for the protection of intact ecosystems.

eiu_l_11

The bioregion has a wide variety of dry vine thickets across a number of different substrates. Vine thickets have been largely cleared from the Brigalow Belt, and the Einasleigh Uplands is of state significance in the protection of these ecosystems and their values. Vine thickets are refugia for a large number of plants and animals, many of which are disjunct populations, or at the limits of their geographic ranges. Although species combinations vary with substrate, EVR and other priority species are present in many occurrences and endemism of invertebrate species is common.

Mapped vine thickets were buffered by 500m to allow for species that shelter in the vine thicket but use resources in the surrounding woodlands.

Some occurrences are at risk from weed invasions (particularly lantana **Lantana camara**), pig damage and adverse fire regimes.

This decision combines and replaces Flora decision 22 and Fauna decision 23.

eiu_l_15

Einasleigh Upland regional ecosystems with a remaining extent that is less than 10,000ha have a naturally restricted distribution, and their threatened status is a reflection of this. They are susceptible to what would normally be viewed as local

threats or impacts, and are therefore most vulnerable of all ecosystems to rapid and potentially total loss of natural values. In most cases their restricted distribution relates to geomorphic and/or micro-climatic settings that are also restricted and these areas therefore have particular ecological and scientific values. These values relate to the unique combination of ecological characteristics, and to the unusual habitat conditions they provide for particular species or genotypes. Where the status has been upgraded to Endangered due to the impact of threatening processes their susceptibility to further loss of values is extreme.

eiu_l_32

This terrestrial corridors decision identifies major themes of habitat connectivity across the bioregion. They identify north/south and east/west links that cover higher altitude areas along watersheds and mountain ranges, and areas characterised by a relative continuity of similar or related habitats, using the methodology outlined in EPA 2008. Identified corridor centrelines are buffered according to the significance of the centreline and the landscape context within which it occurs

Decision eiu_l_22 Corridor Special Management Areas identifies areas where values associated with landscape scale habitat connectivity have been compromised.

eiu_l_33

Riparian corridors in the Einasleigh Uplands are particularly significant for biodiversity, both as a climatic refuge and as a major element of habitat continuity. This decision is based on the bioregional corridor values of major riparian areas. The refugial and other values of riparian areas are covered by decision eiu_l_03.

The watercourse centrelines were buffered by 200m to indicate the general location of this habitat continuity theme, in line with the state-wide approach for riparian corridors in undeveloped bioregions.

wet_l_25

Tracts are defined as patches of continuous remnant vegetation. The size of any tract is a major indicator of ecological significance and is strongly correlated with the long-term viability of biodiversity values. Larger tracts are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller tracts. These areas can be considered core nodes/refugia in which a large proportion of the bioregions biodiversity is represented.

A modified tract size analysis (Criterion C) (EHP 2014) was used to identify and delineate discrete tracts of remnant vegetation at a bioregion scale. For the purpose of the assessment, a core area was identified as a relatively contiguous area of remnant vegetation (disregarding small perforations, or linear breaks) and which was generally greater than 5km in width (based upon the minimum width of the terrestrial corridor network). Tracts of greater than 2,000ha were included.

wet_l_30a

The broad purpose of landscape-scale connections, is to provide for ecological and evolutionary processes at a bioregional scale. Maintaining connectivity across a landscape, either through "continuous linkages" or via "stepping-stones" of remnant vegetation, is important for the long-term conservation of biodiversity.

Corridor triggered remnant vegetation is focused upon areas between core tracts/nodes (as identified under the special area decision wet_l_25) within the bioregion. For further information regarding the broad principles and intent, as well as more specific information relating to the Wet Tropics terrestrial corridor network, refer to Section 3.3.2.1 and Table 14.

wet_l_31b

Riparian corridors encompass some of the most diverse, dynamic and complex habitats incorporating both environmental and topographic gradients. Comparatively, such areas tend to exhibit high species richness with respect to both flora and fauna, provide important resources in terms of water, food, shelter, nesting and nursery sites and act as a refugia during periods of drought, or in response to longer terms impacts associated with climatic change.

At the landscape scale, networks of major and minor riparian linkages are a significant element of habitat continuity and provide important migratory and dispersal pathways for a substantial number of species (especially birds, insects and flora, but also for many arboreal mammals and reptiles). In some areas of fragmented landscapes, watercourses often provide the only remaining habitat connectivity due to the extensive clearing and surrounding modified landscape.

Within the WET, the panel determined that remnant vegetation within 200m and 100m of major and minor waterways should be designated as being of State and Regional significance respectively. The significance of selected riverine systems were also modified in some instances (Table 16). Corridor triggered remnant vegetation focuses upon identifying key connections between remaining core tracts/nodes (as identified under the special area decisions wet_l_25) within the bioregion. For further information regarding the broad principles and intent, as well as more specific information relating to the Wet Tropics riparian corridor network, refer to Section 3.3.2.2.

Aquatic Conservation Assessments

Introduction

The Aquatic Biodiversity Assessment and Mapping Method or AquaBAMM (Clayton *et al.* 2006), was developed to assess conservation values of wetlands in queensland, and may also have application in broader geographical contexts. It is a comprehensive method that uses available data, including data resulting from expert opinion, to identify relative wetland conservation/ecological values within a specified study area (usually a catchment). The product of applying this method is an Aquatic Conservation Assessment (ACA) for the study area.

An ACA using AquaBAMM is non-social, non-economic and identifies the conservation/ecological values of wetlands at a user-defined scale. It provides a robust and objective conservation assessment using criteria, indicators and measures that are founded upon a large body of national and international literature. The criteria, each of which may have variable numbers of indicators and measures, are naturalness (aquatic), naturalness (catchment), diversity and richness, threatened species and ecosystems, priority species and ecosystems, special features, connectivity and representativeness. An ACA using AquaBAMM is a powerful decision support tool that is easily updated and simply interrogated through a geographic information system (GIS).

Where they have been conducted, ACAs can provide a source of baseline wetland conservation/ecological information to support natural resource management and planning processes. They are useful as an independent product or as an important foundation upon which a variety of additional environmental and socio-economic elements can be added and considered (i.e. an early input to broader 'triple-bottom-line' decision-making processes). An ACA can have application in:

- determining priorities for protection, regulation or rehabilitation of wetlands and other aquatic ecosystems
- on-ground investment in wetlands and other aquatic ecosystems
- contributing to impact assessment of large-scale development (e.g. dams)
- water resource and strategic regional planning prcesses

For a detailed explanation of the methodology please refer to the summary and expert panel reports relevant to the ACA utilised in this assessment. These reports can be accessed at Wetland *Info*:

http://wetlandinfo.des.qld.gov.au/wetlands/assessment/assessment-methods/aca

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

http://qspatial.information.qld.gov.au/geoportal/

Explanation of Criteria

Under the AquaBAMM, eight criteria are assessed to derive an overall conservation value. Similar to the Biodiversity Assessment and Mapping Methodology, the criteria may be primarily diagnostic (quantitative) or primarily expert opinion (qualitative) in nature. The following sections provide a brief description of each of the 8 criteria.

Criteria 1. Naturalness - Aquatic: This attribute reflects the extent to which a wetland's (riverine, non-riverine, estuarine) aquatic state of naturalness is affected through relevant influencing indicators which include: presence of exotic flora and fauna; presence of aquatic communities; degree of habitat modification and degree of hydrological modification.

Criteria 2. Naturalness - Catchment: The naturalness of the terrestrial systems of a catchment can have an influence on many wetland characteristics including: natural ecological processes e.g. nutrient cycling, riparian vegetation, water chemistry, and flow. The indicators utilised to assess this criterion include: presence of exotic flora and/or fauna; riparian, catchment and flow modification.

Criteria 3. Naturalness - Diversity and Richness: This criterion is common to many ecological assessment methods and can include both physical and biological features. It includes such indicators as species richness, riparian ecosystem richness and geomorphological diversity.

Criteria 4. Threatened Species and Ecosystems: This criterion evaluates ecological rarity characteristics of a wetland. This includes both species rarity and rarity of communities / assemblages. The communities and assemblages are best represented by regional ecosystems. Species rarity is determined by NCA and EPBC status with Endangered, Vulnerable or Near-threatened species being included in the evaluation. Ecosystem rarity is determined by regional ecosystem biodiversity status i.e. Endangered, Of Concern, or Not of Concern.

Criteria 5. Priority Species and Ecosystems: Priority flora and fauna species lists are expert panel derived. These are aquatic, semi-aquatic and riparian species which exhibit at least 1 particular trait in order to be eligible for consideration. For

flora species the traits included:

- It forms significant macrophyte beds (in shallow or deep water).
- It is an important food source.
- It is important/critical habitat.
- It is implicated in spawning or reproduction for other fauna and/or flora species.
- It is at its distributional limit or is a disjunct population.
- It provides stream bank or bed stabilisation or has soil binding properties.
- It is a small population and subject to threatening processes.

Fauna species are included if they meet at least one of the following traits:

- It is endemic to the study area (>75 per cent of its distribution is in the study area/catchment).
- It has experienced, or is suspected of experiencing, a serious population decline.
- It has experienced a significant reduction in its distribution and has a naturally restricted distribution in the study area/catchment.
- It is currently a small population and threatened by loss of habitat.
- It is a significant disjunct population.
- It is a migratory species (other than birds).
- A significant proportion of the breeding population (>one per cent for waterbirds, >75 per cent other species) occurs in the waterbody (see Ramsar criterion 6 for waterbirds).
- Limit of species range.

See the individual expert panel reports for the priority species traits specific to an ACA.

Criteria 6. Special Features: Special features are areas identified by flora, fauna and ecology expert panels which exhibit characteristics beyond those identified in other criteria and which the expert panels consider to be of the highest ecological importance. Special feature traits can relate to, but are not solely restricted to geomorphic features, unique ecological processes, presence of unique or distinct habitat, presence of unique or special hydrological regimes e.g. spring-fed streams. Special features are rated on a 1 - 4 scale (4 being the highest).

Criteria 7. Connectivity: This criterion is based on the concept that appropriately connected aquatic ecosystems are healthy and resilient, with maximum potential biodiversity and delivery of ecosystem services.

Criteria 8. Representativeness: This criterion applies primarily to non-riverine assessments, evaluates the rarity and uniqueness of a wetland type in relation to specific geographic areas. Rarity is determined by the degree of wetland protection within "protected Areas" estate or within an area subject to the *Fisheries Act 1994*, *Coastal Protection and Management Act 1995*, or *Marine Parks Act 2004*. Wetland uniqueness evaluates the relative abundance and size of a wetland or wetland management group within geographic areas such as catchment and subcatchment.

Riverine Wetlands

Riverine wetlands are all wetlands and deepwater habitats within a channel. The channels are naturally or artificially created, periodically or continuously contain moving water, or connecting two bodies of standing water. AquaBAMM, when applied to riverine wetlands uses a discrete spatial unit termed subsections. A subsection can be considered as an area which encompasses discrete homogeneous stream sections in terms of their natural attributes (i.e. physical, chemical, biological and utilitarian values) and natural resources. Thus in an ACA, an aquatic conservation significance score is calculated for each subsection and applies to all streams within a subsection, rather than individual streams as such.

Please note, the area figures provided in Tables 16 and 17, are derived using the extent of riverine subsections within the AOI. Refer to **Map 5** for further information. A summary of the conservation significance of riverine wetlands within the AOI is provided in the following table.

Table 16: Overall level/s of riverine aquatic conservation significance

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
Very High	12,899.46	24.91

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
High	7,082.17	13.67
Medium	31,812.09	61.42
Low	0.0	0.0
Very Low	0.0	0.0

The individual aquatic conservation criteria ratings for riverine wetlands within the AOI are listed below.

Table 17: Level/s of riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic	51,786.75	100.0					7.0	
2. Naturalness catchment	51,786.75	100.0	7.0					
3. Diversity and richness			81.84	0.2	12,868.18	24.8	38,843.73	75.0
4. Threatened species and ecosystems	12,573.67	24.3	26,266.16	50.7				
5. Priority species and ecosystems			3,139.61	6.1				
6. Special features	12,899.46	24.9						
7. Connectivity			48,629.08	93.9	59.02	0.1	3,105.65	6.0
8. Representative-ness								

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to riverine wetlands within the AOI.

Table 18: Expert panel decisions for assigning overall levels of riverine aquatic conservation significance

Decision number	Special feature	Catchment	Criteria/Indicator/Measure	Conservation rating (1-4)
bp_r_ec_02	Upper Burdekin/ Wet Tropics	Burdekin Upper	6.2.1 6.3.3	4

4 is the highest rating/value

Expert panel decision descriptions:

bp_r_ec_02

This area contains distinct special ecological processes providing extremely valuable fauna habitat areas. This area is biogeographically interesting in terms of rainforest streams with 'inland' drainage. There has also been a major reduction in populations of key top order predator Anguillid eels since the construction of the Burdekin Falls Dam.

Non-riverine Wetlands

Non-riverine wetlands include both lacustrine and palustrine wetlands, however, do not currently incorporate estuarine, marine or subterranean wetland types. A summary of the conservation significance of non-riverine wetlands within the AOI is provided in the following table. Refer to **Map 6** for further information.

Table 19: Overall level/s of non-riverine aquatic conservation significance

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
Very High	0.0	0.0
High	0.0	0.0
Medium	39.38	0.08
Low	0.0	0.0
Very Low	2.86	0.01

The following table provides an assessment of non-riverine wetlands within the AOI and associated aquatic conservation criteria values.

Table 20: Level/s of non-riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic					42.24	0.1		
2. Naturalness catchment	39.38	0.1	2.86					
3. Diversity and richness							36.05	0.1
4. Threatened species and ecosystems	36.05	0.1						
5. Priority species and ecosystems								
6. Special features								
7. Connectivity								
8. Representative-ness								

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to non-riverine wetlands within the AOI.

Table 21: Expert panel decisions for assigning overall levels of non-riverine aquatic conservation significance.

Decision number	Special feature	Catchment	Criteria/Indicator/Measure	Conservation rating (1-4)
(No Records)				

4 is the highest rating/value

Expert panel decision descriptions:

(No Records)

Threatened and Priority Species

Introduction

This chapter contains a list of threatened and priority flora and/or fauna species that have been recorded on, or within 4km of the Assessment Area.

The information presented in this chapter with respect to species presence is derived from compiled databases developed primarily for the purpose of BPAs and ACAs. Data is collated from a number of sources and is updated periodically.

It is important to note that the list of species provided in this report, may differ when compared to other reports generated from other sources such as the State government's WildNet, Herbrecs or the federal government's EPBC database for a number of reasons.

Records for threatened and priority species are filtered and checked based on a number of rules including:

- Taxonomic nomenclature - current scientific names and status,
- Location - cross-check co-ordinates with location description,
- Taxon by location - requires good knowledge of the taxon and history of the record,
- Duplicate records - identify and remove,
- Expert panels - check records and provide new records,
- Flora cultivated records excluded,
- Use precise records less than or equal to 2000m,
- Use recent records greater than or equal to 1975 animals, greater than or equal to 1950 plants.

Threatened Species

Threatened species are those species classified as "Endangered" or "Vulnerable" under the *Environment Protection and Biodiversity Conservation Act 1999* or "Endangered", "Vulnerable" or "Near threatened" under the *Nature Conservation Act 1992*.

The following threatened species have been recorded on, or within approximately 4km of the AOI.

Table 22: Threatened species recorded on, or within 4km of the AOI

Species	Common name	NCA status	EPBC status	Back on Track rank	Migratory species*	Wetland species**	Identified flora/fauna
Acacia tingoorensis		V		High			FL
Corybas cerasinus		NT		Low			FL
Dichanthium setosum		C	V				FL
Petauroides volans	greater glider	V	V	Low			FA
Petauroides volans minor	northern greater glider	V	V				FA
Petrogale sharmani	Sharman's rock-wallaby	V	V	Low			FA
Phascolarctos cinereus	koala	V	V	Low			FA
Poephila cincta cincta	black-throated finch (white-rumped subspecies)	E	E	High			FA

NB. Please note that the threatened species listed in this section are based upon the most recently compiled DES internal state-wide threatened species dataset. This dataset may contain additional records that were not originally available for inclusion in the relevant individual BPAs and ACAs.

**JAMBA - Japan-Australia Migratory Bird Agreement; CAMBA - China-Australia Migratory Bird Agreement; ROKAMBA - Republic of Korea-Australia Migratory Bird Agreement; CMS - Convention on the Conservation of Migratory Species.*

***Y - wetland indicator species.*

BPA Priority Species

A list of BPA priority species that have been recorded on, or within approximately 4km of the AOI is contained in the following table.

Table 23: Priority species recorded on, or within 4km of the AOI

Species	Common name	Back on Track rank	Identified flora/fauna
Acanthiza katherina	Mountain Thornbill	Low	FA
Acianthus exsertus			FL
Acianthus fornicatus	pixie caps		FL
Aepyprymnus rufescens	Rufous Bettong	Low	FA
Ailuroedus maculosus	Spotted Catbird	Low	FA
Climacteris picumnus	Brown Treecreeper	Low	FA
Corybas aconitiflorus			FL
Glaphyromorphus cracens		Low	FA
Heteromyias cinereifrons	Grey-headed Robin	Low	FA
Lomandra filiformis			FL
Lomandra filiformis subsp. filiformis			FL
Lomandra multiflora subsp. multiflora			FL
Melaleuca viridiflora var. viridiflora			FL
Orthonyx spaldingii	Chowchilla	Low	FA
Phascolarctos cinereus	Koala	Low	FA
Phyllanthus fuernrohrii			FL
Phyllanthus virgatus			FL
Pterostylis taurus	charging bull orchid		FL
Ptiloris victoriae	Victoria's Riflebird	Low	FA
Scenopoeetes dentirostris	Tooth-billed Bowerbird	Low	FA
Stylidium eriorhizum			FL
Tephrosia filipes			FL
Tephrosia filipes subsp. filipes			FL
Tephrosia juncea			FL
Tephrosia leptoclada			FL
Typhonium brownii	black arum lily	Low	FL

NB. Please note that the list of priority species is based on those species identified in the BPAs, however records for these species may be more recent than the originals used. furthermore, the BPA priority species databases are updated from time to time. At each update, the taxonomic details for all species are amended as necessary to reflect current taxonomic name and/or status changes.

ACA Priority Species

A list of ACA priority species used in riverine and non-riverine ACAs that have been recorded on, or within approximately 4km of the AOI are contained in the following tables.

Table 24: Priority species recorded on, or within 4 km of the AOI - riverine

Species	Common name	Back on Track rank	Identified flora/fauna
Ceyx azureus	Azure Kingfisher	L	FA
Leersia hexandra	swamp rice grass		FL

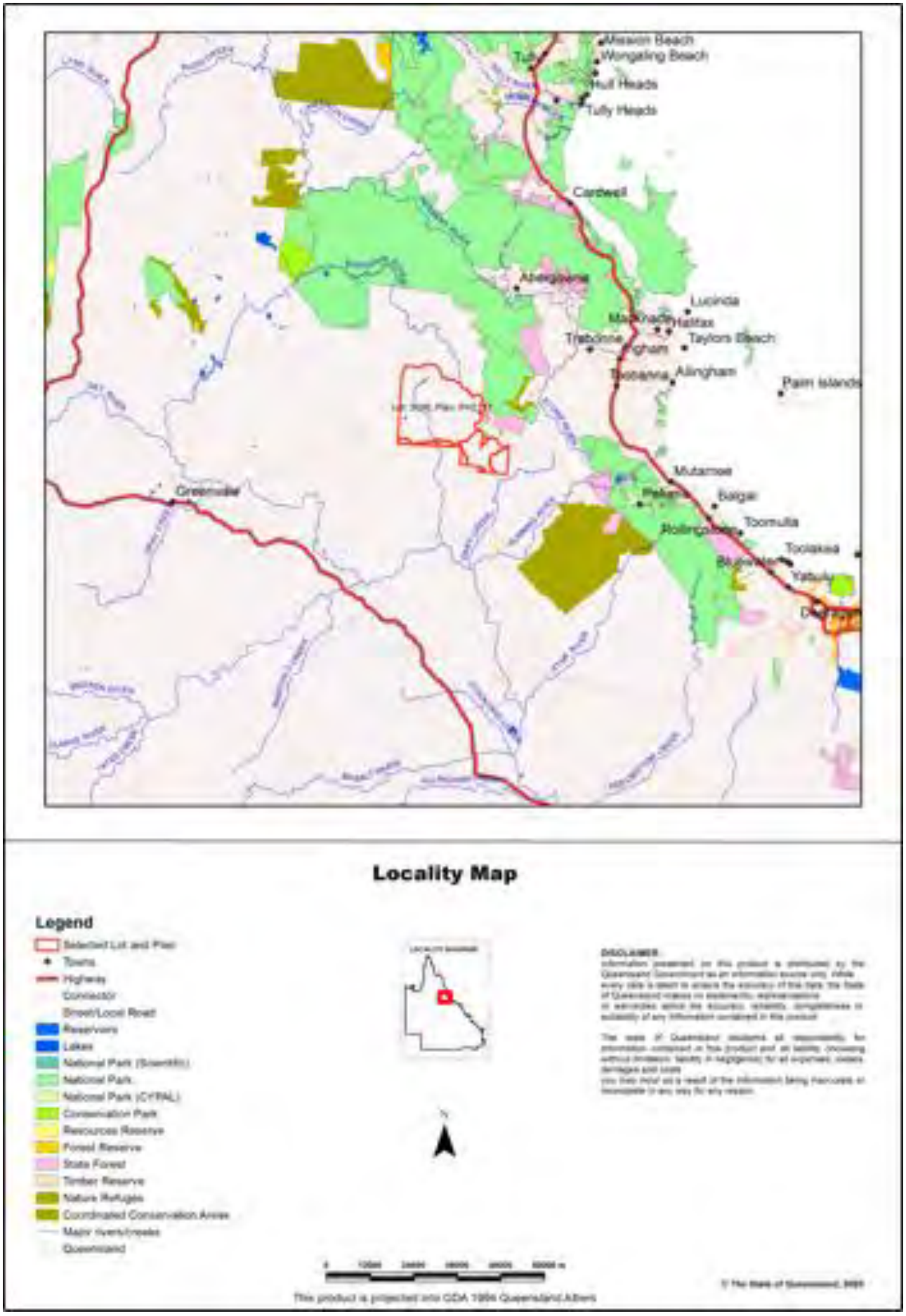
Table 25: Priority species recorded on, or within 4 km of the AOI - non-riverine

Species	Common name	Back on Track rank	Identified flora/fauna
Ceyx azureus	Azure Kingfisher	L	FA
Leersia hexandra	swamp rice grass		FL

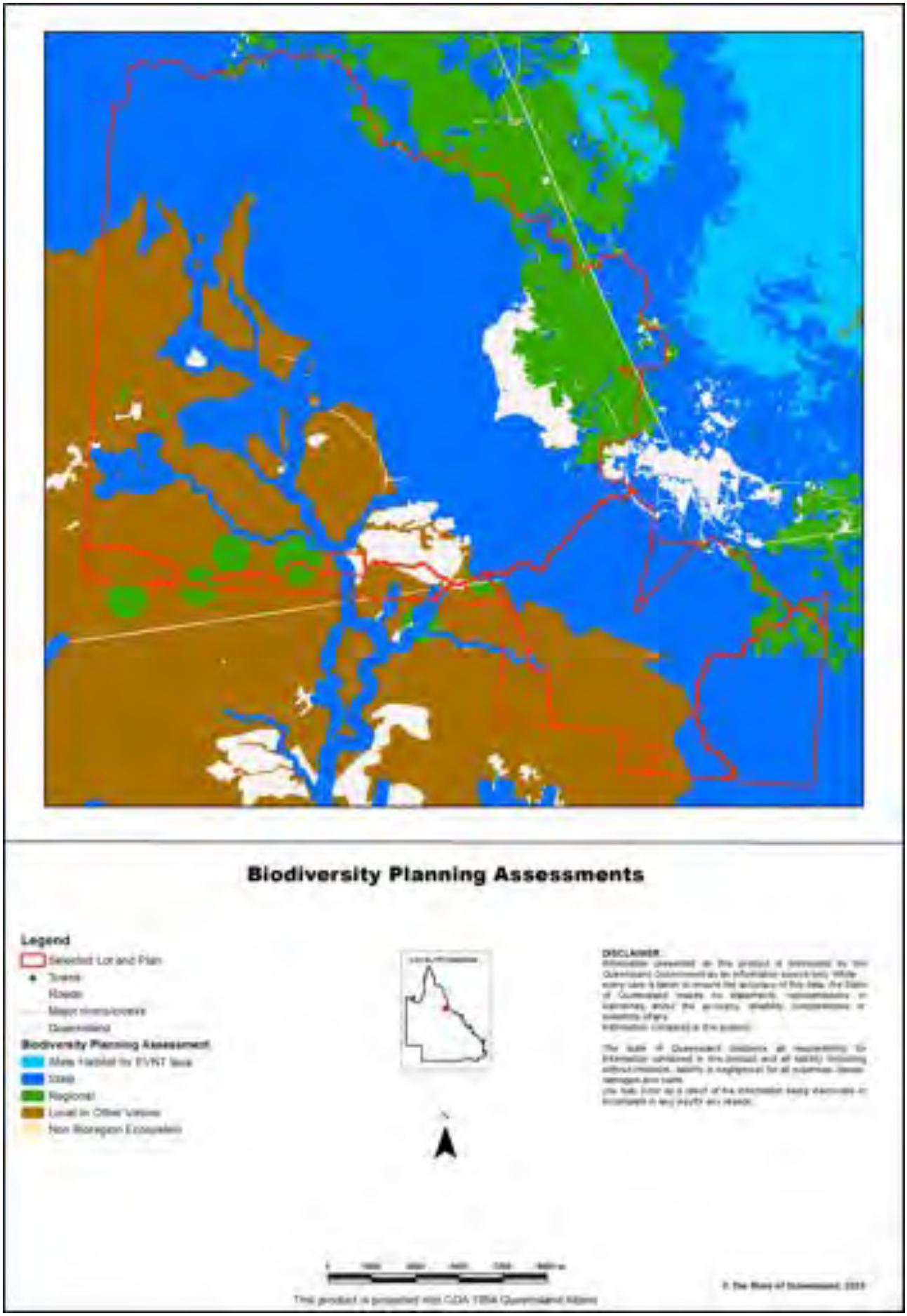
NB. Please note that the priority species records used in the above two tables are comprised of those adopted for the released individual ACAs. The ACA riverine and non-riverine priority species databases are updated from time to time to reflect new release of ACAs. At each update, the taxonomic details for all ACAs records are amended as necessary to reflect current taxonomic name and/or status changes.

Maps

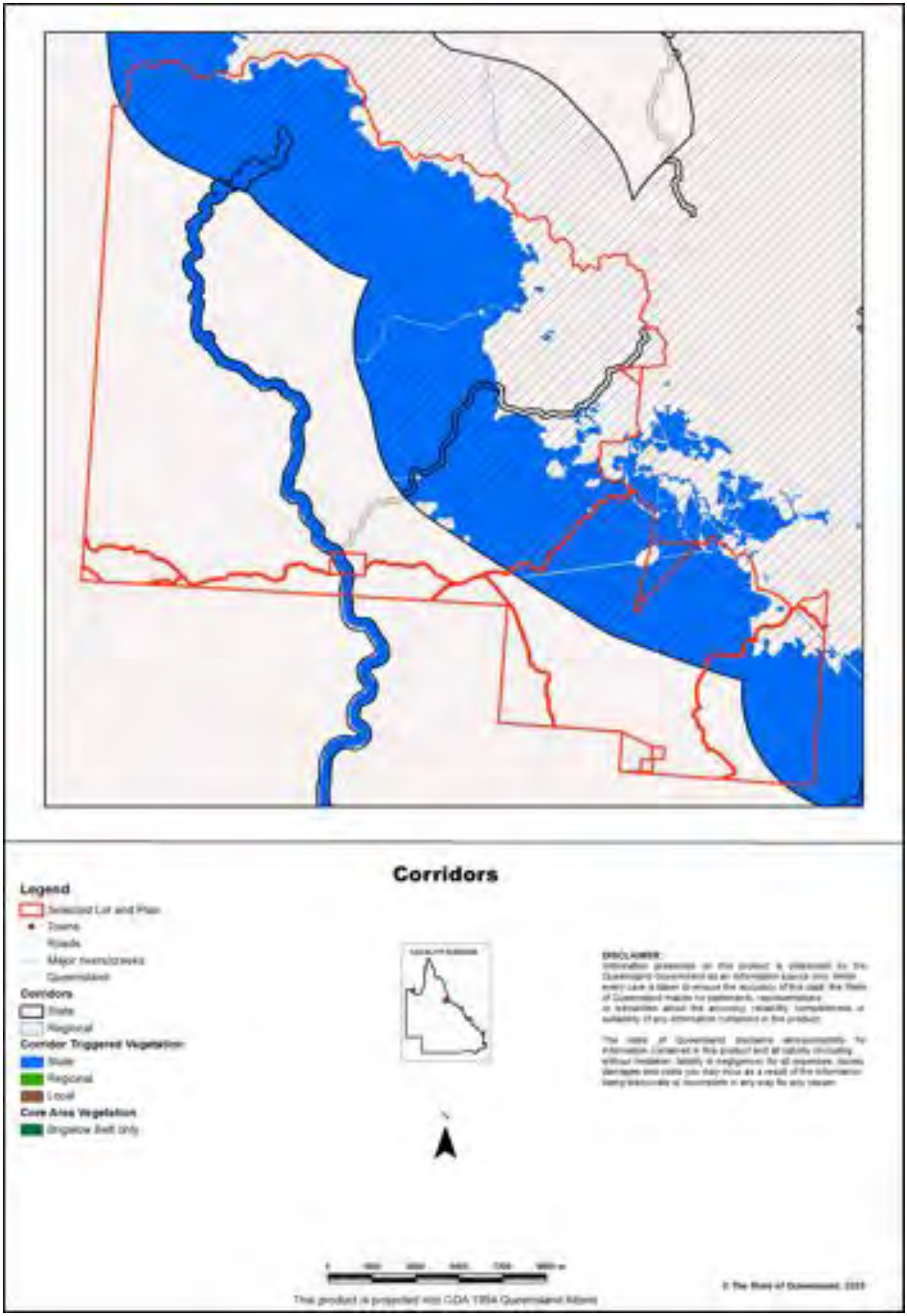
Map 1 - Locality Map



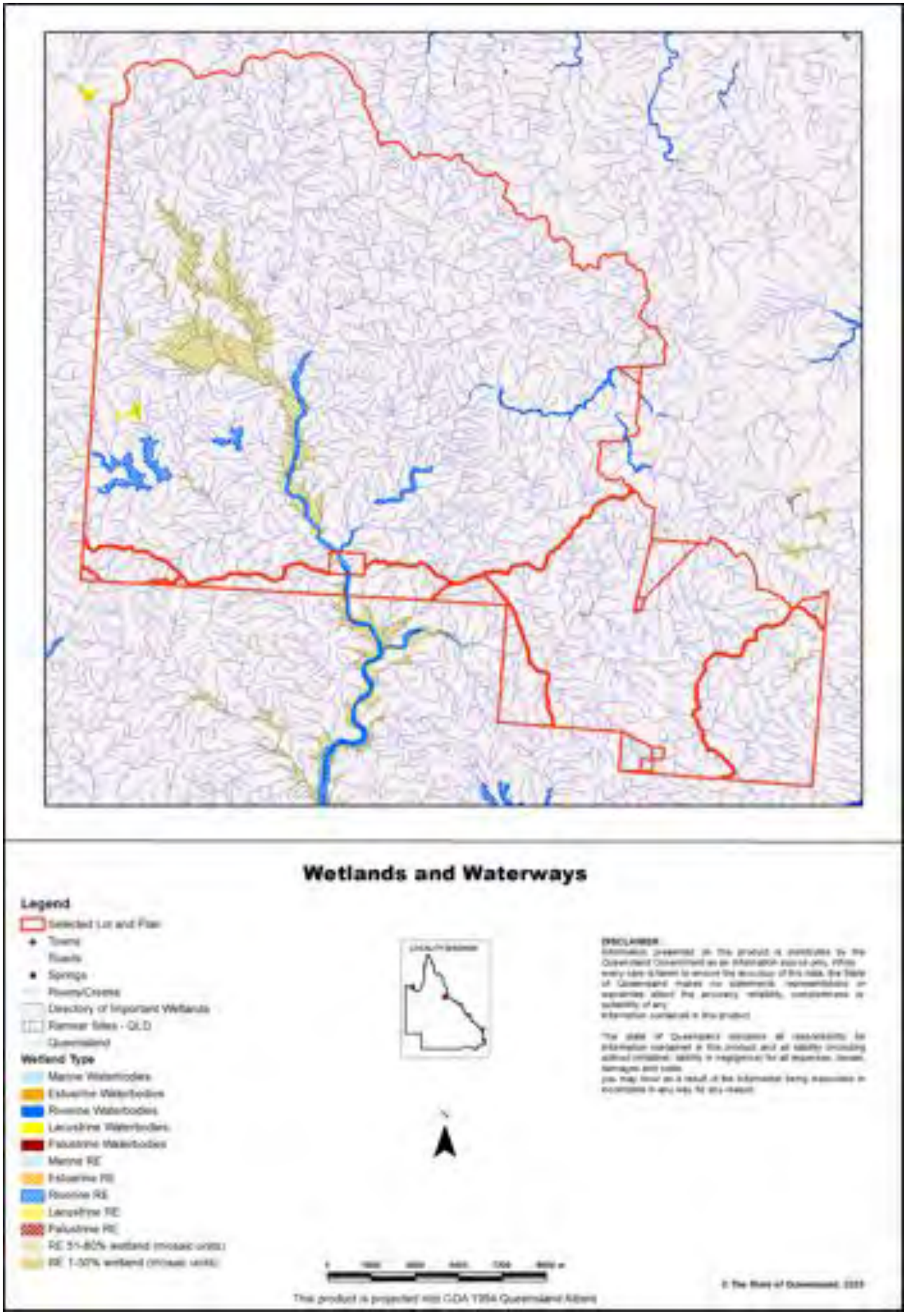
Map 2 - Biodiversity Planning Assessment (BPA)



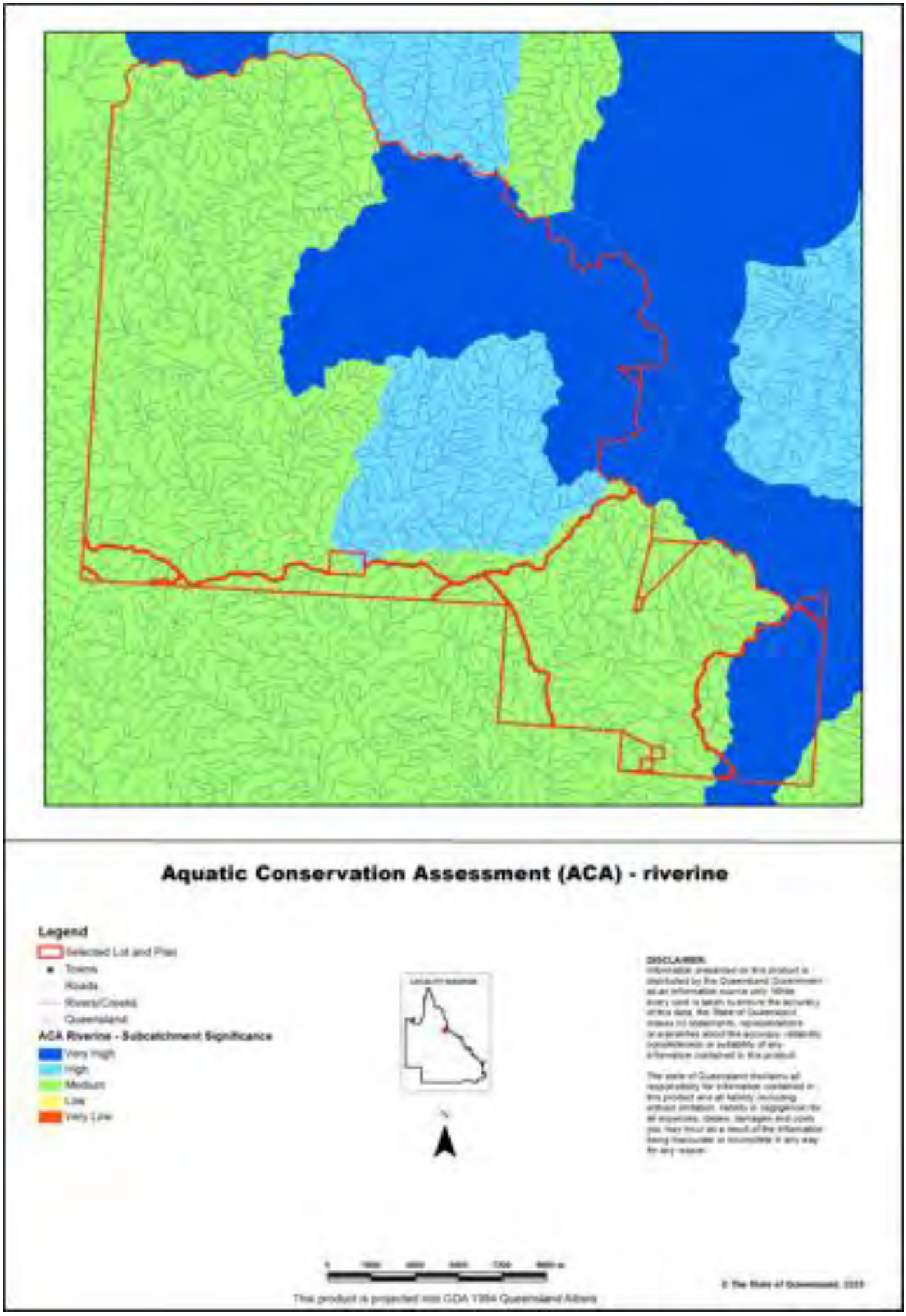
Map 3 - Corridors



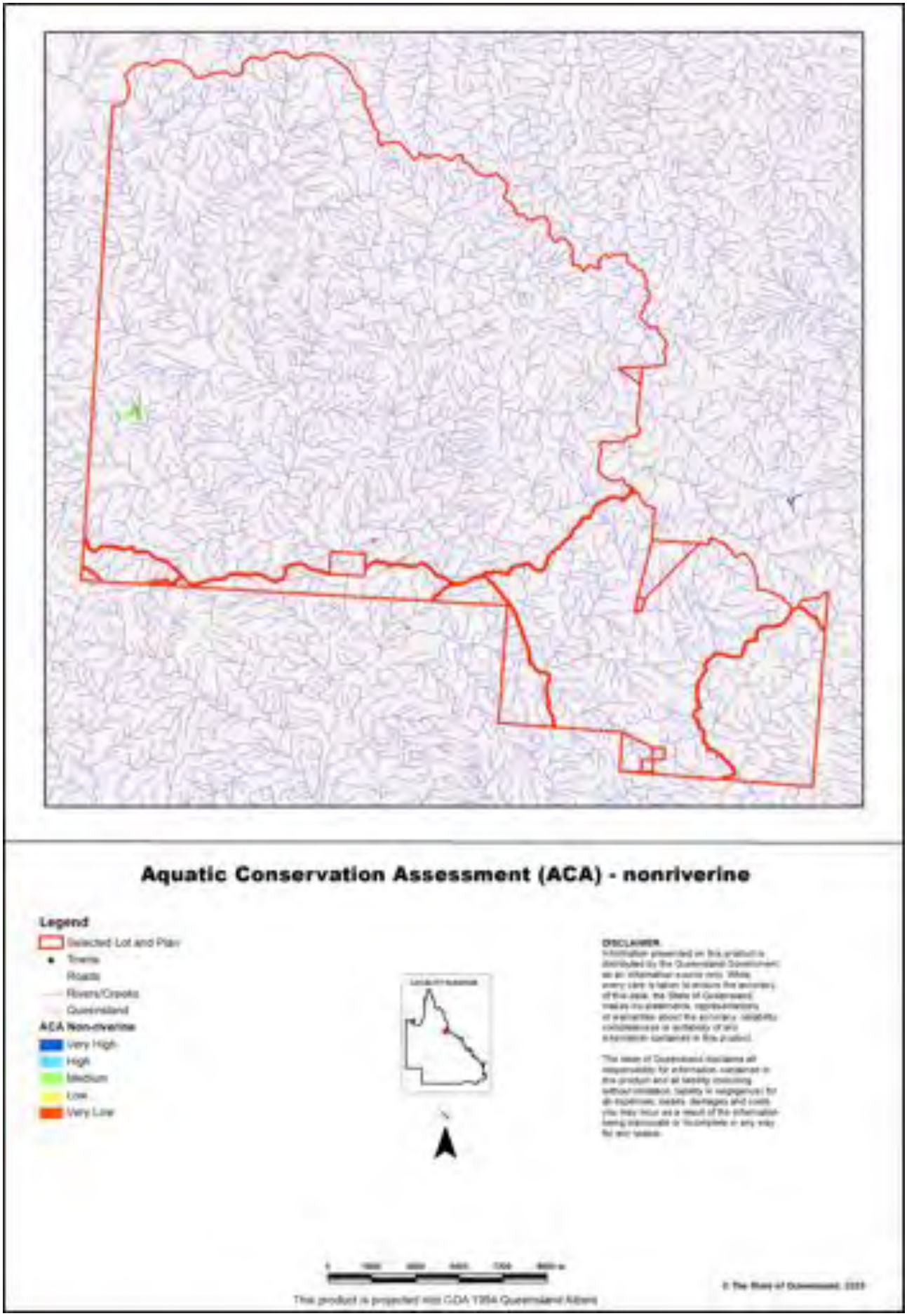
Map 4 - Wetlands and waterways



Map 5 - Aquatic Conservation Assessment (ACA) - riverine



Map 6 - Aquatic Conservation Assessment (ACA) - non-riverine



References

Clayton, P.D., Fielder, D.F., Howell, S. and Hill, C.J. (2006) *Aquatic biodiversity assessment and mapping method (AquaBAMM): a conservation values assessment tool for wetlands with trial application in the Burnett River catchment.* Published by the Environmental Protection Agency, Brisbane. ISBN 1-90928-07-3. Available at

http://wetlandinfo.des.qld.gov.au/wetlands/assessment/assessment-methods/aca/

Environmental Protection Agency (2002) *Biodiversity Assessment and Mapping Methodology. Version 2.1, July 2002.* (Environmental Protection Agency, Brisbane).

Morton, S. R., Short, J. and Barker, R. D. with an Appendix by G.F. Griffin and G. Pearce (1995). *Refugia for Biological Diversity in Arid and Semi-arid Australia. Biodiversity Series* , Paper No. 4, Biodiversity Unit, Environment Australia.

Sattler, P.S. and Williams, R.D. (eds) (1999). *The Conservation Status of Queensland's Bioregional Ecosystems*. Environmental Protection Agency, Brisbane.

Appendices

Appendix 1 - Source Data

Theme	Datasets
Aquatic Conservation Assessments Non-riverine*	Combination of the following datasets: Cape York Peninsula Non-riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Non-riverine v1.3 Lake Eyre and Bulloo Basins v1.1 QMDB Non-riverine ACA v1.4 Southeast Queensland ACA v1.1 WBB Non-riverine ACA v1.1
Aquatic Conservation Assessments Riverine*	Combination of the following datasets: Cape York Peninsula Riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Riverine v1.1 Lake Eyre and Bulloo Basins v1.1 QMDB Riverine ACA v1.4 Southeast Queensland ACA v1.1 WBB Riverine ACA v1.1
Biodiversity Planning Assessments*	Combination of the following datasets: Brigalow Belt BPA v2.1 Cape York Peninsula BPA v1.1 Central Queensland Coast BPA v1.3 Channel Country BPA v1.1 Desert Uplands BPA v1.3 Einasleigh Uplands BPA v1.1 Gulf Plains BPA v1.1 Mitchell Grass Downs BPA v1.1 Mulga Lands BPA v1.4 New England Tableland v2.3 Southeast Queensland v4.1 Wet Tropics v1.1
Statewide BPA Corridors*	Statewide corridors v1.5
Threatened Species	An internal DES database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
BPA Priority Species	An internal DES database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
ACA Priority Species	An internal DES database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.

***These datasets are available at:**

http://dds.information.qld.gov.au/DDS

Appendix 2 - Acronyms and Abbreviations

AOI	- Area of Interest
ACA	- Aquatic Conservation Assessment
AQUABAMM	- Aquatic Biodiversity Assessment and Mapping Methodology
BAMM	- Biodiversity Assessment and Mapping Methodology
BoT	- Back on Track
BPA	- Biodiversity Planning Assessment
CAMBA	- China-Australia Migratory Bird Agreement
DES	- Department of Environment and Science
EPBC	- *Environment Protection and Biodiversity Conservation Act 1999*
EVNT	- Endangered, Vulnerable, Near Threatened
GDA94	- Geocentric Datum of Australia 1994
GIS	- Geographic Information System
JAMBA	- Japan-Australia Migratory Bird Agreement
NCA	- *Nature Conservation Act 1992*
RE	- Regional Ecosystem
REDD	- Regional Ecosystem Description Database
ROKAMBA	- Republic of Korea-Australia Migratory Bird Agreement

Queensland Government

Department of Environment and Science

Environmental Reports

Biodiversity and Conservation Values

Biodiversity Planning Assessments and Aquatic Conservation Assessments

For the selected area of interest
Lot: 2 Plan: SP205224

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or Area of Interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "Central co-ordinates" option, the resulting assessment area encompasses an area extending from 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: biodiversity.planning@des.qld.gov.au

Disclaimer

Table of Contents

Summary Information

Tables 1 to 8 provide an overview of the AOI with respect to selected topographic and environmental values.

Table 1: Area of interest details: Lot: 2 Plan: SP205224

Size (ha)	25,607.13
Local Government(s)	Charters Towers Regional
Bioregion(s)	Einasleigh Uplands, Wet Tropics
Subregion(s)	Paluma - Seaview, Herberton - Wairuna, Broken River
Catchment(s)	Herbert, Burdekin

The following table identifies available Biodiversity Planning Assessments (BPAs) and Aquatic Conservation Assessments (ACAs) with respect to the AOI.

Table 2: Available Biodiversity Planning and Aquatic Conservation Assessments

Assessment Type	Assessment Area and Version
Biodiversity Planning Assessment(s)	Einasleigh Uplands v1.1, Wet Tropics v1.1
Aquatic Conservation Assessment(s) (riverine)	Great Barrier Reef Catchments v1.3
Aquatic Conservation Assessment(s) (non-riverine)	Great Barrier Reef Catchments v1.3

Table 3: Remnant regional ecosystems within the AOI as per the Qld Herbarium's 'biodiversity status'

Biodiversity Status	Area (Ha)	% of AOI
Endangered	863.99	3.37
Of concern	7,296.67	28.49
No concern at present	16,706.98	65.24

The following table identifies the extent and proportion of the user specified area of interest (AOI) which is mapped as being of "State", "Regional" or "Local" significance via application of the Queensland Department of Environment and Science's *Biodiversity Assessment and Mapping Methodology* (BAMM).

Table 4: Summary table, biodiversity significance

Biodiversity significance	Area (Ha)	% of AOI
State Habitat for EVNT taxa	2,500.93	9.77
State	10,455.14	40.83
Regional	12,414.73	48.48
Local or Other Values	0.0	0.0

Table 5: Non-riverine wetlands intersecting the AOI

Non-riverine wetland types intersecting the area of interest	#
Number of Palustrine wetlands	1
Number of Lacustrine wetlands	1
Total number of non-riverine wetlands	2

NB. The figures presented in the table above are derived from the relevant non-riverine Aquatic Conservation Assessment(s). Later releases of wetland mapping produced via the Queensland Wetland Mapping Program may provide more recent information in regards to wetland extent.

Table 6: Named waterways intersecting the AOI

Name	Permanency
GOOD CAMP CREEK	Non-perennial
STONY CREEK	Non-perennial

Refer to **Map 1** for general locality information.

The following two tables identify the extent and proportion of the user specified AOI which is mapped as being of "Very High", "High", "Medium", "Low", or "Very Low" aquatic conservation value for riverine and non-riverine wetlands via application of the Queensland Department of Environment and Science's *Aquatic Biodiversity Assessment and Mapping Method* (AquaBAMM).

Table 7: Summary table, aquatic conservation significance (riverine)

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
Very High	9,477.91	37.01
High	8,322.84	32.5
Medium	7,806.64	30.49
Low	0.0	0.0
Very Low	0.0	0.0

Table 8: Summary table, aquatic conservation significance (non-riverine)

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
Very High	1.36	0.01
High	0.0	0.0
Medium	0.0	0.0
Low	0.0	0.0
Very Low	1.11	0.0

Biodiversity Planning Assessments

Introduction

The Department of Environment and Science (DES) attributes biodiversity significance on a bioregional scale through a Biodiversity Planning Assessment (BPA). A BPA involves the integration of ecological criteria using the *Biodiversity assessment and Mapping Methodology* (BAMM) and is developed in two stages: 1) **diagnostic criteria**, and 2) **expert panel criteria**. The diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion, while the expert panel criteria allows for the refinement of the mapped information from the diagnostic output by incorporating local knowledge and expert opinion.

The BAMM methodology has application for identifying areas with various levels of significance solely for biodiversity reasons. These include threatened ecosystems or taxa, large tracts of habitat in good condition, ecosystem diversity, landscape context and connection, and buffers to wetlands or other types of habitat important for the maintenance of biodiversity or ecological processes. While natural resource values such as dryland salinity, soil erosion potential or land capability are not dealt with explicitly, they are included to some extent within the biodiversity status of regional ecosystems recognised by the DES.

Biodiversity Planning Assessments (BPAs) assign three levels of overall biodiversity significance.

- **State significance** - areas assessed as being significant for biodiversity at the bioregional or state scales. They also include areas assessed by other studies/processes as being significant at national or international scales. In addition, areas flagged as being of State significance due to the presence of endangered, vulnerable and/or near threatened taxa, are identified as "State Habitat for EVNT taxa".
- **Regional significance** - areas assessed as being significant for biodiversity at the subregional scale. These areas have lower significance for biodiversity than areas assessed as being of State significance.
- **Local significance and/or other values** - areas assessed as not being significant for biodiversity at state or regional scales. Local values are of significance at the local government scale.

For further information on released BPAs and a copy of the underlying methodology, go to:

http://www.qld.gov.au/environment/plants-animals/biodiversity/planning/

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

http://qspatial.information.qld.gov.au/geoportal/

The following table identifies the extent and proportion of the user specified AOI which is mapped as being of "State", "Regional" or "Local" significance via application of the BAMM.

Table 9: Summary table, biodiversity significance

Biodiversity significance	Area (Ha)	% of AOI
State Habitat for EVNT taxa	2,500.93	9.77
State	10,455.14	40.83
Regional	12,414.73	48.48
Local or Other Values	0.0	0.0

Refer to **Map 2** for further information.

Diagnostic Criteria

Diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion. These criteria are diagnostic in that they are used to filter the available data and provide a "first-cut" or initial determination of biodiversity significance. This initial assessment is then combined through a second group of other essential criteria.

A description of the individual diagnostic criteria is provided in the following sections.

Criteria A. Habitat for EVNT taxa: Classifies areas according to their significance based on the presence of endangered, vulnerable and/or rare (EVNT) taxa. EVNT taxa are those scheduled under the *Nature Conservation Act 1992* and/or the

Environment Protection and Biodiversity Conservation Act 1999. It excludes highly mobile fauna taxa which are instead considered in Criterion H and brings together information on EVNT taxa using buffering of recorded sites or habitat suitability models (HSM) where available.

Criteria B. Ecosystem value: Classifies on the basis of biodiversity status of regional ecosystems, their extent in protected areas (presence of poorly conserved regional ecosystems), the presence of significant wetlands; and areas of national importance such as the presence of Threatened Ecological Communities, World Heritage areas and Ramsar sites. Ecosystem value is applied at a bioregional (**B1**) and regional (**B2**) scale.

Criteria C. Tract size: Measures the relative size of tracts of vegetation in the landscape. The size of any tract is a major indicator of ecological significance, and is also strongly correlated with the long-term viability of biodiversity values. Larger tracts are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller tracts.

Criteria D. Relative size of regional ecosystems: Classifies the relative size of each regional ecosystem unit within its bioregion (**D1**) and its subregion (**D2**). Remnant units are compared with all other occurrences with the same regional ecosystem. Large examples of a regional ecosystem are more significant than smaller examples of the same regional ecosystem because they are more representative of the biodiversity values particular to the regional ecosystem, are more resilient to the effects of disturbance, and constitute a significant proportion of the total area of the regional ecosystem.

Criteria F. Ecosystem diversity: Is an indicator of the number of regional ecosystems occurring within an area. An area with high ecosystem diversity will have many regional ecosystems and ecotones relative to other areas within the bioregion.

Criteria G. Context and connection: Represents the extent to which a remnant unit incorporates, borders or buffers areas such as significant wetlands, endangered ecosystems; and the degree to which it is connected to other vegetation.

A summary of the biodiversity status based upon the diagnostic criteria is provided in the following table.

Table 10: Summary of biodiversity significance based upon diagnostic criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
State	Remnant contains an RE that is one of the largest of its type in the bioregion (D1) & Remnant has high connectivity or buffers an endangered RE or Sig. Wetland (G)	4,221.38	16.49
State	Remnant contains at least 1 Endangered or 2 Vulnerable or Near Threatened species (A)	2,500.93	9.77
State	Remnant contains at least 1 Endangered RE (B1)	835.55	3.26
State	Remnant contains at least 1 Endangered RE (B1) & World Heritage Area (B1)	1.0	0.0
State	Remnant contains at least one Of Concern RE (B1) & Is part of moderately large Tract (C) & Contains a RE that is a moderately large RE of its type in the bioregion (D1) & Has high connectivity or buffers an endangered RE or Significant Wetland (G)	684.47	2.67
State	Remnant contains at least one Of Concern RE (B1) & Remnant contains an RE that is one of the largest of its type in the bioregion (D1)	3,018.35	11.79
State	Remnant contains at least one Of Concern RE (B1) & Remnant is part of moderately large Tract (C) & Remnant contains a RE that is a moderately large RE of its type in the bioregion (D1) & Remnant has Ecosystem diversity in the top quartile (F)	130.64	0.51
State	World Heritage Area (B1)	31.92	0.12
Regional	Remnant contains an RE that is one of the largest of its type in the subregion (D2)	1,561.76	6.1
Regional	Remnant contains at least 1 RE with <10 pc extent remaining or rare in subregion (B2)	4.9	0.02
Regional	Remnant contains at least 1 RE with 10-30 percent extent remaining in the subregion (B2) & Remnant is part of moderately large Tract (C)	1.99	0.01
Regional	Remnant contains at least 1 RE with 10-30 percent extent remaining in the subregion (B2) & Remnant is part of moderately large Tract (C) & Remnant has high connectivity or buffers an endangered RE or Significant Wetland (G)	1,860.68	7.27
Regional	Remnant contains at least one Of Concern RE (B1)	2,834.36	11.07
Local or Other Values	Refer to diagnostic data for additional information	7,118.09	27.8

Assessment of diagnostic criteria with respect to the AOI

The following table reflects an assessment of the individual diagnostic criteria noted above in regards to the AOI.

Table 11: Assessment of individual diagnostic criteria with respect to the AOI

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
A: Habitat for EVNT Taxa	2,500.95	9.8			6,594.18	25.8	15,710.94	61.4
B1: Ecosystem Value (Bioregion)	907.85	3.5	6,883.59	26.9	3,783.75	14.8	13,230.88	51.7

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
B2: Ecosystem Value (Subregion)	144.58	0.6	3,683.76	14.4	6,675.40	26.1	14,302.33	55.9
C: Tract Size			24,806.07	96.9				
D1: Relative RE Size (Bioregion)	9,629.42	37.6	890.24	3.5	3,488.92	13.6	10,797.49	42.2
D2: Relative RE Size (Subregion)	11,226.45	43.8	2,752.06	10.7	1,780.26	7.0	9,047.30	35.3
F: Ecosystem Diversity	3,922.11	15.3	19,800.65	77.3	1,047.80	4.1	35.51	0.1
G: Context and Connection	24,504.96	95.7	295.94	1.2	5.17			

Other Essential Criteria

Other essential criteria (also known as expert panel criteria) are based on non-uniform information sources and which may rely more upon expert opinion than on quantitative data. These criteria are used to provide a "second-cut" determination of biodiversity significance, which is then combined with the diagnostic criteria for an overall assessment of relative biodiversity significance. A summary of the biodiversity status based upon the other essential criteria is provided in the following table.

Table 12: Summary of biodiversity significance based upon other essential criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
State	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I)	1,594.77	6.23
State	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I) & Remnant forms part of a bioregional corridor (J)	4,650.12	18.16
Regional	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I)	19,125.91	74.69

A description of each of the other essential criteria and associated assessment in regards to the AOI is provided in the following sections.

Criteria H. Essential and general habitat for priority taxa: Priority taxa are those which are at risk or of management concern, taxa of scientific interest as relictual (ancient or primitive), endemic taxa or locally significant populations (such as a flying fox camp or heronry), highly specialised taxa whose habitat requirements are complex and distributions are not well correlated with any particular regional ecosystem, taxa important for maintaining genetic diversity (such as complex spatial patterns of genetic variation, geographic range limits, highly disjunct populations), taxa critical for management or monitoring of biodiversity (functionally important or ecological indicators), or economic and culturally important taxa.

Criteria I. Special biodiversity values: areas with special biodiversity values are important because they contain multiple taxa in a unique ecological and often highly biodiverse environment. Areas with special biodiversity values can include the following:

- Ia - centres of endemism - areas where concentrations of taxa are endemic to a bioregion or subregion are found.
- Ib - wildlife refugia (Morton *et al*. 1995), for example, islands, mound springs, caves, wetlands, gorges, mountain ranges and topographic isolates, ecological refuges, refuges from exotic animals, and refuges from clearing. The latter may include large areas that are not suitable for clearing because of land suitability/capability.

- Ic - areas with concentrations of disjunct populations.
- Id - areas with concentrations of taxa at the limits of their geographic ranges.
- Ie - areas with high species richness.
- If - areas with concentrations of relictual populations (ancient and primitive taxa).
- Ig - areas containing REs with distinct variation in species composition associated with geomorphology and other environmental variables.
- Ih - an artificial waterbody or managed/manipulated wetland considered by the panel/s to be of ecological significance.
- Ii - areas with a high density of hollow-bearing trees that provide habitat for animals.
- Ij - breeding or roosting sites used by a significant number of individuals.
- Ik - climate change refuge.

The following table identifies the value and extent area of the Other Essential Criteria H and I within the AOI.

Table 13: Relative importance of expert panel criteria (H and I) used to access overall biodiversity significance with respect to the AOI

Expert Panel	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
H: Core Habitat Priority Taxa	303.93	1.2	609.18	2.4	23.62	0.1		
Ia: Centres of Endemism	3.66		6,241.28	24.4				
Ib: Wildlife Refugia	6,241.28	24.4	19,129.59	74.7				
Ic: Disjunct Populations	6,241.28	24.4						
Id: Limits of Geographic Ranges	6,241.28	24.4						
Ie: High Species Richness	6,241.28	24.4						
If: Relictual Populations								
Ig: Variation in Species Composition	201.9	0.8	56.96	0.2				
Ih: Artificial Wetland								
Ii: Hollow Bearing Trees	6,241.28	24.4						
Ij: Breeding or Roosting Site	6,241.28	24.4						
Ik: Climate Refugia								

NB. Whilst biodiversity values associated with Criteria I may be present within the site (refer to tables 12 and 15), for the New England Tableland and Central Queensland Coast BPAs, area and % area figures associated with Criteria Ia through to Ij cannot be listed in the table above (due to slight variations in data formats between BPAs).

Criteria J. Corridors: areas identified under this criterion qualify either because they are existing vegetated corridors important for contiguity, or cleared areas that could serve this purpose if revegetated. Some examples of corridors include

riparian habitats, transport corridors and "stepping stones".

Bioregional and subregional conservation corridors have been identified in the more developed bioregions of Queensland through the BPAs, using an intensive process involving expert panels. Map 3 displays the location of corridors as identified under the Statewide Corridor network. The Statewide Corridor network incorporates BPA derived corridors and for bioregions where no BPA has been assessed yet, corridors derived under other planning processes. *Note: as a result of updating and developing a statewide network, the alignment of corridors may differ slightly in some instances when compared to those used in individual BPAs.*

The functions of these corridors are:

- **Terrestrial** Bioregional corridors, in conjunction with large tracts of remnant vegetation, maintain ecological and evolutionary processes at a landscape scale, by:

  • Maintaining long term evolutionary/genetic processes that allow the natural change in distributions of species and connectivity between populations of species over long periods of time;

  • Maintaining landscape/ecosystems processes associated with geological, altitudinal and climatic gradients, to allow for ecological responses to climate change;

  • Maintaining large scale seasonal/migratory species processes and movement of fauna;

  • Maximising connectivity between large tracts/patches of remnant vegetation;

  • Identifying key areas for rehabilitation and offsets; and

- **Riparian** Bioregional Corridors also maintain and encourage connectivity of riparian and associated ecosystems.

The location of the corridors is determined by the following principles:

- Terrestrial

  • Complement riparian landscape corridors (i.e. minimise overlap and maximise connectivity);

  • Follow major watershed/catchment and/or coastal boundaries;

  • Incorporate major altitudinal/geological/climatic gradients;

  • Include and maximise connectivity between large tracts/patches of remnant vegetation;

  • Include and maximise connectivity between remnant vegetation in good condition; and

- Riparian

  • Located on the major river or creek systems within the bioregion in question.

The total extent of remnant vegetation triggered as being of "State", "Regional" or "Local" significance due to the presence of an overlying BPA derived terrestrial or riparian corridor within the AOI, is provided in the following table. For further information on how remnant vegetation is triggered due to the presence of an overlying BPA derived corridor, refer to the relevant landscape BPA expert panel report(s).

Table 14: Extent of triggered remnant vegetation due to the presence of BPA derived corridors with respect to the AOI

Biodiversity Significance	Area (Ha)	% of AOI
State	4,650.12	18.16
Regional	0.0	0.0
Local	0.0	0.0

NB: area figures associated with the extent of corridor triggered remnant vegetation are only available for those bioregions where a BPA has been undertaken.

Refer to **Map 3** for further information.

Threatening process/condition (Criteria K) - areas identified by experts under this criterion may be used to amend (upgrade or downgrade) biodiversity significance arising from the "first-cut" analysis. The condition of remnant vegetation is affected by threatening processes such as weeds, ferals, grazing and burning regime, selective timber harvesting/removal, salinity, soil erosion, and climate change.

Assessment of Criteria K with respect to the AOI is not currently included in the "Biodiversity and Conservation Values" report, as it has not been applied to the majority of Queensland due to data/information limitations and availability.

Special Area Decisions

Expert panel derived "Special Area Decisions" are used to assign values to Other Essential Criteria. The specific decisions which relate to the AOI in question are listed in the table below.

Table 15: Expert panel decisions for assigning levels of biodiversity significance with respect to the AOI

Decision Number	Description	Panel Recommended Significance	Criteria Values
eiu_fa_24	Eastern ecotone	State	Ia (centre of endemism): HIGH Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): VERY HIGH Id (taxa at the limits of their ranges): VERY HIGH Ie (high species richness): VERY HIGH Ii (high density of hollow-bearing trees): VERY HIGH Ij (significant breeding or roosting sites): VERY HIGH
eiu_fa_28	High precision records for priority taxa of State significance are contained within the remnant.	State	Criterion H: VERY HIGH
eiu_fa_30	High precision records for priority taxa of Regional significance are contained within the remnant.	Regional	Criterion H: HIGH
eiu_fl_12	Western Lumholtz - Princess Hills area	Regional	Ib (wildlife refugia): VERY HIGH Ie (high species richness): VERY HIGH
eiu_l_03	Riparian ecosystems and associated areas.	State	Ib (wildlife refugia): VERY HIGH Ie (high species richness): VERY HIGH Ig (RE's with distinct variation): VERY HIGH Ii (high density of hollow-bearing trees): HIGH Ij (significant breeding or roosting sites): VERY HIGH
eiu_l_10	Landscapes of least disturbance	State	Ia (centre of endemism): HIGH Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): HIGH Id (taxa at the limits of their ranges): HIGH Ie (high species richness): VERY HIGH Ig (RE's with distinct variation): HIGH K (Condition): State
eiu_l_32	Bioregional Terrestrial Corridors	State or Regional	J (corridors): State or Regional
wet_l_16	Wet Tropics endemic BVGs of simple to complex upland mesophyll and notophyll vine forests.	State	Ia (endemic richness):VH
wet_l_25	Core areas	Regional	Ib (refugia): H

Expert panel decision descriptions:

eiu_fa_24

The Eastern ecotone of the Einasleigh Uplands is a band of eucalypt forest separating the rainforest of the Wet Tropics from the dry tropical woodlands that characterize the bioregion. These better developed forests support a number of species that are endemic to the ecotone, or are isolated populations of species more widely distributed in the wet sclerophyll forest of south-east Queensland. These species include the northern bettong (**Bettongia tropica**), eastern yellow robin (**Eopsaltria australis**), yellow thornbill (**Acanthiza nana**), greater glider (**Petauroides volans**), Squirrel glider (**Petaurus norfolcensis**), crested shrike-tit (**Falcunculus frontatus**) and the yellow-faced honeyeater (**Lichenostomus chrysops**). Disjunct tree species that have the major part of their North Queensland distribution in the ecotone include **Eucalyptus resinifera, E. pellita, E. grandis, E. moluccana, E. reducta, E. cloeziana, E. citriodora** and **Angophora floribunda.**

eiu_fa_28

Remnant contains Core Habitat for Priority taxa with high precision records.

eiu_fa_30

Remnant contains Core Habitat for Priority taxa with high precision records.

eiu_fl_12

This area is centred on the southern part of the Herberton-Wairuna Subregion, south of the Herbert River. In the north and east the area is characterized by open forests of **Corymbia citriodora** (lemon-scented gum), **Eucalyptus crebra** (narrow-leaved ironbark), **C. intermedia** (pink bloodwood) and **E. portuensis** (white mahogany) on deeper soils of the largely intact plateau surface, most of which lies between 600 and 800m ASL. It includes small areas of granite and metamorphic hills, alluvial valleys and wetlands. In the south west the plateau has been largely stripped and has shallow soils and a low open woodland of **Allocasuarina inophloia** (stringybark sheoak), with **Eucalyptus exserta** (Queensland peppermint) and **Melaleuca nervosa** (woodland paperbark), and mostly lies between 550 and 600m ASL. The area straddles the ecotone between the Wet Tropics and the Einasleigh Uplands.

Significant flora known to occur in the area include **Acacia ramiflora** (E), **Cartonema brachyantherum** (R), **Eucalyptus howittiana** (R), **Eucalyptus atrata**, **Eucalyptus lockyeri subsp. exuta** (R), **Hibbertia** sp. (Girraween NP D.Halford+ Q1611), **Leptospermum pallidum** (R), **Peripleura scabra** (R), and a diversity of **Stylidium** (trigger plants) including **S. eriorhizum**, **S. floodii**, **S. oviflorum**, **S. rotundifolium**, **S. tenerum** and Sty**lidium velleioides**.

eiu_l_03

Most of the Einasleigh Uplands is dominated by open vegetation on shallow or skeletal soils. Riparian RE's associated with the larger river systems function as important refuges for many species of flora and fauna because of the relatively high nutrient levels associated with most of these areas, their better moisture balance and their generally well developed vegetation. These mesic ribbons of habitat provide an important seasonal refuge and resources for a variety of species, in particular arboreal mammals, woodland birds, hollow-roosting species and amphibians. Many raptor species preferentially nest in tall riparian trees.

Riparian areas are also biogeographically significant habitat as they allow inland incursions of many east coast species into drier areas on the edge of their geographic range.

Riparian areas were given a 200m buffer with the same significance rating to ensure that adjacent habitat used opportunistically by species using the riparian areas was also included.

This decision includes Landscape decision 4.

eiu_l_10

Parts of the Einasleigh Uplands, due to ruggedness, remoteness or the absence of permanent surface water, have had little impact from grazing by domestic stock or the associated infrastructure. These are areas where the landscapes have been little disturbed and the biodiversity values within them have the greatest chance of being maintained in the long term. The major threatening process to these areas is the intensification of grazing through development of infrastructure such as watering points and fencing. The current condition of the ground layer and soil is considered to be very good and they provide a refuge for sensitive plant and animal species from the impacts of grazing.

These are predominantly areas of very low land capability, with skeletal, infertile and droughty soils, steep slopes and much rock outcrop. Any increase in land use intensity in these areas is likely to result in rapid land degradation and consequent loss of biodiversity values.

The extent of these areas in the Einasleigh Uplands, compared with other parts of the state, makes them of State Significance for the protection of intact ecosystems.

eiu_l_32

This terrestrial corridors decision identifies major themes of habitat connectivity across the bioregion. They identify north/south and east/west links that cover higher altitude areas along watersheds and mountain ranges, and areas characterised by a relative continuity of similar or related habitats, using the methodology outlined in EPA 2008. Identified corridor centrelines are buffered according to the significance of the centreline and the landscape context within which it occurs

Decision eiu_l_22 Corridor Special Management Areas identifies areas where values associated with landscape scale habitat connectivity have been compromised.

wet_l_16

The special area encompasses the broad vegetation groups 1b and 5c (at the 1:1,000,000 scale). BVG 1b refers to - Complex mesophyll to notophyll vine forests usually on basalt tablelands whilst the BVG 5c refers to - Simple to complex notophyll vine forests, often with **Agathis** spp. on ranges and uplands of the WET.

Both these BVGs are unique and endemic to the Wet Tropics and exhibit a unique combination of vegetation communities that only exist within the bioregion.

wet_l_25

Tracts are defined as patches of continuous remnant vegetation. The size of any tract is a major indicator of ecological significance and is strongly correlated with the long-term viability of biodiversity values. Larger tracts are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller tracts. These areas can be considered core nodes/refugia in which a large proportion of the bioregions biodiversity is represented.

A modified tract size analysis (Criterion C) (EHP 2014) was used to identify and delineate discrete tracts of remnant vegetation at a bioregion scale. For the purpose of the assessment, a core area was identified as a relatively contiguous area of remnant vegetation (disregarding small perforations, or linear breaks) and which was generally greater than 5km in width (based upon the minimum width of the terrestrial corridor network). Tracts of greater than 2,000ha were included.

Aquatic Conservation Assessments

Introduction

The Aquatic Biodiversity Assessment and Mapping Method or AquaBAMM (Clayton *et al.* 2006), was developed to assess conservation values of wetlands in queensland, and may also have application in broader geographical contexts. It is a comprehensive method that uses available data, including data resulting from expert opinion, to identify relative wetland conservation/ecological values within a specified study area (usually a catchment). The product of applying this method is an Aquatic Conservation Assessment (ACA) for the study area.

An ACA using AquaBAMM is non-social, non-economic and identifies the conservation/ecological values of wetlands at a user-defined scale. It provides a robust and objective conservation assessment using criteria, indicators and measures that are founded upon a large body of national and international literature. The criteria, each of which may have variable numbers of indicators and measures, are naturalness (aquatic), naturalness (catchment), diversity and richness, threatened species and ecosystems, priority species and ecosystems, special features, connectivity and representativeness. An ACA using AquaBAMM is a powerful decision support tool that is easily updated and simply interrogated through a geographic information system (GIS).

Where they have been conducted, ACAs can provide a source of baseline wetland conservation/ecological information to support natural resource management and planning processes. They are useful as an independent product or as an important foundation upon which a variety of additional environmental and socio-economic elements can be added and considered (i.e. an early input to broader 'triple-bottom-line' decision-making processes). An ACA can have application in:

- determining priorities for protection, regulation or rehabilitation of wetlands and other aquatic ecosystems
- on-ground investment in wetlands and other aquatic ecosystems
- contributing to impact assessment of large-scale development (e.g. dams)
- water resource and strategic regional planning prcesses

For a detailed explanation of the methodology please refer to the summary and expert panel reports relevant to the ACA utilised in this assessment. These reports can be accessed at Wetland *Info*:

http://wetlandinfo.des.qld.gov.au/wetlands/assessment/assessment-methods/aca

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

http://qspatial.information.qld.gov.au/geoportal/

Explanation of Criteria

Under the AquaBAMM, eight criteria are assessed to derive an overall conservation value. Similar to the Biodiversity Assessment and Mapping Methodology, the criteria may be primarily diagnostic (quantitative) or primarily expert opinion (qualitative) in nature. The following sections provide a brief description of each of the 8 criteria.

Criteria 1. Naturalness - Aquatic: This attribute reflects the extent to which a wetland's (riverine, non-riverine, estuarine) aquatic state of naturalness is affected through relevant influencing indicators which include: presence of exotic flora and fauna; presence of aquatic communities; degree of habitat modification and degree of hydrological modification.

Criteria 2. Naturalness - Catchment: The naturalness of the terrestrial systems of a catchment can have an influence on many wetland characteristics including: natural ecological processes e.g. nutrient cycling, riparian vegetation, water chemistry, and flow. The indicators utilised to assess this criterion include: presence of exotic flora and/or fauna; riparian, catchment and flow modification.

Criteria 3. Naturalness - Diversity and Richness: This criterion is common to many ecological assessment methods and can include both physical and biological features. It includes such indicators as species richness, riparian ecosystem richness and geomorphological diversity.

Criteria 4. Threatened Species and Ecosystems: This criterion evaluates ecological rarity characteristics of a wetland. This includes both species rarity and rarity of communities / assemblages. The communities and assemblages are best represented by regional ecosystems. Species rarity is determined by NCA and EPBC status with Endangered, Vulnerable or Near-threatened species being included in the evaluation. Ecosystem rarity is determined by regional ecosystem biodiversity status i.e. Endangered, Of Concern, or Not of Concern.

Criteria 5. Priority Species and Ecosystems: Priority flora and fauna species lists are expert panel derived. These are aquatic, semi-aquatic and riparian species which exhibit at least 1 particular trait in order to be eligible for consideration. For

flora species the traits included:

- It forms significant macrophyte beds (in shallow or deep water).
- It is an important food source.
- It is important/critical habitat.
- It is implicated in spawning or reproduction for other fauna and/or flora species.
- It is at its distributional limit or is a disjunct population.
- It provides stream bank or bed stabilisation or has soil binding properties.
- It is a small population and subject to threatening processes.

Fauna species are included if they meet at least one of the following traits:

- It is endemic to the study area (>75 per cent of its distribution is in the study area/catchment).
- It has experienced, or is suspected of experiencing, a serious population decline.
- It has experienced a significant reduction in its distribution and has a naturally restricted distribution in the study area/catchment.
- It is currently a small population and threatened by loss of habitat.
- It is a significant disjunct population.
- It is a migratory species (other than birds).
- A significant proportion of the breeding population (>one per cent for waterbirds, >75 per cent other species) occurs in the waterbody (see Ramsar criterion 6 for waterbirds).
- Limit of species range.

See the individual expert panel reports for the priority species traits specific to an ACA.

Criteria 6. Special Features: Special features are areas identified by flora, fauna and ecology expert panels which exhibit characteristics beyond those identified in other criteria and which the expert panels consider to be of the highest ecological importance. Special feature traits can relate to, but are not solely restricted to geomorphic features, unique ecological processes, presence of unique or distinct habitat, presence of unique or special hydrological regimes e.g. spring-fed streams. Special features are rated on a 1 - 4 scale (4 being the highest).

Criteria 7. Connectivity: This criterion is based on the concept that appropriately connected aquatic ecosystems are healthy and resilient, with maximum potential biodiversity and delivery of ecosystem services.

Criteria 8. Representativeness: This criterion applies primarily to non-riverine assessments, evaluates the rarity and uniqueness of a wetland type in relation to specific geographic areas. Rarity is determined by the degree of wetland protection within "protected Areas" estate or within an area subject to the *Fisheries Act 1994*, *Coastal Protection and Management Act 1995*, or *Marine Parks Act 2004*. Wetland uniqueness evaluates the relative abundance and size of a wetland or wetland management group within geographic areas such as catchment and subcatchment.

Riverine Wetlands

Riverine wetlands are all wetlands and deepwater habitats within a channel. The channels are naturally or artificially created, periodically or continuously contain moving water, or connecting two bodies of standing water. AquaBAMM, when applied to riverine wetlands uses a discrete spatial unit termed subsections. A subsection can be considered as an area which encompasses discrete homogeneous stream sections in terms of their natural attributes (i.e. physical, chemical, biological and utilitarian values) and natural resources. Thus in an ACA, an aquatic conservation significance score is calculated for each subsection and applies to all streams within a subsection, rather than individual streams as such.

Please note, the area figures provided in Tables 16 and 17, are derived using the extent of riverine subsections within the AOI. Refer to **Map 5** for further information. A summary of the conservation significance of riverine wetlands within the AOI is provided in the following table.

Table 16: Overall level/s of riverine aquatic conservation significance

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
Very High	9,477.91	37.01

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
High	8,322.84	32.5
Medium	7,806.64	30.49
Low	0.0	0.0
Very Low	0.0	0.0

The individual aquatic conservation criteria ratings for riverine wetlands within the AOI are listed below.

Table 17: Level/s of riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic	16,012.49	62.5					9,594.90	37.5
2. Naturalness catchment	16,042.72	62.6	9,564.67	37.4				
3. Diversity and richness			14,117.29	55.1	1,886.10	7.4	9,604.00	37.5
4. Threatened species and ecosystems	23,374.23	91.3	2,189.64	8.6				
5. Priority species and ecosystems	30.23	0.1	12,130.69	47.4				
6. Special features	9,477.92	37.0						
7. Connectivity	5,995.19	23.4	5,290.96	20.7	8,864.75	34.6	5,456.49	21.3
8. Representative-ness								

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to riverine wetlands within the AOI.

Table 18: Expert panel decisions for assigning overall levels of riverine aquatic conservation significance

Decision number	Special feature	Catchment	Criteria/Indicator/Measure	Conservation rating (1-4)
bp_r_ec_02	Upper Burdekin/ Wet Tropics	Burdekin Upper	6.2.1 6.3.3	4

4 is the highest rating/value

Expert panel decision descriptions:

bp_r_ec_02

This area contains distinct special ecological processes providing extremely valuable fauna habitat areas. This area is biogeographically interesting in terms of rainforest streams with 'inland' drainage. There has also been a major reduction in populations of key top order predator Anguillid eels since the construction of the Burdekin Falls Dam.

Non-riverine Wetlands

Non-riverine wetlands include both lacustrine and palustrine wetlands, however, do not currently incorporate estuarine, marine or subterranean wetland types. A summary of the conservation significance of non-riverine wetlands within the AOI is provided in the following table. Refer to **Map 6** for further information.

Table 19: Overall level/s of non-riverine aquatic conservation significance

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
Very High	1.36	0.01
High	0.0	0.0
Medium	0.0	0.0
Low	0.0	0.0
Very Low	1.11	0.0

The following table provides an assessment of non-riverine wetlands within the AOI and associated aquatic conservation criteria values.

Table 20: Level/s of non-riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic	1.36				1.11			
2. Naturalness catchment	1.36		1.11					
3. Diversity and richness			1.36				1.11	
4. Threatened species and ecosystems	1.36							
5. Priority species and ecosystems			1.36					
6. Special features								
7. Connectivity								
8. Representative-ness	1.36							

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to non-riverine wetlands within the AOI.

Table 21: Expert panel decisions for assigning overall levels of non-riverine aquatic conservation significance.

Decision number	Special feature	Catchment	Criteria/Indicator/Measure	Conservation rating (1-4)
(No Records)				

4 is the highest rating/value

Expert panel decision descriptions:

(No Records)

Threatened and Priority Species

Introduction

This chapter contains a list of threatened and priority flora and/or fauna species that have been recorded on, or within 4km of the Assessment Area.

The information presented in this chapter with respect to species presence is derived from compiled databases developed primarily for the purpose of BPAs and ACAs. Data is collated from a number of sources and is updated periodically.

It is important to note that the list of species provided in this report, may differ when compared to other reports generated from other sources such as the State government's WildNet, Herbrecs or the federal government's EPBC database for a number of reasons.

Records for threatened and priority species are filtered and checked based on a number of rules including:

- Taxonomic nomenclature - current scientific names and status,
- Location - cross-check co-ordinates with location description,
- Taxon by location - requires good knowledge of the taxon and history of the record,
- Duplicate records - identify and remove,
- Expert panels - check records and provide new records,
- Flora cultivated records excluded,
- Use precise records less than or equal to 2000m,
- Use recent records greater than or equal to 1975 animals, greater than or equal to 1950 plants.

Threatened Species

Threatened species are those species classified as "Endangered" or "Vulnerable" under the *Environment Protection and Biodiversity Conservation Act 1999* or "Endangered", "Vulnerable" or "Near threatened" under the *Nature Conservation Act 1992*.

The following threatened species have been recorded on, or within approximately 4km of the AOI.

Table 22: Threatened species recorded on, or within 4km of the AOI

Species	Common name	NCA status	EPBC status	Back on Track rank	Migratory species*	Wetland species**	Identified flora/fauna
Casuarius casuarius johnsonii (southern population)	southern cassowary (southern population)	E	E	Critical			FA
Corybas cerasinus		NT		Low			FL
Cyclopsitta diophthalma macleayana	Macleay's fig-parrot	V		Low			FA
Geophaps scripta scripta	squatter pigeon (southern subspecies)	V	V	Medium			FA
Litoria dayi	Australian lacelid	E	V	Low		Y	FA
Litoria nannotis	waterfall frog	E	E	Low		Y	FA
Litoria serrata	tapping green eyed frog	V		Low		Y	FA
Murina florium	tube-nosed insectivorous bat	V		High			FA
Petauroides volans	greater glider	V	V	Low			FA
Petauroides volans minor	northern greater glider	V	V				FA
Petrogale sharmani	Sharman's rock-wallaby	V	V	Low			FA
Phascolarctos cinereus	koala	V	V	Low			FA

NB. Please note that the threatened species listed in this section are based upon the most recently compiled DES internal state-wide threatened species dataset. This dataset may contain additional records that were not originally available for inclusion in the relevant individual BPAs and ACAs.

**JAMBA - Japan-Australia Migratory Bird Agreement; CAMBA - China-Australia Migratory Bird Agreement; ROKAMBA - Republic of Korea-Australia Migratory Bird Agreement; CMS - Convention on the Conservation of Migratory Species.*

***Y - wetland indicator species.*

BPA Priority Species

A list of BPA priority species that have been recorded on, or within approximately 4km of the AOI is contained in the following table.

Table 23: Priority species recorded on, or within 4km of the AOI

Species	Common name	Back on Track rank	Identified flora/fauna
Acanthiza katherina	Mountain Thornbill	Low	FA
Aepyprymnus rufescens	Rufous Bettong	Low	FA
Ailuroedus maculosus	Spotted Catbird	Low	FA
Chlamydosaurus kingii	Frilled Lizard	Low	FA
Climacteris picumnus	Brown Treecreeper	Low	FA
Colluricincla boweri	Bower's Shrike-thrush	Low	FA
Eucalyptus atrata	Herberton ironbark	Low	FL
Glaphyromorphus cracens		Low	FA
Heteromyias cinereifrons	Grey-headed Robin	Low	FA
Melaleuca viridiflora var. viridiflora			FL
Orthonyx spaldingii	Chowchilla	Low	FA
Phascolarctos cinereus	Koala	Low	FA
Pseudochirops archeri	Green Ringtail Possum	Low	FA
Pseudochirulus herbertensis	Herbert River Ringtail Possum	Low	FA
Ptiloris victoriae	Victoria's Riflebird	Low	FA
Scenopoeetes dentirostris	Tooth-billed Bowerbird	Low	FA

NB. Please note that the list of priority species is based on those species identified in the BPAs, however records for these species may be more recent than the originals used. furthermore, the BPA priority species databases are updated from time to time. At each update, the taxonomic details for all species are amended as necessary to reflect current taxonomic name and/or status changes.

ACA Priority Species

A list of ACA priority species used in riverine and non-riverine ACAs that have been recorded on, or within approximately 4km of the AOI are contained in the following tables.

Table 24: Priority species recorded on, or within 4 km of the AOI - riverine

Species	Common name	Back on Track rank	Identified flora/fauna
Ceyx azureus	Azure Kingfisher	L	FA
Leersia hexandra	swamp rice grass		FL
Litoria jungguy	Northern Stony Creek Frog	L	FA
Litoria xanthomera	Orange Thighed Treefrog	L	FA

Species	Common name	Back on Track rank	Identified flora/fauna
Mixophyes schevilli	Northern Barred-Frog	L	FA
Ornithorhynchus anatinus	Platypus	L	FA

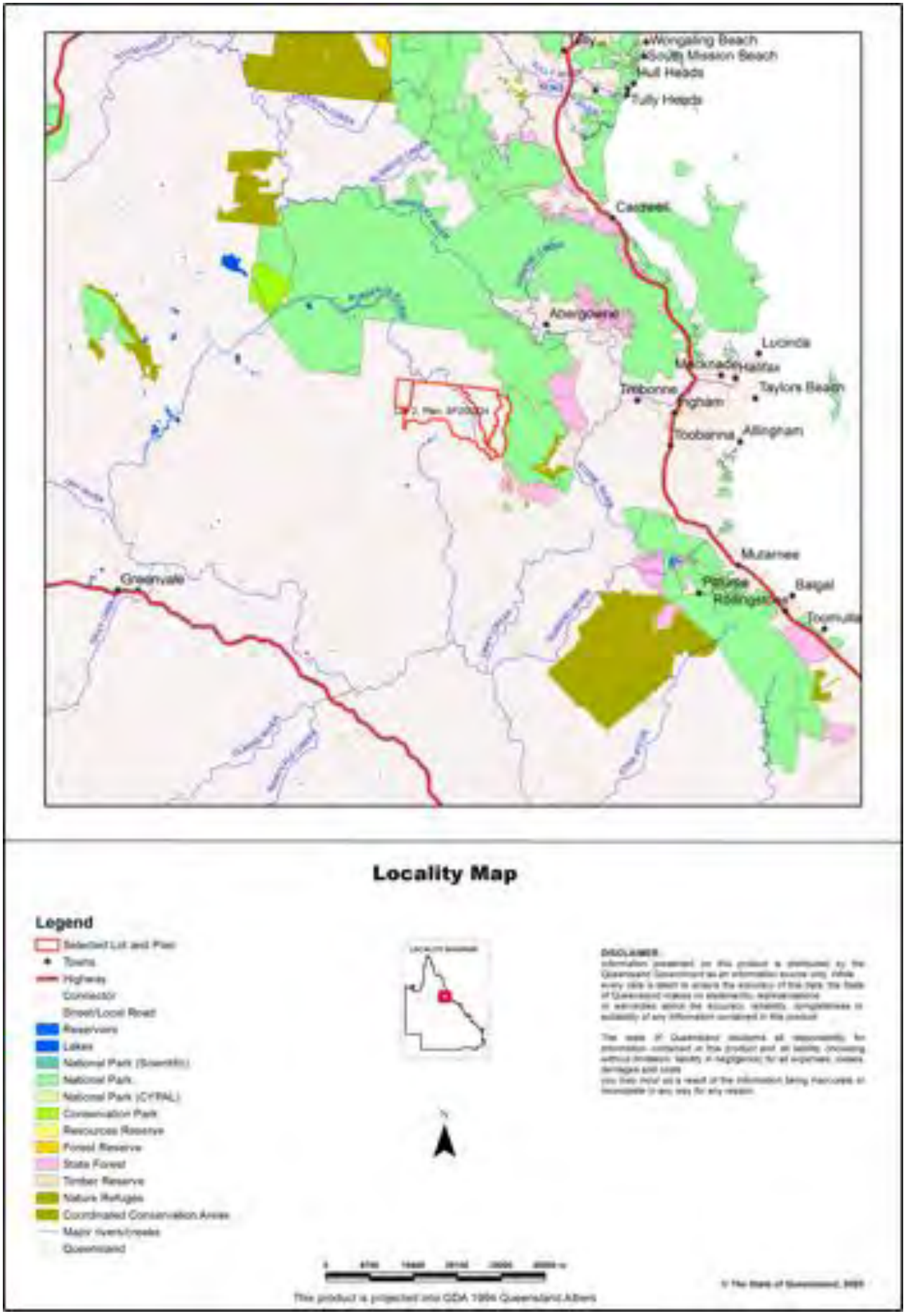
Table 25: Priority species recorded on, or within 4 km of the AOI - non-riverine

Species	Common name	Back on Track rank	Identified flora/fauna
Ceyx azureus	Azure Kingfisher	L	FA
Gahnia sieberiana	sword grass		FL
Leersia hexandra	swamp rice grass		FL
Litoria jungguy	Northern Stony Creek Frog	L	FA
Litoria xanthomera	Orange Thighed Treefrog	L	FA
Mixophyes schevilli	Northern Barred-Frog	L	FA

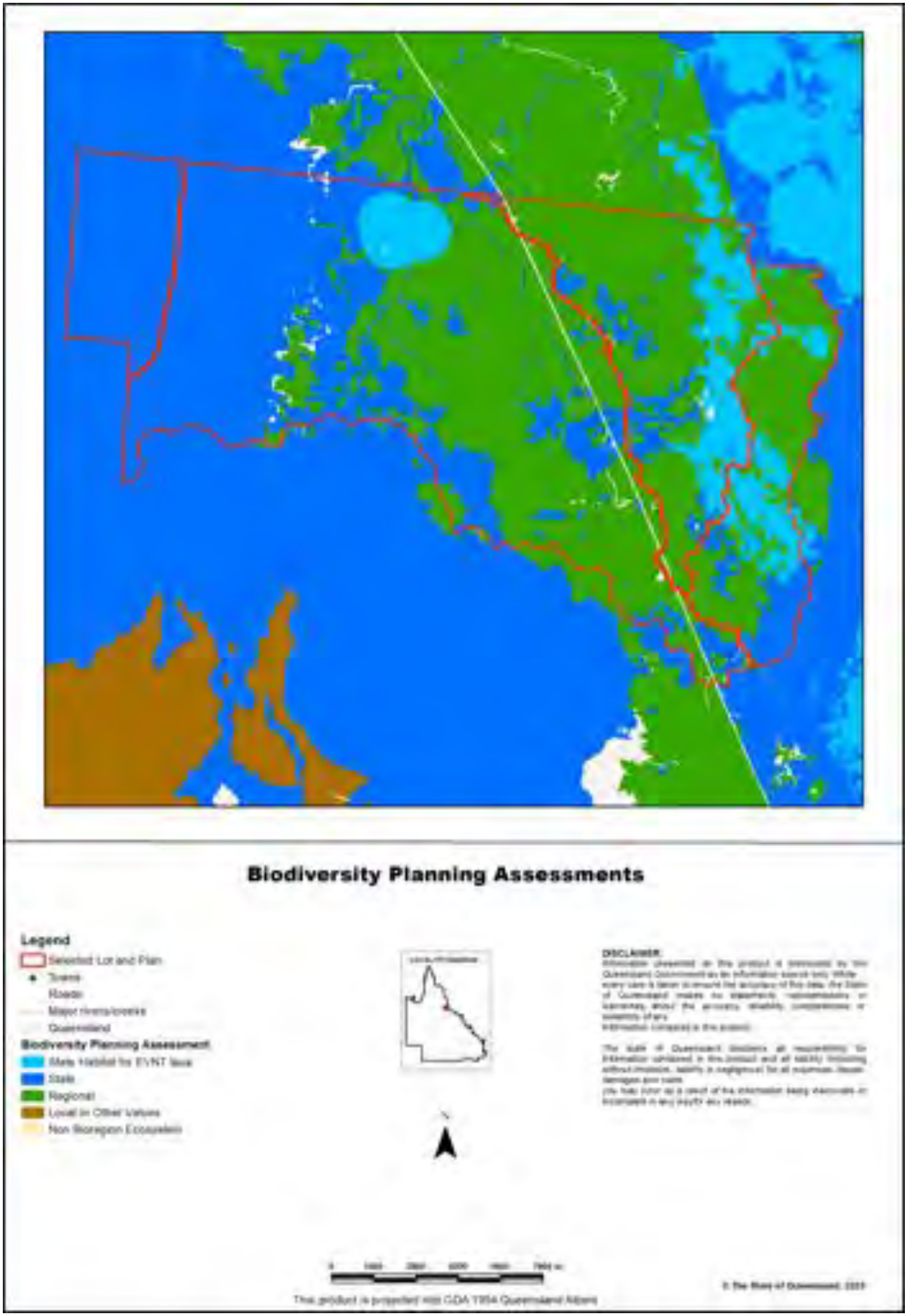
NB. Please note that the priority species records used in the above two tables are comprised of those adopted for the released individual ACAs. The ACA riverine and non-riverine priority species databases are updated from time to time to reflect new release of ACAs. At each update, the taxonomic details for all ACAs records are amended as necessary to reflect current taxonomic name and/or status changes.

Maps

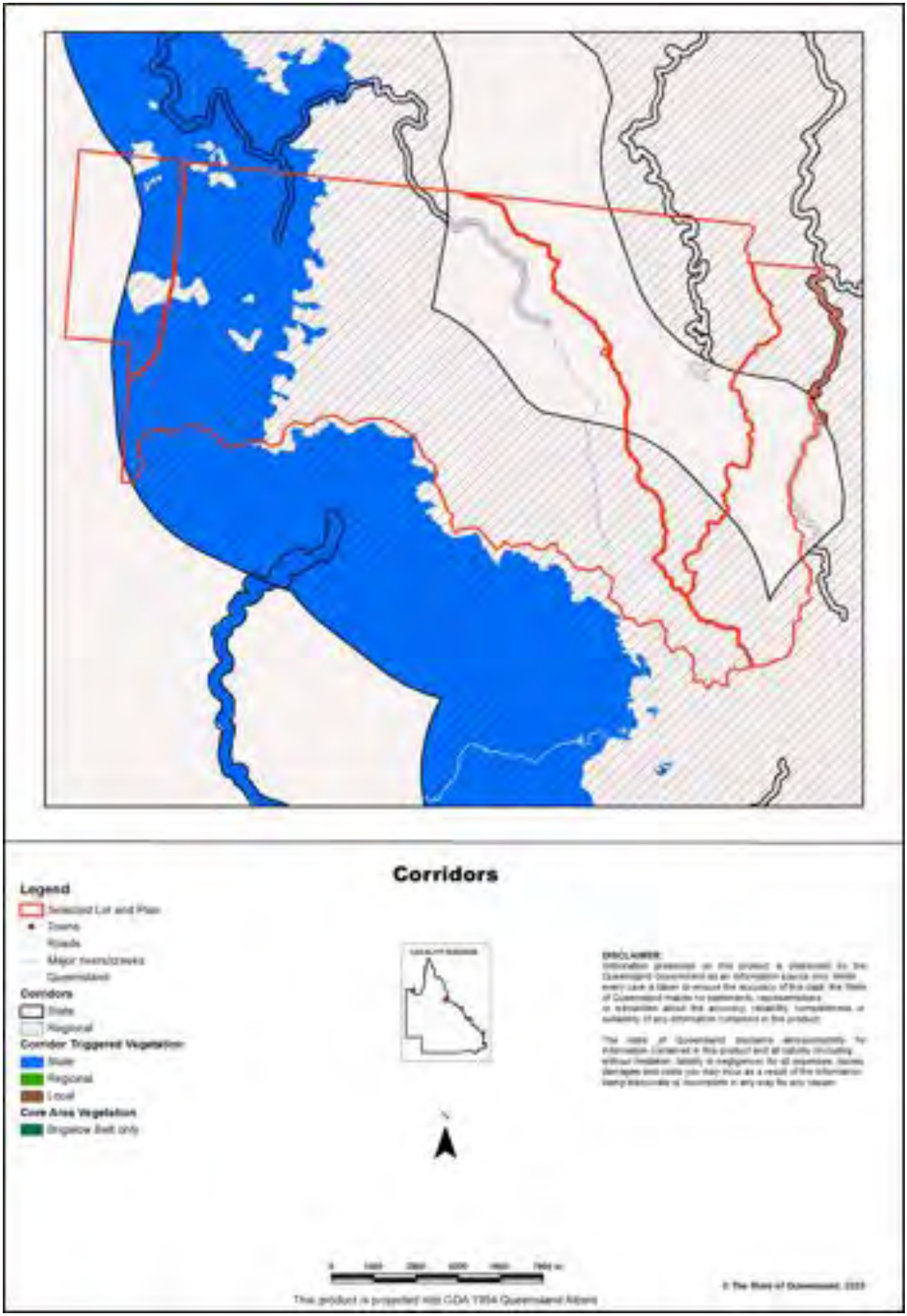
Map 1 - Locality Map



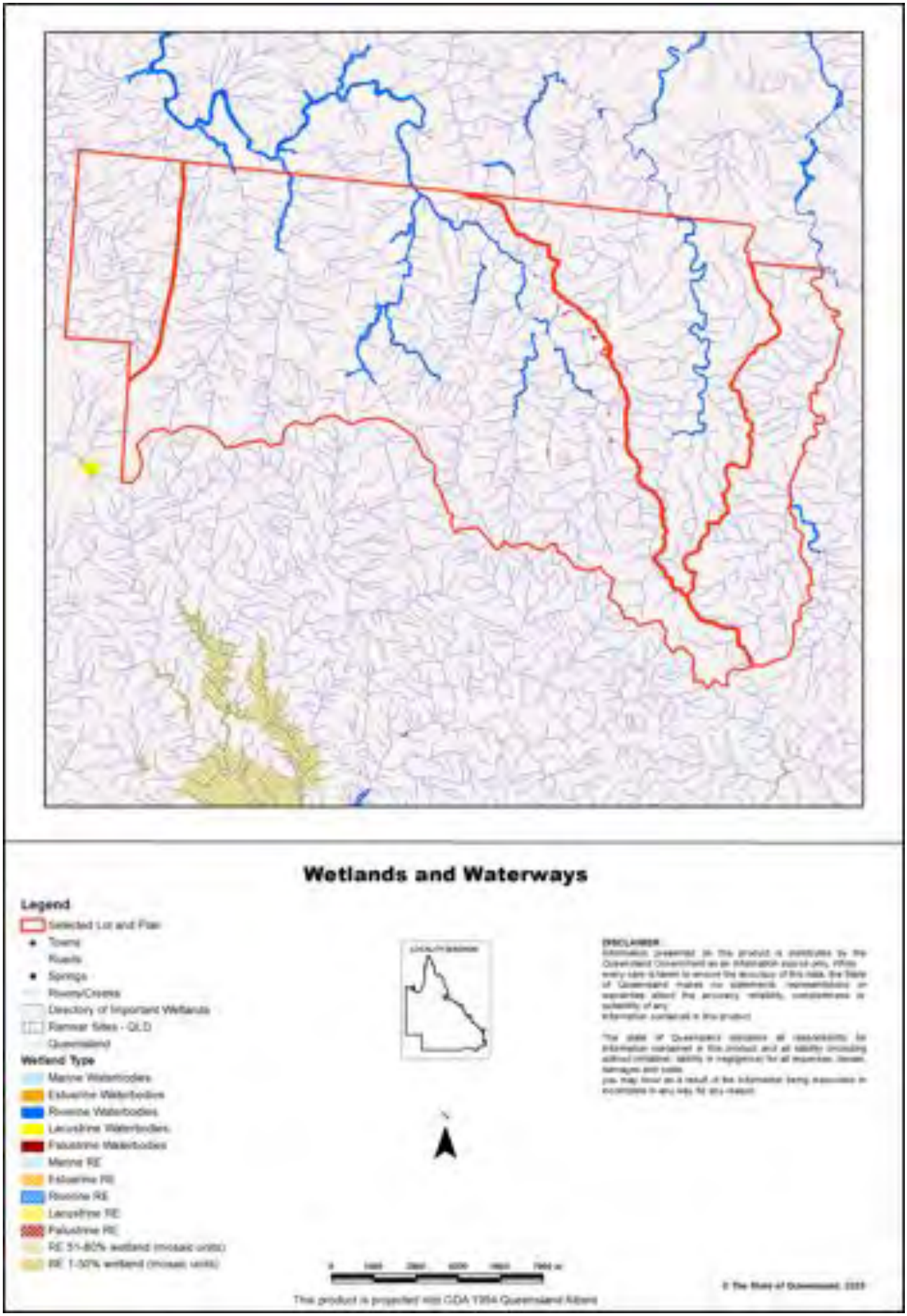
Map 2 - Biodiversity Planning Assessment (BPA)



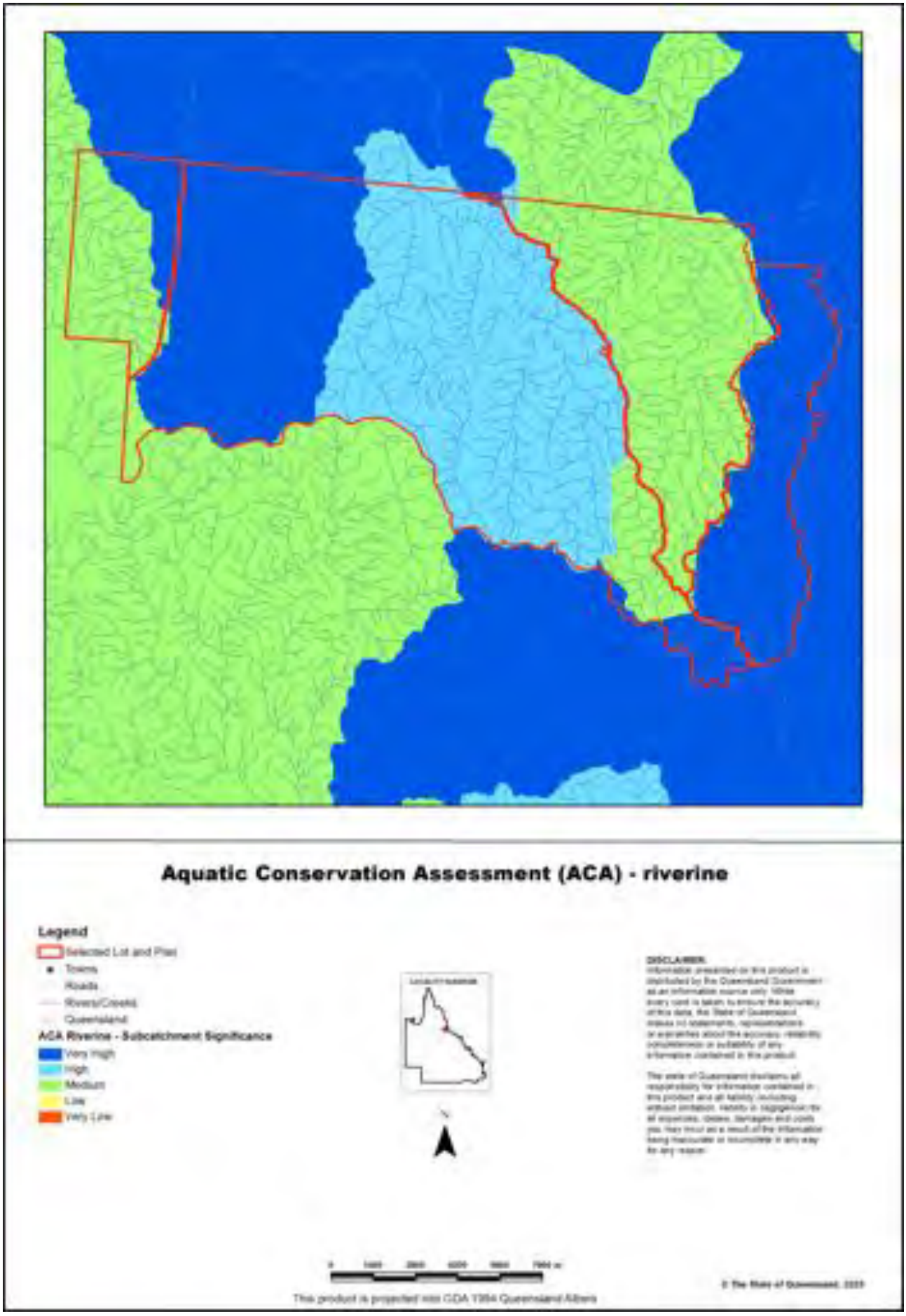
Map 3 - Corridors



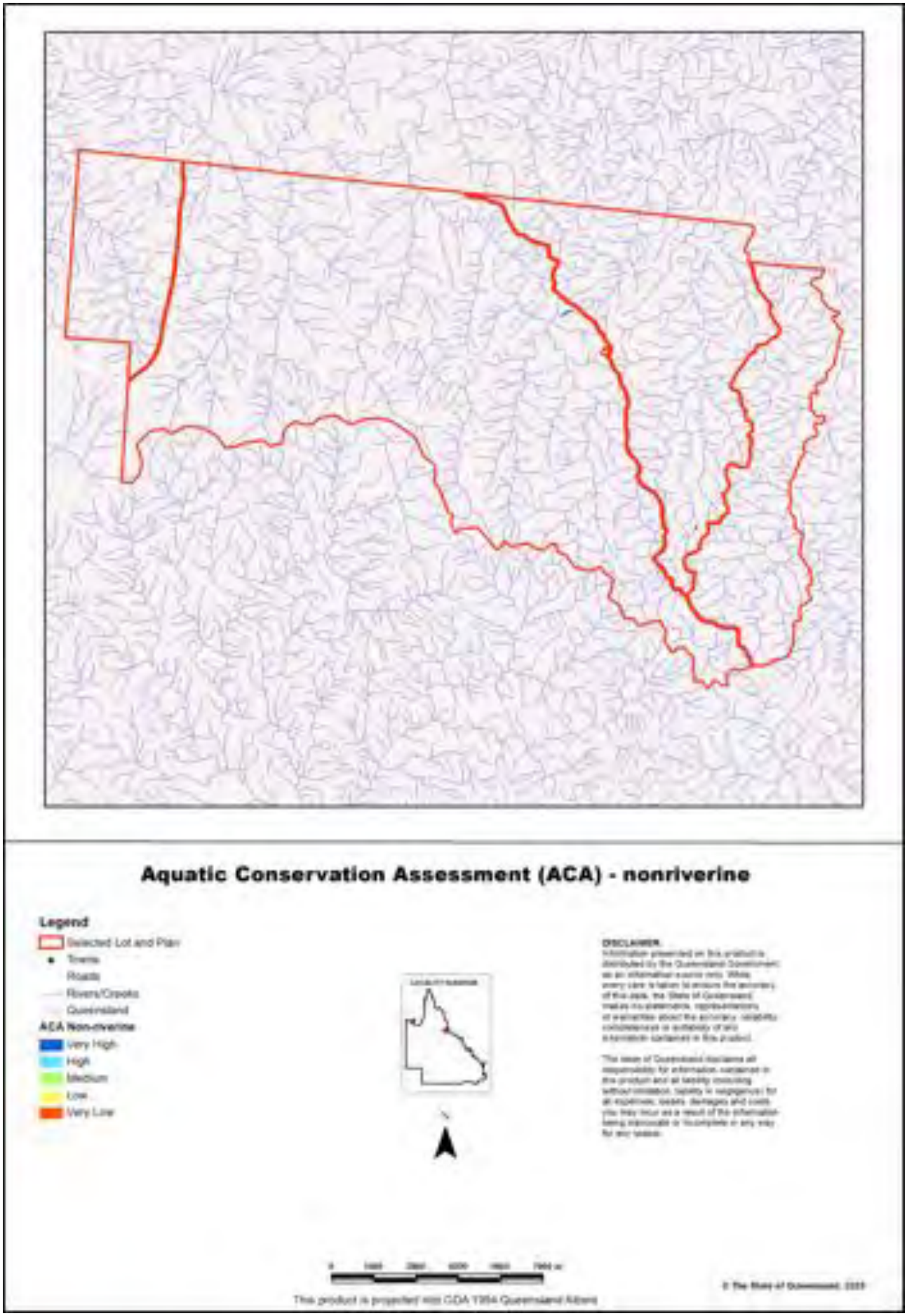
Map 4 - Wetlands and waterways



Map 5 - Aquatic Conservation Assessment (ACA) - riverine



Map 6 - Aquatic Conservation Assessment (ACA) - non-riverine



References

Clayton, P.D., Fielder, D.F., Howell, S. and Hill, C.J. (2006) *Aquatic biodiversity assessment and mapping method (AquaBAMM): a conservation values assessment tool for wetlands with trial application in the Burnett River catchment.* Published by the Environmental Protection Agency, Brisbane. ISBN 1-90928-07-3. Available at

http://wetlandinfo.des.qld.gov.au/wetlands/assessment/assessment-methods/aca/

Environmental Protection Agency (2002) *Biodiversity Assessment and Mapping Methodology. Version 2.1, July 2002.* (Environmental Protection Agency, Brisbane).

Morton, S. R., Short, J. and Barker, R. D. with an Appendix by G.F. Griffin and G. Pearce (1995). *Refugia for Biological Diversity in Arid and Semi-arid Australia. Biodiversity Series* , Paper No. 4, Biodiversity Unit, Environment Australia.

Sattler, P.S. and Williams, R.D. (eds) (1999). *The Conservation Status of Queensland's Bioregional Ecosystems*. Environmental Protection Agency, Brisbane.

Appendices

Appendix 1 - Source Data

Theme	Datasets
Aquatic Conservation Assessments Non-riverine*	Combination of the following datasets: Cape York Peninsula Non-riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Non-riverine v1.3 Lake Eyre and Bulloo Basins v1.1 QMDB Non-riverine ACA v1.4 Southeast Queensland ACA v1.1 WBB Non-riverine ACA v1.1
Aquatic Conservation Assessments Riverine*	Combination of the following datasets: Cape York Peninsula Riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Riverine v1.1 Lake Eyre and Bulloo Basins v1.1 QMDB Riverine ACA v1.4 Southeast Queensland ACA v1.1 WBB Riverine ACA v1.1
Biodiversity Planning Assessments*	Combination of the following datasets: Brigalow Belt BPA v2.1 Cape York Peninsula BPA v1.1 Central Queensland Coast BPA v1.3 Channel Country BPA v1.1 Desert Uplands BPA v1.3 Einasleigh Uplands BPA v1.1 Gulf Plains BPA v1.1 Mitchell Grass Downs BPA v1.1 Mulga Lands BPA v1.4 New England Tableland v2.3 Southeast Queensland v4.1 Wet Tropics v1.1
Statewide BPA Corridors*	Statewide corridors v1.5
Threatened Species	An internal DES database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
BPA Priority Species	An internal DES database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
ACA Priority Species	An internal DES database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.

***These datasets are available at:**

http://dds.information.qld.gov.au/DDS

Appendix 2 - Acronyms and Abbreviations

AOI	- Area of Interest
ACA	- Aquatic Conservation Assessment
AQUABAMM	- Aquatic Biodiversity Assessment and Mapping Methodology
BAMM	- Biodiversity Assessment and Mapping Methodology
BoT	- Back on Track
BPA	- Biodiversity Planning Assessment
CAMBA	- China-Australia Migratory Bird Agreement
DES	- Department of Environment and Science
EPBC	- *Environment Protection and Biodiversity Conservation Act 1999*
EVNT	- Endangered, Vulnerable, Near Threatened
GDA94	- Geocentric Datum of Australia 1994
GIS	- Geographic Information System
JAMBA	- Japan-Australia Migratory Bird Agreement
NCA	- *Nature Conservation Act 1992*
RE	- Regional Ecosystem
REDD	- Regional Ecosystem Description Database
ROKAMBA	- Republic of Korea-Australia Migratory Bird Agreement

Queensland Government

Department of Environment and Science

Environmental Reports

Biodiversity and Conservation Values

Biodiversity Planning Assessments and Aquatic Conservation Assessments

For the selected area of interest
Lot: 3 Plan: WG274

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or Area of Interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "Central co-ordinates" option, the resulting assessment area encompasses an area extending from 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: biodiversity.planning@des.qld.gov.au

Disclaimer

Table of Contents

Summary Information

Tables 1 to 8 provide an overview of the AOI with respect to selected topographic and environmental values.

Table 1: Area of interest details: Lot: 3 Plan: WG274

Size (ha)	2,371.05
Local Government(s)	Hinchinbrook Shire
Bioregion(s)	Wet Tropics
Subregion(s)	Paluma - Seaview
Catchment(s)	Herbert, Burdekin

The following table identifies available Biodiversity Planning Assessments (BPAs) and Aquatic Conservation Assessments (ACAs) with respect to the AOI.

Table 2: Available Biodiversity Planning and Aquatic Conservation Assessments

Assessment Type	Assessment Area and Version
Biodiversity Planning Assessment(s)	Wet Tropics v1.1
Aquatic Conservation Assessment(s) (riverine)	Great Barrier Reef Catchments v1.3
Aquatic Conservation Assessment(s) (non-riverine)	Great Barrier Reef Catchments v1.3

Table 3: Remnant regional ecosystems within the AOI as per the Qld Herbarium's 'biodiversity status'

Biodiversity Status	Area (Ha)	% of AOI
Endangered	24.92	1.05
Of concern	692.7	29.22
No concern at present	1,540.05	64.95

The following table identifies the extent and proportion of the user specified area of interest (AOI) which is mapped as being of "State", "Regional" or "Local" significance via application of the Queensland Department of Environment and Science's *Biodiversity Assessment and Mapping Methodology* (BAMM).

Table 4: Summary table, biodiversity significance

Biodiversity significance	Area (Ha)	% of AOI
State Habitat for EVNT taxa	11.58	0.49
State	1,645.25	69.39
Regional	602.02	25.39
Local or Other Values	0.0	0.0

Table 5: Non-riverine wetlands intersecting the AOI

Non-riverine wetland types intersecting the area of interest	#
(No Records)	

NB. The figures presented in the table above are derived from the relevant non-riverine Aquatic Conservation Assessment(s). Later releases of wetland mapping produced via the Queensland Wetland Mapping Program may provide more recent

information in regards to wetland extent.

Table 6: Named waterways intersecting the AOI

(no results)

Refer to **Map 1** for general locality information.

The following two tables identify the extent and proportion of the user specified AOI which is mapped as being of "Very High", "High", "Medium", "Low", or "Very Low" aquatic conservation value for riverine and non-riverine wetlands via application of the Queensland Department of Environment and Science's *Aquatic Biodiversity Assessment and Mapping Method* (AquaBAMM).

Table 7: Summary table, aquatic conservation significance (riverine)

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
Very High	2,247.07	94.77
High	5.99	0.25
Medium	117.94	4.97
Low	0.0	0.0
Very Low	0.0	0.0

Table 8: Summary table, aquatic conservation significance (non-riverine)

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
(No Records)		

Biodiversity Planning Assessments

Introduction

The Department of Environment and Science (DES) attributes biodiversity significance on a bioregional scale through a Biodiversity Planning Assessment (BPA). A BPA involves the integration of ecological criteria using the *Biodiversity assessment and Mapping Methodology* (BAMM) and is developed in two stages: 1) **diagnostic criteria**, and 2) **expert panel criteria**. The diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion, while the expert panel criteria allows for the refinement of the mapped information from the diagnostic output by incorporating local knowledge and expert opinion.

The BAMM methodology has application for identifying areas with various levels of significance solely for biodiversity reasons. These include threatened ecosystems or taxa, large tracts of habitat in good condition, ecosystem diversity, landscape context and connection, and buffers to wetlands or other types of habitat important for the maintenance of biodiversity or ecological processes. While natural resource values such as dryland salinity, soil erosion potential or land capability are not dealt with explicitly, they are included to some extent within the biodiversity status of regional ecosystems recognised by the DES.

Biodiversity Planning Assessments (BPAs) assign three levels of overall biodiversity significance.

- **State significance** - areas assessed as being significant for biodiversity at the bioregional or state scales. They also include areas assessed by other studies/processes as being significant at national or international scales. In addition, areas flagged as being of State significance due to the presence of endangered, vulnerable and/or near threatened taxa, are identified as "State Habitat for EVNT taxa".
- **Regional significance** - areas assessed as being significant for biodiversity at the subregional scale. These areas have lower significance for biodiversity than areas assessed as being of State significance.
- **Local significance and/or other values** - areas assessed as not being significant for biodiversity at state or regional scales. Local values are of significance at the local government scale.

For further information on released BPAs and a copy of the underlying methodology, go to:

http://www.qld.gov.au/environment/plants-animals/biodiversity/planning/

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

http://qspatial.information.qld.gov.au/geoportal/

The following table identifies the extent and proportion of the user specified AOI which is mapped as being of "State", "Regional" or "Local" significance via application of the BAMM.

Table 9: Summary table, biodiversity significance

Biodiversity significance	Area (Ha)	% of AOI
State Habitat for EVNT taxa	11.58	0.49
State	1,645.25	69.39
Regional	602.02	25.39
Local or Other Values	0.0	0.0

Refer to **Map 2** for further information.

Diagnostic Criteria

Diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion. These criteria are diagnostic in that they are used to filter the available data and provide a "first-cut" or initial determination of biodiversity significance. This initial assessment is then combined through a second group of other essential criteria.

A description of the individual diagnostic criteria is provided in the following sections.

Criteria A. Habitat for EVNT taxa: Classifies areas according to their significance based on the presence of endangered, vulnerable and/or rare (EVNT) taxa. EVNT taxa are those scheduled under the *Nature Conservation Act 1992* and/or the

Environment Protection and Biodiversity Conservation Act 1999. It excludes highly mobile fauna taxa which are instead considered in Criterion H and brings together information on EVNT taxa using buffering of recorded sites or habitat suitability models (HSM) where available.

Criteria B. Ecosystem value: Classifies on the basis of biodiversity status of regional ecosystems, their extent in protected areas (presence of poorly conserved regional ecosystems), the presence of significant wetlands; and areas of national importance such as the presence of Threatened Ecological Communities, World Heritage areas and Ramsar sites. Ecosystem value is applied at a bioregional (**B1**) and regional (**B2**) scale.

Criteria C. Tract size: Measures the relative size of tracts of vegetation in the landscape. The size of any tract is a major indicator of ecological significance, and is also strongly correlated with the long-term viability of biodiversity values. Larger tracts are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller tracts.

Criteria D. Relative size of regional ecosystems: Classifies the relative size of each regional ecosystem unit within its bioregion (**D1**) and its subregion (**D2**). Remnant units are compared with all other occurrences with the same regional ecosystem. Large examples of a regional ecosystem are more significant than smaller examples of the same regional ecosystem because they are more representative of the biodiversity values particular to the regional ecosystem, are more resilient to the effects of disturbance, and constitute a significant proportion of the total area of the regional ecosystem.

Criteria F. Ecosystem diversity: Is an indicator of the number of regional ecosystems occurring within an area. An area with high ecosystem diversity will have many regional ecosystems and ecotones relative to other areas within the bioregion.

Criteria G. Context and connection: Represents the extent to which a remnant unit incorporates, borders or buffers areas such as significant wetlands, endangered ecosystems; and the degree to which it is connected to other vegetation.

A summary of the biodiversity status based upon the diagnostic criteria is provided in the following table.

Table 10: Summary of biodiversity significance based upon diagnostic criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
State	Remnant contains an RE that is one of the largest of its type in the bioregion (D1) & Remnant has high connectivity or buffers an endangered RE or Sig. Wetland (G)	1,232.53	51.98
State	Remnant contains at least 1 Endangered or 2 Vulnerable or Near Threatened species (A)	11.58	0.49
State	Remnant contains at least 1 Endangered RE (B1)	24.92	1.05
State	Remnant contains at least one Of Concern RE (B1) & Remnant contains an RE that is one of the largest of its type in the bioregion (D1)	303.11	12.78
Regional	Remnant contains at least one Of Concern RE (B1)	389.69	16.44
Local or Other Values	Refer to diagnostic data for additional information	297.03	12.53

Assessment of diagnostic criteria with respect to the AOI

The following table reflects an assessment of the individual diagnostic criteria noted above in regards to the AOI.

Table 11: Assessment of individual diagnostic criteria with respect to the AOI

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
A: Habitat for EVNT Taxa	11.58	0.5			21.55	0.9	2,225.73	93.9
B1: Ecosystem Value (Bioregion)	24.92	1.1	692.79	29.2	76.25	3.2	1,464.90	61.8
B2: Ecosystem Value (Subregion)	29.64	1.3			669.35	28.2	1,559.87	65.8
C: Tract Size			2,251.91	95.0			6.95	0.3
D1: Relative RE Size (Bioregion)	1,543.53	65.1	37.66	1.6	286.72	12.1	390.95	16.5
D2: Relative RE Size (Subregion)	1,543.53	65.1	77.15	3.3	275.9	11.6	362.28	15.3
F: Ecosystem Diversity	76.55	3.2	1,236.02	52.1	936.35	39.5	9.94	0.4
G: Context and Connection	2,169.97	91.5	39.37	1.7	42.28	1.8	7.24	0.3

Other Essential Criteria

Other essential criteria (also known as expert panel criteria) are based on non-uniform information sources and which may rely more upon expert opinion than on quantitative data. These criteria are used to provide a "second-cut" determination of biodiversity significance, which is then combined with the diagnostic criteria for an overall assessment of relative biodiversity significance. A summary of the biodiversity status based upon the other essential criteria is provided in the following table.

Table 12: Summary of biodiversity significance based upon other essential criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
State	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I) & Remnant forms part of a bioregional corridor (J)	1.18	0.05
State	Remnant forms part of a bioregional corridor (J)	88.11	3.72
Regional	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I)	2,169.55	91.5

A description of each of the other essential criteria and associated assessment in regards to the AOI is provided in the following sections.

Criteria H. Essential and general habitat for priority taxa: Priority taxa are those which are at risk or of management concern, taxa of scientific interest as relictual (ancient or primitive), endemic taxa or locally significant populations (such as a flying fox camp or heronry), highly specialised taxa whose habitat requirements are complex and distributions are not well correlated with any particular regional ecosystem, taxa important for maintaining genetic diversity (such as complex spatial patterns of genetic variation, geographic range limits, highly disjunct populations), taxa critical for management or monitoring of biodiversity (functionally important or ecological indicators), or economic and culturally important taxa.

Criteria I. Special biodiversity values: areas with special biodiversity values are important because they contain multiple taxa in a unique ecological and often highly biodiverse environment. Areas with special biodiversity values can include the following:

- Ia - centres of endemism - areas where concentrations of taxa are endemic to a bioregion or subregion are found.
- Ib - wildlife refugia (Morton *et al*. 1995), for example, islands, mound springs, caves, wetlands, gorges, mountain ranges and topographic isolates, ecological refuges, refuges from exotic animals, and refuges from clearing. The latter may include large areas that are not suitable for clearing because of land suitability/capability.
- Ic - areas with concentrations of disjunct populations.
- Id - areas with concentrations of taxa at the limits of their geographic ranges.
- Ie - areas with high species richness.
- If - areas with concentrations of relictual populations (ancient and primitive taxa).
- Ig - areas containing REs with distinct variation in species composition associated with geomorphology and other environmental variables.
- Ih - an artificial waterbody or managed/manipulated wetland considered by the panel/s to be of ecological significance.
- Ii - areas with a high density of hollow-bearing trees that provide habitat for animals.
- Ij - breeding or roosting sites used by a significant number of individuals.
- Ik - climate change refuge.

The following table identifies the value and extent area of the Other Essential Criteria H and I within the AOI.

Table 13: Relative importance of expert panel criteria (H and I) used to access overall biodiversity significance with respect to the AOI

Expert Panel	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
H: Core Habitat Priority Taxa								
Ia: Centres of Endemism			1.19	0.1				
Ib: Wildlife Refugia	1.19	0.1	2,169.57	91.5				

Expert Panel	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
Ic: Disjunct Populations	1.19	0.1						
Id: Limits of Geographic Ranges	1.19	0.1						
Ie: High Species Richness	1.19	0.1						
If: Relictual Populations								
Ig: Variation in Species Composition								
Ih: Artificial Wetland								
Ii: Hollow Bearing Trees	1.19	0.1						
Ij: Breeding or Roosting Site	1.19	0.1						
Ik: Climate Refugia								

NB. Whilst biodiversity values associated with Criteria I may be present within the site (refer to tables 12 and 15), for the New England Tableland and Central Queensland Coast BPAs, area and % area figures associated with Criteria Ia through to Ij cannot be listed in the table above (due to slight variations in data formats between BPAs).

Criteria J. Corridors: areas identified under this criterion qualify either because they are existing vegetated corridors important for contiguity, or cleared areas that could serve this purpose if revegetated. Some examples of corridors include riparian habitats, transport corridors and "stepping stones".

Bioregional and subregional conservation corridors have been identified in the more developed bioregions of Queensland through the BPAs, using an intensive process involving expert panels. Map 3 displays the location of corridors as identified under the Statewide Corridor network. The Statewide Corridor network incorporates BPA derived corridors and for bioregions where no BPA has been assessed yet, corridors derived under other planning processes. *Note: as a result of updating and developing a statewide network, the alignment of corridors may differ slightly in some instances when compared to those used in individual BPAs.*

The functions of these corridors are:

- **Terrestrial** Bioregional corridors, in conjunction with large tracts of remnant vegetation, maintain ecological and evolutionary processes at a landscape scale, by:

  • Maintaining long term evolutionary/genetic processes that allow the natural change in distributions of species and connectivity between populations of species over long periods of time;

  • Maintaining landscape/ecosystems processes associated with geological, altitudinal and climatic gradients, to allow for ecological responses to climate change;

  • Maintaining large scale seasonal/migratory species processes and movement of fauna;

  • Maximising connectivity between large tracts/patches of remnant vegetation;

  • Identifying key areas for rehabilitation and offsets; and

- **Riparian** Bioregional Corridors also maintain and encourage connectivity of riparian and associated ecosystems.

The location of the corridors is determined by the following principles:

- Terrestrial

  • Complement riparian landscape corridors (i.e. minimise overlap and maximise connectivity);

  • Follow major watershed/catchment and/or coastal boundaries;

- Incorporate major altitudinal/geological/climatic gradients;
- Include and maximise connectivity between large tracts/patches of remnant vegetation;
- Include and maximise connectivity between remnant vegetation in good condition; and

- Riparian
  - Located on the major river or creek systems within the bioregion in question.

The total extent of remnant vegetation triggered as being of "State", "Regional" or "Local" significance due to the presence of an overlying BPA derived terrestrial or riparian corridor within the AOI, is provided in the following table. For further information on how remnant vegetation is triggered due to the presence of an overlying BPA derived corridor, refer to the relevant landscape BPA expert panel report(s).

Table 14: Extent of triggered remnant vegetation due to the presence of BPA derived corridors with respect to the AOI

Biodiversity Significance	Area (Ha)	% of AOI
State	89.3	3.77
Regional	0.0	0.0
Local	0.0	0.0

NB: area figures associated with the extent of corridor triggered remnant vegetation are only available for those bioregions where a BPA has been undertaken.

Refer to **Map 3** for further information.

Threatening process/condition (Criteria K) - areas identified by experts under this criterion may be used to amend (upgrade or downgrade) biodiversity significance arising from the "first-cut" analysis. The condition of remnant vegetation is affected by threatening processes such as weeds, ferals, grazing and burning regime, selective timber harvesting/removal, salinity, soil erosion, and climate change.

Assessment of Criteria K with respect to the AOI is not currently included in the "Biodiversity and Conservation Values" report, as it has not been applied to the majority of Queensland due to data/information limitations and availability.

Special Area Decisions

Expert panel derived "Special Area Decisions" are used to assign values to Other Essential Criteria. The specific decisions which relate to the AOI in question are listed in the table below.

Table 15: Expert panel decisions for assigning levels of biodiversity significance with respect to the AOI

Decision Number	Description	Panel Recommended Significance	Criteria Values
brbn_l_17a	None	None	None
eiu_fa_24	Eastern ecotone	State	Ia (centre of endemism): HIGH Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): VERY HIGH Id (taxa at the limits of their ranges): VERY HIGH Ie (high species richness): VERY HIGH Ii (high density of hollow-bearing trees): VERY HIGH Ij (significant breeding or roosting sites): VERY HIGH
eiu_l_32	Bioregional Terrestrial Corridors	State or Regional	J (corridors): State or Regional
wet_l_25	Core areas	Regional	Ib (refugia): H
wet_l_30a	Terrestrial bioregional corridors (landscape connections) .	State	Criterion J (terrestrial corridor): STATE

Expert panel decision descriptions:

brbn_l_17a

None

eiu_fa_24

The Eastern ecotone of the Einasleigh Uplands is a band of eucalypt forest separating the rainforest of the Wet Tropics from the dry tropical woodlands that characterize the bioregion. These better developed forests support a number of species that are endemic to the ecotone, or are isolated populations of species more widely distributed in the wet sclerophyll forest of south-east Queensland. These species include the northern bettong (**Bettongia tropica**), eastern yellow robin (**Eopsaltria australis**), yellow thornbill (**Acanthiza nana**), greater glider (**Petauroides volans**), Squirrel glider (**Petaurus norfolcensis**), crested shrike-tit (**Falcunculus frontatus**) and the yellow-faced honeyeater (**Lichenostomus chrysops**). Disjunct tree species that have the major part of their North Queensland distribution in the ecotone include **Eucalyptus resinifera, E. pellita, E. grandis, E. moluccana, E. reducta, E. cloeziana, E. citriodora** and **Angophora floribunda.**

eiu_l_32

This terrestrial corridors decision identifies major themes of habitat connectivity across the bioregion. They identify north/south and east/west links that cover higher altitude areas along watersheds and mountain ranges, and areas characterised by a relative continuity of similar or related habitats, using the methodology outlined in EPA 2008. Identified corridor centrelines are buffered according to the significance of the centreline and the landscape context within which it occurs

Decision eiu_l_22 Corridor Special Management Areas identifies areas where values associated with landscape scale habitat connectivity have been compromised.

wet_l_25

Tracts are defined as patches of continuous remnant vegetation. The size of any tract is a major indicator of ecological significance and is strongly correlated with the long-term viability of biodiversity values. Larger tracts are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller tracts. These areas can be considered core nodes/refugia in which a large proportion of the bioregions biodiversity is represented.

A modified tract size analysis (Criterion C) (EHP 2014) was used to identify and delineate discrete tracts of remnant vegetation at a bioregion scale. For the purpose of the assessment, a core area was identified as a relatively contiguous area of remnant vegetation (disregarding small perforations, or linear breaks) and which was generally greater than 5km in width (based upon the minimum width of the terrestrial corridor network). Tracts of greater than 2,000ha were included.

wet_l_30a

The broad purpose of landscape-scale connections, is to provide for ecological and evolutionary processes at a bioregional scale. Maintaining connectivity across a landscape, either through "continuous linkages" or via "stepping-stones" of remnant vegetation, is important for the long-term conservation of biodiversity.

Corridor triggered remnant vegetation is focused upon areas between core tracts/nodes (as identified under the special area decision wet_l_25) within the bioregion. For further information regarding the broad principles and intent, as well as more specific information relating to the Wet Tropics terrestrial corridor network, refer to Section 3.3.2.1 and Table 14.

Aquatic Conservation Assessments

Introduction

The Aquatic Biodiversity Assessment and Mapping Method or AquaBAMM (Clayton *et al.* 2006), was developed to assess conservation values of wetlands in queensland, and may also have application in broader geographical contexts. It is a comprehensive method that uses available data, including data resulting from expert opinion, to identify relative wetland conservation/ecological values within a specified study area (usually a catchment). The product of applying this method is an Aquatic Conservation Assessment (ACA) for the study area.

An ACA using AquaBAMM is non-social, non-economic and identifies the conservation/ecological values of wetlands at a user-defined scale. It provides a robust and objective conservation assessment using criteria, indicators and measures that are founded upon a large body of national and international literature. The criteria, each of which may have variable numbers of indicators and measures, are naturalness (aquatic), naturalness (catchment), diversity and richness, threatened species and ecosystems, priority species and ecosystems, special features, connectivity and representativeness. An ACA using AquaBAMM is a powerful decision support tool that is easily updated and simply interrogated through a geographic information system (GIS).

Where they have been conducted, ACAs can provide a source of baseline wetland conservation/ecological information to support natural resource management and planning processes. They are useful as an independent product or as an important foundation upon which a variety of additional environmental and socio-economic elements can be added and considered (i.e. an early input to broader 'triple-bottom-line' decision-making processes). An ACA can have application in:

- determining priorities for protection, regulation or rehabilitation of wetlands and other aquatic ecosystems
- on-ground investment in wetlands and other aquatic ecosystems
- contributing to impact assessment of large-scale development (e.g. dams)
- water resource and strategic regional planning prcesses

For a detailed explanation of the methodology please refer to the summary and expert panel reports relevant to the ACA utilised in this assessment. These reports can be accessed at Wetland *Info*:

http://wetlandinfo.des.qld.gov.au/wetlands/assessment/assessment-methods/aca

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

http://qspatial.information.qld.gov.au/geoportal/

Explanation of Criteria

Under the AquaBAMM, eight criteria are assessed to derive an overall conservation value. Similar to the Biodiversity Assessment and Mapping Methodology, the criteria may be primarily diagnostic (quantitative) or primarily expert opinion (qualitative) in nature. The following sections provide a brief description of each of the 8 criteria.

Criteria 1. Naturalness - Aquatic: This attribute reflects the extent to which a wetland's (riverine, non-riverine, estuarine) aquatic state of naturalness is affected through relevant influencing indicators which include: presence of exotic flora and fauna; presence of aquatic communities; degree of habitat modification and degree of hydrological modification.

Criteria 2. Naturalness - Catchment: The naturalness of the terrestrial systems of a catchment can have an influence on many wetland characteristics including: natural ecological processes e.g. nutrient cycling, riparian vegetation, water chemistry, and flow. The indicators utilised to assess this criterion include: presence of exotic flora and/or fauna; riparian, catchment and flow modification.

Criteria 3. Naturalness - Diversity and Richness: This criterion is common to many ecological assessment methods and can include both physical and biological features. It includes such indicators as species richness, riparian ecosystem richness and geomorphological diversity.

Criteria 4. Threatened Species and Ecosystems: This criterion evaluates ecological rarity characteristics of a wetland. This includes both species rarity and rarity of communities / assemblages. The communities and assemblages are best represented by regional ecosystems. Species rarity is determined by NCA and EPBC status with Endangered, Vulnerable or Near-threatened species being included in the evaluation. Ecosystem rarity is determined by regional ecosystem biodiversity status i.e. Endangered, Of Concern, or Not of Concern.

Criteria 5. Priority Species and Ecosystems: Priority flora and fauna species lists are expert panel derived. These are aquatic, semi-aquatic and riparian species which exhibit at least 1 particular trait in order to be eligible for consideration. For

flora species the traits included:

- It forms significant macrophyte beds (in shallow or deep water).
- It is an important food source.
- It is important/critical habitat.
- It is implicated in spawning or reproduction for other fauna and/or flora species.
- It is at its distributional limit or is a disjunct population.
- It provides stream bank or bed stabilisation or has soil binding properties.
- It is a small population and subject to threatening processes.

Fauna species are included if they meet at least one of the following traits:

- It is endemic to the study area (>75 per cent of its distribution is in the study area/catchment).
- It has experienced, or is suspected of experiencing, a serious population decline.
- It has experienced a significant reduction in its distribution and has a naturally restricted distribution in the study area/catchment.
- It is currently a small population and threatened by loss of habitat.
- It is a significant disjunct population.
- It is a migratory species (other than birds).
- A significant proportion of the breeding population (>one per cent for waterbirds, >75 per cent other species) occurs in the waterbody (see Ramsar criterion 6 for waterbirds).
- Limit of species range.

See the individual expert panel reports for the priority species traits specific to an ACA.

Criteria 6. Special Features: Special features are areas identified by flora, fauna and ecology expert panels which exhibit characteristics beyond those identified in other criteria and which the expert panels consider to be of the highest ecological importance. Special feature traits can relate to, but are not solely restricted to geomorphic features, unique ecological processes, presence of unique or distinct habitat, presence of unique or special hydrological regimes e.g. spring-fed streams. Special features are rated on a 1 - 4 scale (4 being the highest).

Criteria 7. Connectivity: This criterion is based on the concept that appropriately connected aquatic ecosystems are healthy and resilient, with maximum potential biodiversity and delivery of ecosystem services.

Criteria 8. Representativeness: This criterion applies primarily to non-riverine assessments, evaluates the rarity and uniqueness of a wetland type in relation to specific geographic areas. Rarity is determined by the degree of wetland protection within "protected Areas" estate or within an area subject to the *Fisheries Act 1994*, *Coastal Protection and Management Act 1995*, or *Marine Parks Act 2004*. Wetland uniqueness evaluates the relative abundance and size of a wetland or wetland management group within geographic areas such as catchment and subcatchment.

Riverine Wetlands

Riverine wetlands are all wetlands and deepwater habitats within a channel. The channels are naturally or artificially created, periodically or continuously contain moving water, or connecting two bodies of standing water. AquaBAMM, when applied to riverine wetlands uses a discrete spatial unit termed subsections. A subsection can be considered as an area which encompasses discrete homogeneous stream sections in terms of their natural attributes (i.e. physical, chemical, biological and utilitarian values) and natural resources. Thus in an ACA, an aquatic conservation significance score is calculated for each subsection and applies to all streams within a subsection, rather than individual streams as such.

Please note, the area figures provided in Tables 16 and 17, are derived using the extent of riverine subsections within the AOI. Refer to **Map 5** for further information. A summary of the conservation significance of riverine wetlands within the AOI is provided in the following table.

Table 16: Overall level/s of riverine aquatic conservation significance

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
Very High	2,247.07	94.77

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
High	5.99	0.25
Medium	117.94	4.97
Low	0.0	0.0
Very Low	0.0	0.0

The individual aquatic conservation criteria ratings for riverine wetlands within the AOI are listed below.

Table 17: Level/s of riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic	2,365.01	99.7					5.99	0.3
2. Naturalness catchment	2,371.00	100.0						
3. Diversity and richness			5.99	0.3	2,247.07	94.8	117.94	5.0
4. Threatened species and ecosystems	2,253.06	95.0	117.94	5.0				
5. Priority species and ecosystems			1,138.24	48.0				
6. Special features	2,247.07	94.8						
7. Connectivity			1,226.77	51.7	5.99	0.3	1,138.24	48.0
8. Representative-ness								

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to riverine wetlands within the AOI.

Table 18: Expert panel decisions for assigning overall levels of riverine aquatic conservation significance

Decision number	Special feature	Catchment	Criteria/Indicator/Measure	Conservation rating (1-4)
bp_r_ec_02	Upper Burdekin/ Wet Tropics	Burdekin Upper	6.2.1 6.3.3	4

4 is the highest rating/value

Expert panel decision descriptions:

bp_r_ec_02

This area contains distinct special ecological processes providing extremely valuable fauna habitat areas. This area is biogeographically interesting in terms of rainforest streams with 'inland' drainage. There has also been a major reduction in populations of key top order predator Anguillid eels since the construction of the Burdekin Falls Dam.

Non-riverine Wetlands

Non-riverine wetlands include both lacustrine and palustrine wetlands, however, do not currently incorporate estuarine, marine or subterranean wetland types. A summary of the conservation significance of non-riverine wetlands within the AOI is provided in the following table. Refer to **Map 6** for further information.

Table 19: Overall level/s of non-riverine aquatic conservation significance

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
(No Records)		

The following table provides an assessment of non-riverine wetlands within the AOI and associated aquatic conservation criteria values.

Table 20: Level/s of non-riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
(No Records)								

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to non-riverine wetlands within the AOI.

Table 21: Expert panel decisions for assigning overall levels of non-riverine aquatic conservation significance.

Decision number	Special feature	Catchment	Criteria/Indicator/Measure	Conservation rating (1-4)
(No Records)				

4 is the highest rating/value

Expert panel decision descriptions:

(No Records)

Threatened and Priority Species

Introduction

This chapter contains a list of threatened and priority flora and/or fauna species that have been recorded on, or within 4km of the Assessment Area.

The information presented in this chapter with respect to species presence is derived from compiled databases developed primarily for the purpose of BPAs and ACAs. Data is collated from a number of sources and is updated periodically.

It is important to note that the list of species provided in this report, may differ when compared to other reports generated from other sources such as the State government's WildNet, Herbrecs or the federal government's EPBC database for a number of reasons.

Records for threatened and priority species are filtered and checked based on a number of rules including:

- Taxonomic nomenclature - current scientific names and status,
- Location - cross-check co-ordinates with location description,
- Taxon by location - requires good knowledge of the taxon and history of the record,
- Duplicate records - identify and remove,
- Expert panels - check records and provide new records,
- Flora cultivated records excluded,
- Use precise records less than or equal to 2000m,
- Use recent records greater than or equal to 1975 animals, greater than or equal to 1950 plants.

Threatened Species

Threatened species are those species classified as "Endangered" or "Vulnerable" under the *Environment Protection and Biodiversity Conservation Act 1999* or "Endangered", "Vulnerable" or "Near threatened" under the *Nature Conservation Act 1992*.

The following threatened species have been recorded on, or within approximately 4km of the AOI.

Table 22: Threatened species recorded on, or within 4km of the AOI

Species	Common name	NCA status	EPBC status	Back on Track rank	Migratory species*	Wetland species**	Identified flora/fauna
Casuarius casuarius johnsonii (southern population)	southern cassowary (southern population)	E	E	Critical			FA

NB. Please note that the threatened species listed in this section are based upon the most recently compiled DES internal state-wide threatened species dataset. This dataset may contain additional records that were not originally available for inclusion in the relevant individual BPAs and ACAs.

**JAMBA - Japan-Australia Migratory Bird Agreement; CAMBA - China-Australia Migratory Bird Agreement; ROKAMBA - Republic of Korea-Australia Migratory Bird Agreement; CMS - Convention on the Conservation of Migratory Species.*

***Y - wetland indicator species.*

BPA Priority Species

A list of BPA priority species that have been recorded on, or within approximately 4km of the AOI is contained in the following table.

Table 23: Priority species recorded on, or within 4km of the AOI

Species	Common name	Back on Track rank	Identified flora/fauna
Aepyprymnus rufescens	Rufous Bettong	Low	FA

NB. Please note that the list of priority species is based on those species identified in the BPAs, however records for these species may be more recent than the originals used. furthermore, the BPA priority species databases are updated from time to time. At each update, the taxonomic details for all species are amended as necessary to reflect current taxonomic name

and/or status changes.

ACA Priority Species

A list of ACA priority species used in riverine and non-riverine ACAs that have been recorded on, or within approximately 4km of the AOI are contained in the following tables.

Table 24: Priority species recorded on, or within 4 km of the AOI - riverine

(no results)

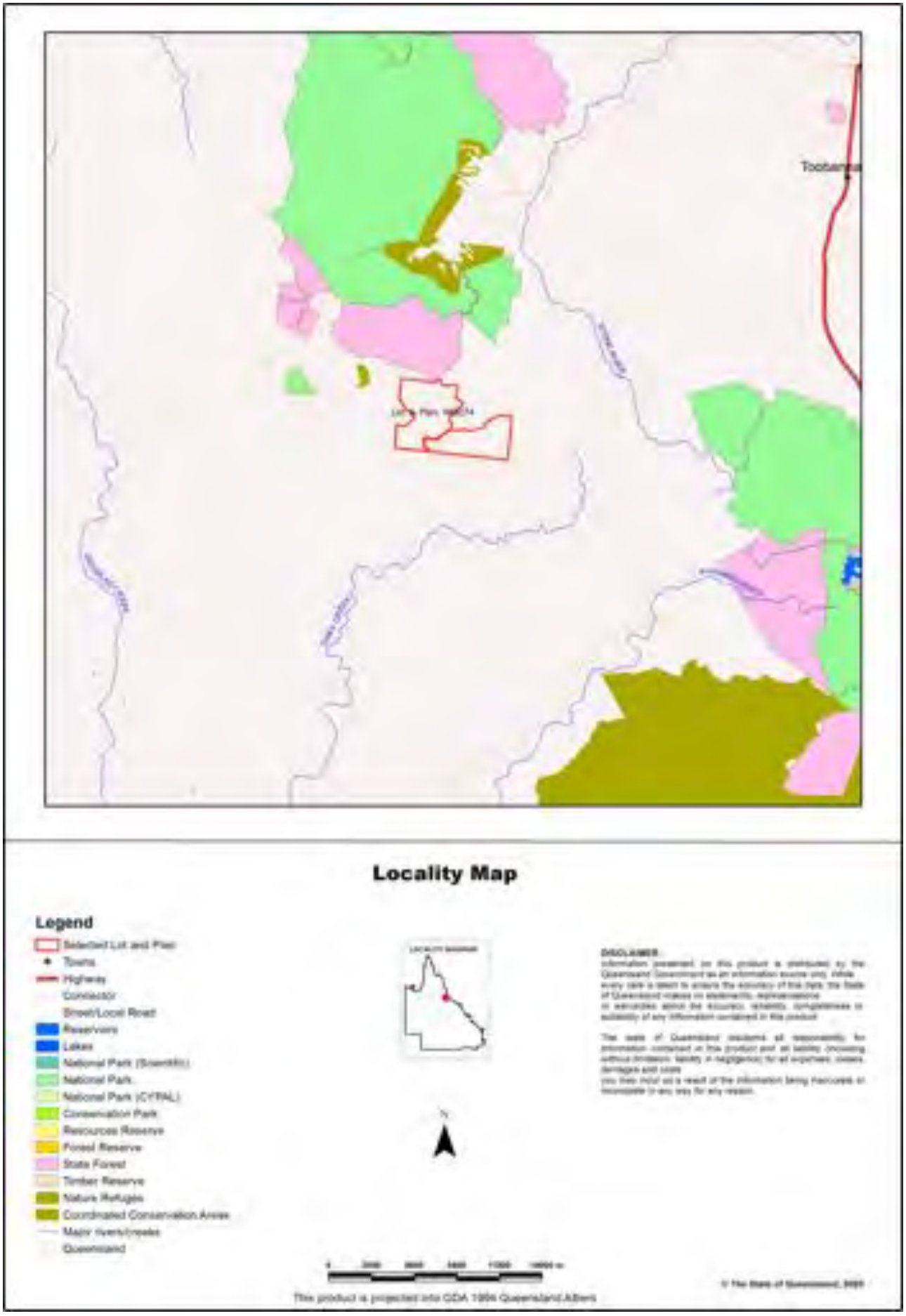
Table 25: Priority species recorded on, or within 4 km of the AOI - non-riverine

(no results)

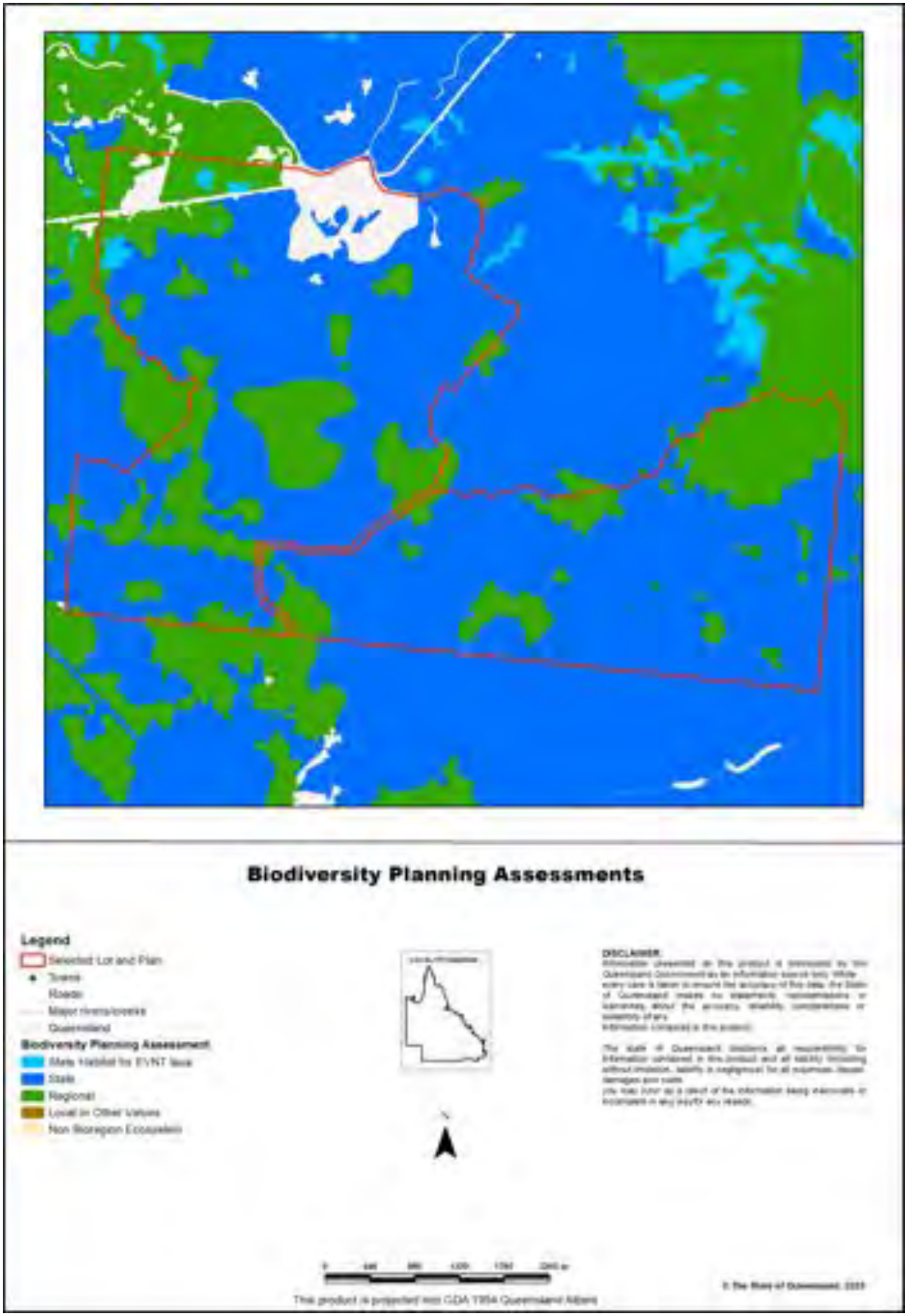
NB. Please note that the priority species records used in the above two tables are comprised of those adopted for the released individual ACAs. The ACA riverine and non-riverine priority species databases are updated from time to time to reflect new release of ACAs. At each update, the taxonomic details for all ACAs records are amended as necessary to reflect current taxonomic name and/or status changes.

Maps

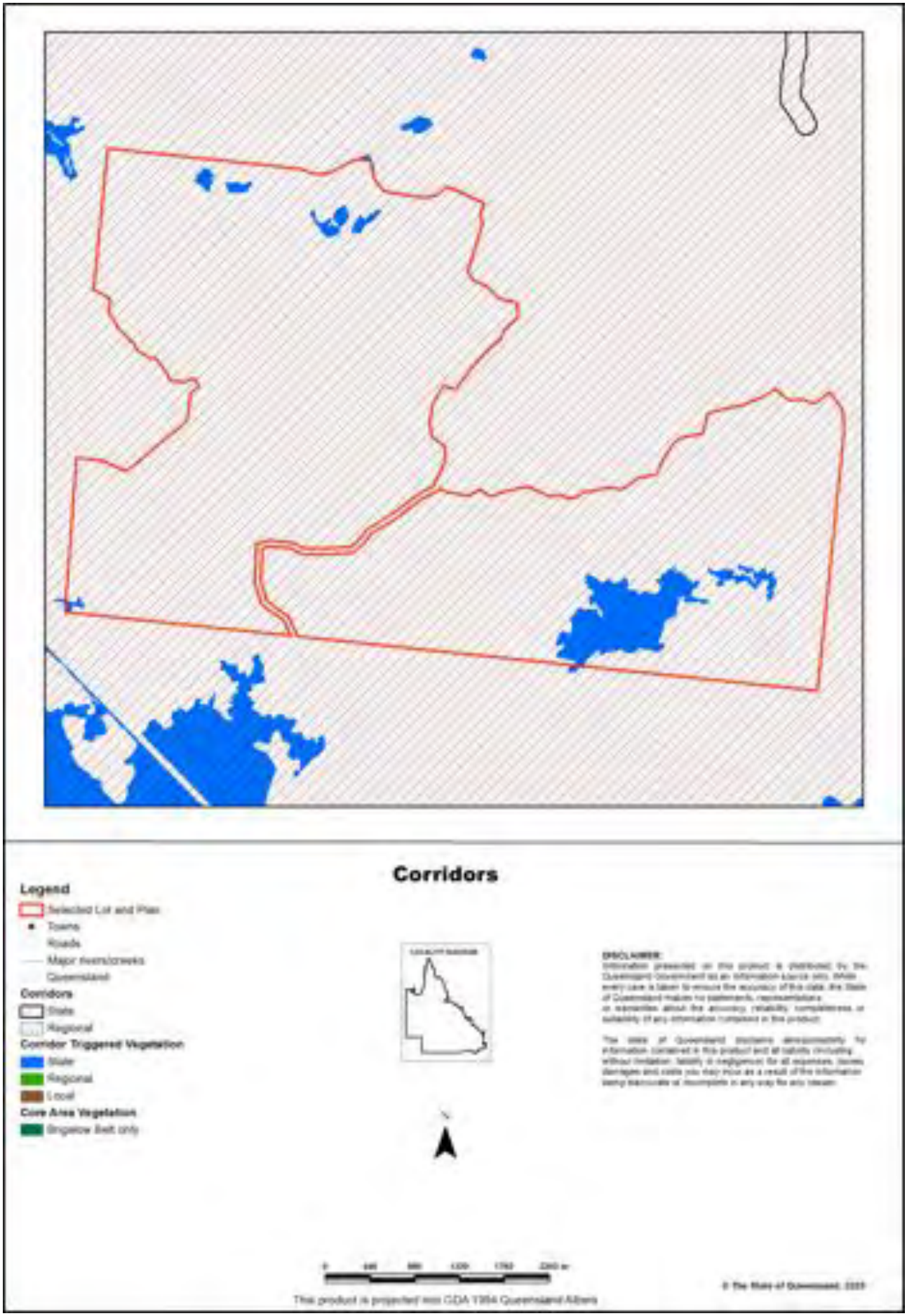
Map 1 - Locality Map



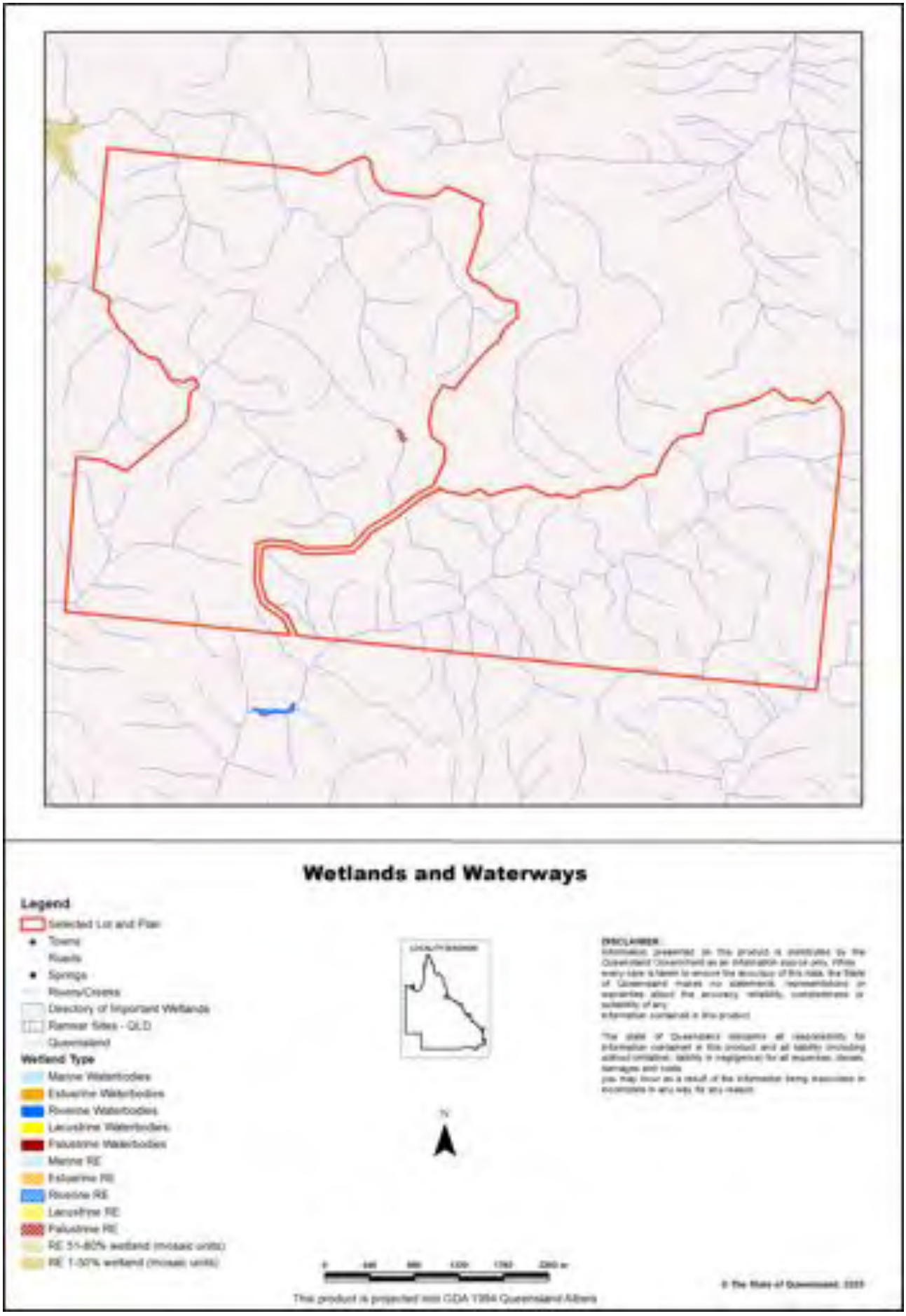
Map 2 - Biodiversity Planning Assessment (BPA)



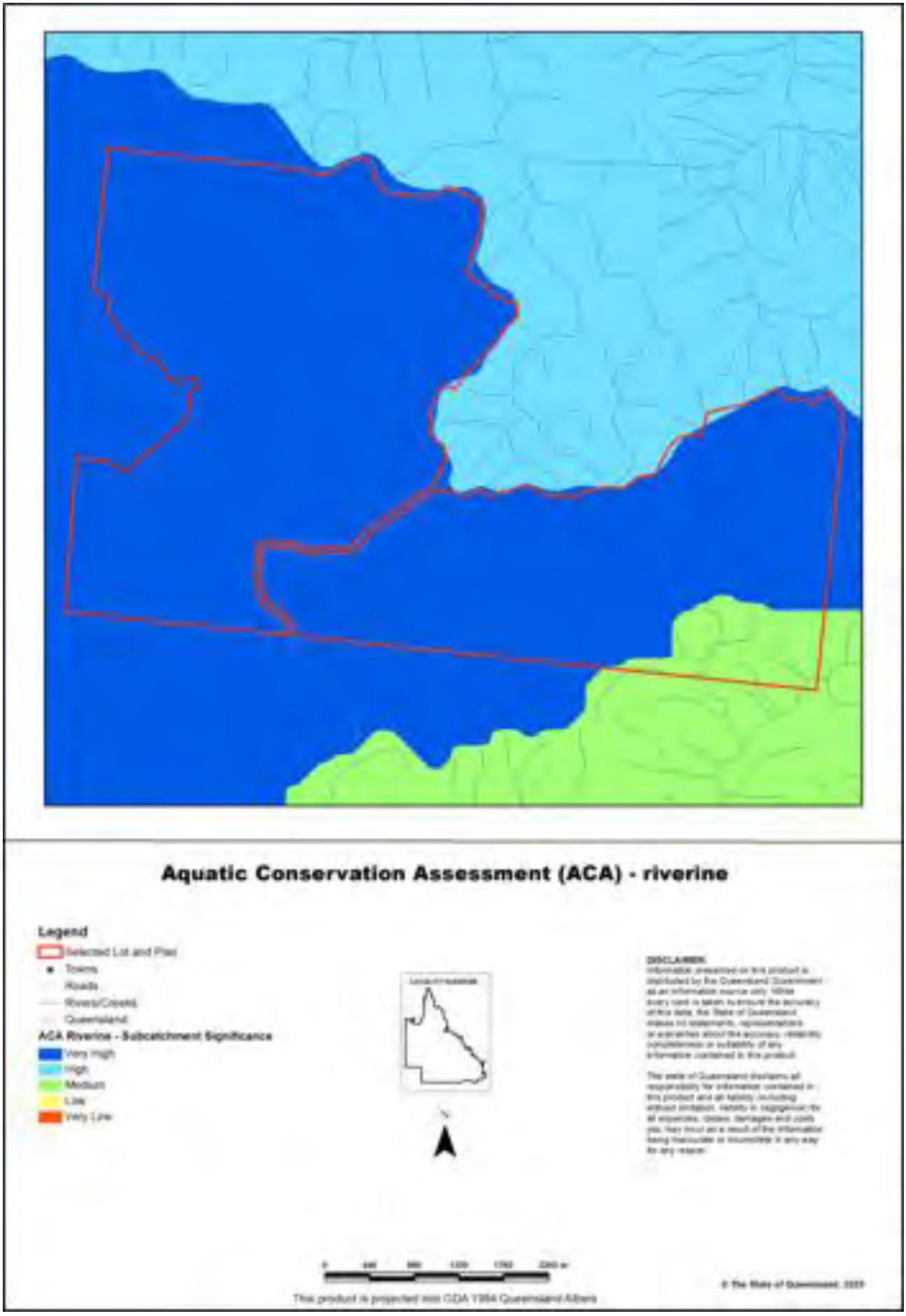
Map 3 - Corridors



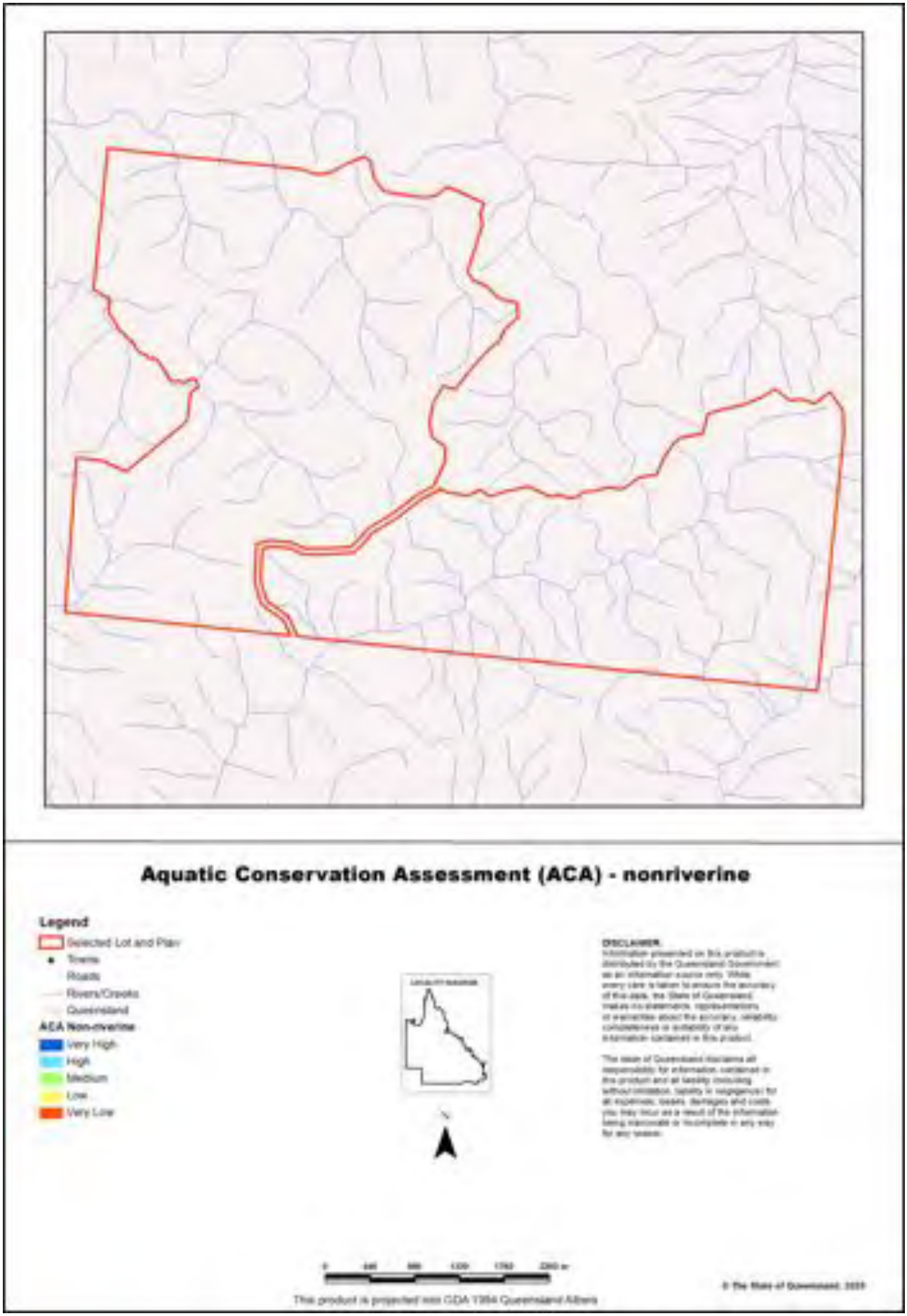
Map 4 - Wetlands and waterways



Map 5 - Aquatic Conservation Assessment (ACA) - riverine



Map 6 - Aquatic Conservation Assessment (ACA) - non-riverine



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http://wetlandinfo.des.qld.gov.au/wetlands/assessment/assessment-methods/aca/

Environmental Protection Agency (2002) *Biodiversity Assessment and Mapping Methodology. Version 2.1, July 2002.* (Environmental Protection Agency, Brisbane).

Morton, S. R., Short, J. and Barker, R. D. with an Appendix by G.F. Griffin and G. Pearce (1995). *Refugia for Biological Diversity in Arid and Semi-arid Australia. Biodiversity Series* , Paper No. 4, Biodiversity Unit, Environment Australia.

Sattler, P.S. and Williams, R.D. (eds) (1999). *The Conservation Status of Queensland's Bioregional Ecosystems*. Environmental Protection Agency, Brisbane.

Appendices

Appendix 1 - Source Data

Theme	Datasets
Aquatic Conservation Assessments Non-riverine*	Combination of the following datasets: Cape York Peninsula Non-riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Non-riverine v1.3 Lake Eyre and Bulloo Basins v1.1 QMDB Non-riverine ACA v1.4 Southeast Queensland ACA v1.1 WBB Non-riverine ACA v1.1
Aquatic Conservation Assessments Riverine*	Combination of the following datasets: Cape York Peninsula Riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Riverine v1.1 Lake Eyre and Bulloo Basins v1.1 QMDB Riverine ACA v1.4 Southeast Queensland ACA v1.1 WBB Riverine ACA v1.1
Biodiversity Planning Assessments*	Combination of the following datasets: Brigalow Belt BPA v2.1 Cape York Peninsula BPA v1.1 Central Queensland Coast BPA v1.3 Channel Country BPA v1.1 Desert Uplands BPA v1.3 Einasleigh Uplands BPA v1.1 Gulf Plains BPA v1.1 Mitchell Grass Downs BPA v1.1 Mulga Lands BPA v1.4 New England Tableland v2.3 Southeast Queensland v4.1 Wet Tropics v1.1
Statewide BPA Corridors*	Statewide corridors v1.5
Threatened Species	An internal DES database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
BPA Priority Species	An internal DES database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
ACA Priority Species	An internal DES database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.

***These datasets are available at:**

http://dds.information.qld.gov.au/DDS

Appendix 2 - Acronyms and Abbreviations

AOI	- Area of Interest
ACA	- Aquatic Conservation Assessment
AQUABAMM	- Aquatic Biodiversity Assessment and Mapping Methodology
BAMM	- Biodiversity Assessment and Mapping Methodology
BoT	- Back on Track
BPA	- Biodiversity Planning Assessment
CAMBA	- China-Australia Migratory Bird Agreement
DES	- Department of Environment and Science
EPBC	- *Environment Protection and Biodiversity Conservation Act 1999*
EVNT	- Endangered, Vulnerable, Near Threatened
GDA94	- Geocentric Datum of Australia 1994
GIS	- Geographic Information System
JAMBA	- Japan-Australia Migratory Bird Agreement
NCA	- *Nature Conservation Act 1992*
RE	- Regional Ecosystem
REDD	- Regional Ecosystem Description Database
ROKAMBA	- Republic of Korea-Australia Migratory Bird Agreement

Queensland Government

Department of Environment and Science

Environmental Reports

Biodiversity and Conservation Values

Biodiversity Planning Assessments and Aquatic Conservation Assessments

For the selected area of interest
Lot: 8 Plan: SP104503

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or Area of Interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "Central co-ordinates" option, the resulting assessment area encompasses an area extending from 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: biodiversity.planning@des.qld.gov.au

Disclaimer

Table of Contents

Summary Information

Tables 1 to 8 provide an overview of the AOI with respect to selected topographic and environmental values.

Table 1: Area of interest details: Lot: 8 Plan: SP104503

Size (ha)	21,345.35
Local Government(s)	Charters Towers Regional
Bioregion(s)	Einasleigh Uplands, Wet Tropics
Subregion(s)	Broken River, Paluma - Seaview
Catchment(s)	Herbert, Burdekin

The following table identifies available Biodiversity Planning Assessments (BPAs) and Aquatic Conservation Assessments (ACAs) with respect to the AOI.

Table 2: Available Biodiversity Planning and Aquatic Conservation Assessments

Assessment Type	Assessment Area and Version
Biodiversity Planning Assessment(s)	Einasleigh Uplands v1.1, Wet Tropics v1.1
Aquatic Conservation Assessment(s) (riverine)	Great Barrier Reef Catchments v1.3
Aquatic Conservation Assessment(s) (non-riverine)	Great Barrier Reef Catchments v1.3

Table 3: Remnant regional ecosystems within the AOI as per the Qld Herbarium's 'biodiversity status'

Biodiversity Status	Area (Ha)	% of AOI
Endangered	1,946.31	9.12
Of concern	3,356.07	15.72
No concern at present	15,780.42	73.93

The following table identifies the extent and proportion of the user specified area of interest (AOI) which is mapped as being of "State", "Regional" or "Local" significance via application of the Queensland Department of Environment and Science's *Biodiversity Assessment and Mapping Methodology* (BAMM).

Table 4: Summary table, biodiversity significance

Biodiversity significance	Area (Ha)	% of AOI
State Habitat for EVNT taxa	1,633.82	7.65
State	17,267.10	80.89
Regional	1,930.56	9.04
Local or Other Values	418.45	1.96

Table 5: Non-riverine wetlands intersecting the AOI

Non-riverine wetland types intersecting the area of interest	#
(No Records)	

NB. The figures presented in the table above are derived from the relevant non-riverine Aquatic Conservation Assessment(s). Later releases of wetland mapping produced via the Queensland Wetland Mapping Program may provide more recent information in regards to wetland extent.

Table 6: Named waterways intersecting the AOI

Name	Permanency
OAKY CREEK	Non-perennial
RUNNING RIVER	Non-perennial

Refer to **Map 1** for general locality information.

The following two tables identify the extent and proportion of the user specified AOI which is mapped as being of "Very High", "High", "Medium", "Low", or "Very Low" aquatic conservation value for riverine and non-riverine wetlands via application of the Queensland Department of Environment and Science's *Aquatic Biodiversity Assessment and Mapping Method* (AquaBAMM).

Table 7: Summary table, aquatic conservation significance (riverine)

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
Very High	16,258.69	76.17
High	7.1	0.03
Medium	5,079.61	23.8
Low	0.0	0.0
Very Low	0.0	0.0

Table 8: Summary table, aquatic conservation significance (non-riverine)

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
(No Records)		

Biodiversity Planning Assessments

Introduction

The Department of Environment and Science (DES) attributes biodiversity significance on a bioregional scale through a Biodiversity Planning Assessment (BPA). A BPA involves the integration of ecological criteria using the *Biodiversity assessment and Mapping Methodology* (BAMM) and is developed in two stages: 1) **diagnostic criteria**, and 2) **expert panel criteria**. The diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion, while the expert panel criteria allows for the refinement of the mapped information from the diagnostic output by incorporating local knowledge and expert opinion.

The BAMM methodology has application for identifying areas with various levels of significance solely for biodiversity reasons. These include threatened ecosystems or taxa, large tracts of habitat in good condition, ecosystem diversity, landscape context and connection, and buffers to wetlands or other types of habitat important for the maintenance of biodiversity or ecological processes. While natural resource values such as dryland salinity, soil erosion potential or land capability are not dealt with explicitly, they are included to some extent within the biodiversity status of regional ecosystems recognised by the DES.

Biodiversity Planning Assessments (BPAs) assign three levels of overall biodiversity significance.

- **State significance** - areas assessed as being significant for biodiversity at the bioregional or state scales. They also include areas assessed by other studies/processes as being significant at national or international scales. In addition, areas flagged as being of State significance due to the presence of endangered, vulnerable and/or near threatened taxa, are identified as "State Habitat for EVNT taxa".
- **Regional significance** - areas assessed as being significant for biodiversity at the subregional scale. These areas have lower significance for biodiversity than areas assessed as being of State significance.
- **Local significance and/or other values** - areas assessed as not being significant for biodiversity at state or regional scales. Local values are of significance at the local government scale.

For further information on released BPAs and a copy of the underlying methodology, go to:

http://www.qld.gov.au/environment/plants-animals/biodiversity/planning/

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

http://qspatial.information.qld.gov.au/geoportal/

The following table identifies the extent and proportion of the user specified AOI which is mapped as being of "State", "Regional" or "Local" significance via application of the BAMM.

Table 9: Summary table, biodiversity significance

Biodiversity significance	Area (Ha)	% of AOI
State Habitat for EVNT taxa	1,633.82	7.65
State	17,267.10	80.89
Regional	1,930.56	9.04
Local or Other Values	418.45	1.96

Refer to **Map 2** for further information.

Diagnostic Criteria

Diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion. These criteria are diagnostic in that they are used to filter the available data and provide a "first-cut" or initial determination of biodiversity significance. This initial assessment is then combined through a second group of other essential criteria.

A description of the individual diagnostic criteria is provided in the following sections.

Criteria A. Habitat for EVNT taxa: Classifies areas according to their significance based on the presence of endangered, vulnerable and/or rare (EVNT) taxa. EVNT taxa are those scheduled under the *Nature Conservation Act 1992* and/or the

Environment Protection and Biodiversity Conservation Act 1999. It excludes highly mobile fauna taxa which are instead considered in Criterion H and brings together information on EVNT taxa using buffering of recorded sites or habitat suitability models (HSM) where available.

Criteria B. Ecosystem value: Classifies on the basis of biodiversity status of regional ecosystems, their extent in protected areas (presence of poorly conserved regional ecosystems), the presence of significant wetlands; and areas of national importance such as the presence of Threatened Ecological Communities, World Heritage areas and Ramsar sites. Ecosystem value is applied at a bioregional (**B1**) and regional (**B2**) scale.

Criteria C. Tract size: Measures the relative size of tracts of vegetation in the landscape. The size of any tract is a major indicator of ecological significance, and is also strongly correlated with the long-term viability of biodiversity values. Larger tracts are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller tracts.

Criteria D. Relative size of regional ecosystems: Classifies the relative size of each regional ecosystem unit within its bioregion (**D1**) and its subregion (**D2**). Remnant units are compared with all other occurrences with the same regional ecosystem. Large examples of a regional ecosystem are more significant than smaller examples of the same regional ecosystem because they are more representative of the biodiversity values particular to the regional ecosystem, are more resilient to the effects of disturbance, and constitute a significant proportion of the total area of the regional ecosystem.

Criteria F. Ecosystem diversity: Is an indicator of the number of regional ecosystems occurring within an area. An area with high ecosystem diversity will have many regional ecosystems and ecotones relative to other areas within the bioregion.

Criteria G. Context and connection: Represents the extent to which a remnant unit incorporates, borders or buffers areas such as significant wetlands, endangered ecosystems; and the degree to which it is connected to other vegetation.

A summary of the biodiversity status based upon the diagnostic criteria is provided in the following table.

Table 10: Summary of biodiversity significance based upon diagnostic criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
State	Remnant contains an RE that is one of the largest of its type in the bioregion (D1) & Remnant has Ecosystem diversity in the top quartile (F)	2,014.77	9.44
State	Remnant contains an RE that is one of the largest of its type in the bioregion (D1) & Remnant has high connectivity or buffers an endangered RE or Sig. Wetland (G)	3,236.34	15.16
State	Remnant contains at least 1 Endangered or 2 Vulnerable or Near Threatened species (A)	1,633.82	7.65
State	Remnant contains at least 1 Endangered RE (B1)	1,825.60	8.55
State	Remnant contains at least one Of Concern RE (B1) & Is part of moderately large Tract (C) & Contains a RE that is a moderately large RE of its type in the bioregion (D1) & Has high connectivity or buffers an endangered RE or Significant Wetland (G)	340.69	1.6
State	Remnant contains at least one Of Concern RE (B1) & Remnant contains an RE that is one of the largest of its type in the bioregion (D1)	533.2	2.5
Regional	Remnant contains at least 1 Vulnerable or Near Threatened species (A)	14.38	0.07
Regional	Remnant contains at least one Of Concern RE (B1)	2,053.20	9.62
Local or Other Values	Refer to diagnostic data for additional information	9,354.04	43.82

Assessment of diagnostic criteria with respect to the AOI

The following table reflects an assessment of the individual diagnostic criteria noted above in regards to the AOI.

Table 11: Assessment of individual diagnostic criteria with respect to the AOI

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
A: Habitat for EVNT Taxa	1,633.78	7.7	112.65	0.5	13,066.85	61.2	6,192.72	29.0
B1: Ecosystem Value (Bioregion)	1,947.89	9.1	3,373.54	15.8	9,727.06	45.6	5,957.51	27.9
B2: Ecosystem Value (Subregion)	734.98	3.4			3,682.65	17.3	16,588.37	77.7
C: Tract Size			21,006.00	98.4				
D1: Relative RE Size (Bioregion)	8,536.25	40.0	608.19	2.8	6,070.16	28.4	5,791.40	27.1
D2: Relative RE Size (Subregion)	8,942.32	41.9	719.74	3.4	5,920.16	27.7	5,423.78	25.4
F: Ecosystem Diversity	6,519.88	30.5	9,630.04	45.1	4,837.03	22.7	19.05	0.1

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
G: Context and Connection	20,431.89	95.7	504.2	2.4	69.91	0.3		

Other Essential Criteria

Other essential criteria (also known as expert panel criteria) are based on non-uniform information sources and which may rely more upon expert opinion than on quantitative data. These criteria are used to provide a "second-cut" determination of biodiversity significance, which is then combined with the diagnostic criteria for an overall assessment of relative biodiversity significance. A summary of the biodiversity status based upon the other essential criteria is provided in the following table.

Table 12: Summary of biodiversity significance based upon other essential criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
State	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I)	3,316.26	15.54
State	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I) & Remnant forms part of a bioregional corridor (J)	12,399.58	58.09
State	Remnant forms part of a bioregional corridor (J)	365.51	1.71
Regional	Refer to Expert Panel data for additional information	4.62	0.02
Regional	Remnant contains Special Biodiversity Values (view Expert Panel data for further information) (I)	4,711.82	22.07
Regional	Remnant forms part of a bioregional corridor (J)	1.13	0.01

A description of each of the other essential criteria and associated assessment in regards to the AOI is provided in the following sections.

Criteria H. Essential and general habitat for priority taxa: Priority taxa are those which are at risk or of management concern, taxa of scientific interest as relictual (ancient or primitive), endemic taxa or locally significant populations (such as a flying fox camp or heronry), highly specialised taxa whose habitat requirements are complex and distributions are not well correlated with any particular regional ecosystem, taxa important for maintaining genetic diversity (such as complex spatial patterns of genetic variation, geographic range limits, highly disjunct populations), taxa critical for management or monitoring of biodiversity (functionally important or ecological indicators), or economic and culturally important taxa.

Criteria I. Special biodiversity values: areas with special biodiversity values are important because they contain multiple taxa in a unique ecological and often highly biodiverse environment. Areas with special biodiversity values can include the following:

- Ia - centres of endemism - areas where concentrations of taxa are endemic to a bioregion or subregion are found.
- Ib - wildlife refugia (Morton *et al.* 1995), for example, islands, mound springs, caves, wetlands, gorges, mountain ranges and topographic isolates, ecological refuges, refuges from exotic animals, and refuges from clearing. The latter may include large areas that are not suitable for clearing because of land suitability/capability.
- Ic - areas with concentrations of disjunct populations.
- Id - areas with concentrations of taxa at the limits of their geographic ranges.
- Ie - areas with high species richness.
- If - areas with concentrations of relictual populations (ancient and primitive taxa).
- Ig - areas containing REs with distinct variation in species composition associated with geomorphology and other environmental variables.
- Ih - an artificial waterbody or managed/manipulated wetland considered by the panel/s to be of ecological significance.
- Ii - areas with a high density of hollow-bearing trees that provide habitat for animals.

- Ij - breeding or roosting sites used by a significant number of individuals.
- Ik - climate change refuge.

The following table identifies the value and extent area of the Other Essential Criteria H and I within the AOI.

Table 13: Relative importance of expert panel criteria (H and I) used to access overall biodiversity significance with respect to the AOI

Expert Panel	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
H: Core Habitat Priority Taxa	643.81	3.0	897.96	4.2	1,080.28	5.1		
Ia: Centres of Endemism	3,532.48	16.5	12,672.09	59.4				
Ib: Wildlife Refugia	15,596.49	73.1	4,751.86	22.3	79.3	0.4		
Ic: Disjunct Populations	15,062.43	70.6	531.48	2.5	610.66	2.9		
Id: Limits of Geographic Ranges	15,299.98	71.7	904.59	4.2				
Ie: High Species Richness	15,636.57	73.3	590.31	2.8				
If: Relictual Populations			1,753.50	8.2	1,816.34	8.5		
Ig: Variation in Species Composition	2,035.79	9.5	12,688.32	59.4				
Ih: Artificial Wetland								
Ii: Hollow Bearing Trees	14,689.32	68.8	207.89	1.0				
Ij: Breeding or Roosting Site	13,118.23	61.5	1,778.98	8.3				
Ik: Climate Refugia			1,778.98	8.3	610.66	2.9		

NB. Whilst biodiversity values associated with Criteria I may be present within the site (refer to tables 12 and 15), for the New England Tableland and Central Queensland Coast BPAs, area and % area figures associated with Criteria Ia through to Ij cannot be listed in the table above (due to slight variations in data formats between BPAs).

Criteria J. Corridors: areas identified under this criterion qualify either because they are existing vegetated corridors important for contiguity, or cleared areas that could serve this purpose if revegetated. Some examples of corridors include riparian habitats, transport corridors and "stepping stones".

Bioregional and subregional conservation corridors have been identified in the more developed bioregions of Queensland through the BPAs, using an intensive process involving expert panels. Map 3 displays the location of corridors as identified under the Statewide Corridor network. The Statewide Corridor network incorporates BPA derived corridors and for bioregions where no BPA has been assessed yet, corridors derived under other planning processes. *Note: as a result of updating and developing a statewide network, the alignment of corridors may differ slightly in some instances when compared to those used in individual BPAs.*

The functions of these corridors are:

- **Terrestrial** Bioregional corridors, in conjunction with large tracts of remnant vegetation, maintain ecological and evolutionary processes at a landscape scale, by:

• Maintaining long term evolutionary/genetic processes that allow the natural change in distributions of species and connectivity between populations of species over long periods of time;

• Maintaining landscape/ecosystems processes associated with geological, altitudinal and climatic gradients, to allow for ecological responses to climate change;

• Maintaining large scale seasonal/migratory species processes and movement of fauna;

• Maximising connectivity between large tracts/patches of remnant vegetation;

• Identifying key areas for rehabilitation and offsets; and

- **Riparian** Bioregional Corridors also maintain and encourage connectivity of riparian and associated ecosystems.

The location of the corridors is determined by the following principles:

- Terrestrial

• Complement riparian landscape corridors (i.e. minimise overlap and maximise connectivity);

• Follow major watershed/catchment and/or coastal boundaries;

• Incorporate major altitudinal/geological/climatic gradients;

• Include and maximise connectivity between large tracts/patches of remnant vegetation;

• Include and maximise connectivity between remnant vegetation in good condition; and

- Riparian

• Located on the major river or creek systems within the bioregion in question.

The total extent of remnant vegetation triggered as being of "State", "Regional" or "Local" significance due to the presence of an overlying BPA derived terrestrial or riparian corridor within the AOI, is provided in the following table. For further information on how remnant vegetation is triggered due to the presence of an overlying BPA derived corridor, refer to the relevant landscape BPA expert panel report(s).

Table 14: Extent of triggered remnant vegetation due to the presence of BPA derived corridors with respect to the AOI

Biodiversity Significance	Area (Ha)	% of AOI
State	12,765.09	59.8
Regional	1.13	0.01
Local	0.0	0.0

NB: area figures associated with the extent of corridor triggered remnant vegetation are only available for those bioregions where a BPA has been undertaken.

Refer to **Map 3** for further information.

Threatening process/condition (Criteria K) - areas identified by experts under this criterion may be used to amend (upgrade or downgrade) biodiversity significance arising from the "first-cut" analysis. The condition of remnant vegetation is affected by threatening processes such as weeds, ferals, grazing and burning regime, selective timber harvesting/removal, salinity, soil erosion, and climate change.

Assessment of Criteria K with respect to the AOI is not currently included in the "Biodiversity and Conservation Values" report, as it has not been applied to the majority of Queensland due to data/information limitations and availability.

Special Area Decisions

Expert panel derived "Special Area Decisions" are used to assign values to Other Essential Criteria. The specific decisions which relate to the AOI in question are listed in the table below.

Table 15: Expert panel decisions for assigning levels of biodiversity significance with respect to the AOI

Decision Number	Description	Panel Recommended Significance	Criteria Values
brbn_l_17a	None	None	None
eiu_fa_24	Eastern ecotone	State	Ia (centre of endemism): HIGH Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): VERY HIGH Id (taxa at the limits of their ranges): VERY HIGH Ie (high species richness): VERY HIGH Ii (high density of hollow-bearing trees): VERY HIGH Ij (significant breeding or roosting sites): VERY HIGH
eiu_fa_30	High precision records for priority taxa of Regional significance are contained within the remnant.	Regional	Criterion H: HIGH
eiu_fa_31	Low precision records for priority taxa of Regional significance are contained within the remnant.	None	Criterion H: MEDIUM
eiu_fl_24	High precision records for priority taxa of State significance are contained within the remnant.	State	Criterion H: VERY HIGH
eiu_fl_25	Low precision records for priority taxa of State significance are contained within the remnant.	None	Criterion H: MEDIUM
eiu_fl_26	High precision records for priority taxa of Regional significance are contained within the remnant.	Regional	Criterion H: HIGH
eiu_fl_27	Low precision records for priority taxa of Regional significance are contained within the remnant.	None	Criterion H: MEDIUM
eiu_l_03	Riparian ecosystems and associated areas.	State	Ib (wildlife refugia): VERY HIGH Ie (high species richness): VERY HIGH Ig (RE's with distinct variation): VERY HIGH Ii (high density of hollow-bearing trees): HIGH Ij (significant breeding or roosting sites): VERY HIGH
eiu_l_10	Landscapes of least disturbance	State	Ia (centre of endemism): HIGH Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): HIGH Id (taxa at the limits of their ranges): HIGH Ie (high species richness): VERY HIGH Ig (RE's with distinct variation): HIGH K (Condition): State
eiu_l_11	Vine Thickets	State	Ia (centre of endemism): VERY HIGH Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): VERY HIGH Id (taxa at the limits of their ranges): HIGH Ie (high species richness): VERY HIGH If (relictual populations): HIGH
eiu_l_15	Ecosystems with a Biodiversity status of Endangered or Of Concern and a current extent of less than 10,000ha	State	Ib (wildlife refugia): HIGH Ig (RE's with distinct variation): VERY HIGH
eiu_l_26	Hidden Valley/Mt Zero	State	Ia (centre of endemism): HIGH Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): HIGH Id (taxa at the limits of their ranges): HIGH Ie (high species richness): VERY HIGH
eiu_l_32	Bioregional Terrestrial Corridors	State or Regional	J (corridors): State or Regional
eiu_l_33	Bioregional Riparian Corridors	State	J (corridors): State
wet_fa_22	High 'rainforest vertebrate' taxa richness	State	Ie) (species richness): VH

Decision Number	Description	Panel Recommended Significance	Criteria Values
wet_fl_24	Paluma Range	Regional	Ia (endemic richness): H Ib (refugia): M Ic (disjunct populations): M Id (range limits): VH Ie (species richness): H If (relictual taxa): M Ik (climate change refugia): M
wet_l_15	Sclerophyll forest west of rainforest - tall open forest	State	Ia (endemic richness): VH Ib (refugia): VH Ic (disjunct populations): VH Id (range limits): VH Ie (species richness): VH Ig (ecosystem variation): H Ii (hollows and habitat): VH Ij (aggregation site): H Ik (climate change refugia): H
wet_l_25	Core areas	Regional	Ib (refugia): H
wet_l_30a	Terrestrial bioregional corridors (landscape connections) .	State	Criterion J (terrestrial corridor): STATE
wet_l_31b	Riparian bioregional corridors (landscape connections)	Regional	Criterion J (riparian corridor): REGIONAL

Expert panel decision descriptions:

brbn_l_17a

None

eiu_fa_24

The Eastern ecotone of the Einasleigh Uplands is a band of eucalypt forest separating the rainforest of the Wet Tropics from the dry tropical woodlands that characterize the bioregion. These better developed forests support a number of species that are endemic to the ecotone, or are isolated populations of species more widely distributed in the wet sclerophyll forest of south-east Queensland. These species include the northern bettong (**Bettongia tropica**), eastern yellow robin (**Eopsaltria australis**), yellow thornbill (**Acanthiza nana**), greater glider (**Petauroides volans**), Squirrel glider (**Petaurus norfolcensis**), crested shrike-tit (**Falcunculus frontatus**) and the yellow-faced honeyeater (**Lichenostomus chrysops**). Disjunct tree species that have the major part of their North Queensland distribution in the ecotone include **Eucalyptus resinifera, E. pellita, E. grandis, E. moluccana, E. reducta, E. cloeziana, E. citriodora** and **Angophora floribunda.**

eiu_fa_30

Remnant contains Core Habitat for Priority taxa with high precision records.

eiu_fa_31

Remnant contains Core Habitat for Priority taxa with low precision records.

eiu_fl_24

Remnant contains Core Habitat for Priority taxa with high precision records.

eiu_fl_25

Remnant contains Core Habitat for Priority taxa with low precision records.

eiu_fl_26

Remnant contains Core Habitat for Priority taxa with high precision records.

eiu_fl_27

Remnant contains Core Habitat for Priority taxa with low precision records.

eiu_l_03

Most of the Einasleigh Uplands is dominated by open vegetation on shallow or skeletal soils. Riparian RE's associated with the larger river systems function as important refuges for many species of flora and fauna because of the relatively high nutrient levels associated with most of these areas, their better moisture balance and their generally well developed vegetation. These mesic ribbons of habitat provide an important seasonal refuge and resources for a variety of species, in particular arboreal mammals, woodland birds, hollow-roosting species and amphibians. Many raptor species preferentially nest in tall riparian trees.

Riparian areas are also biogeographically significant habitat as they allow inland incursions of many east coast species into drier areas on the edge of their geographic range.

Riparian areas were given a 200m buffer with the same significance rating to ensure that adjacent habitat used opportunistically by species using the riparian areas was also included.

This decision includes Landscape decision 4.

eiu_l_10

Parts of the Einasleigh Uplands, due to ruggedness, remoteness or the absence of permanent surface water, have had little impact from grazing by domestic stock or the associated infrastructure. These are areas where the landscapes have been little disturbed and the biodiversity values within them have the greatest chance of being maintained in the long term. The major threatening process to these areas is the intensification of grazing through development of infrastructure such as watering points and fencing. The current condition of the ground layer and soil is considered to be very good and they provide a refuge for sensitive plant and animal species from the impacts of grazing.

These are predominantly areas of very low land capability, with skeletal, infertile and droughty soils, steep slopes and much rock outcrop. Any increase in land use intensity in these areas is likely to result in rapid land degradation and consequent loss of biodiversity values.

The extent of these areas in the Einasleigh Uplands, compared with other parts of the state, makes them of State Significance for the protection of intact ecosystems.

eiu_l_11

The bioregion has a wide variety of dry vine thickets across a number of different substrates. Vine thickets have been largely cleared from the Brigalow Belt, and the Einasleigh Uplands is of state significance in the protection of these ecosystems and their values. Vine thickets are refugia for a large number of plants and animals, many of which are disjunct populations, or at the limits of their geographic ranges. Although species combinations vary with substrate, EVR and other priority species are present in many occurrences and endemism of invertebrate species is common.

Mapped vine thickets were buffered by 500m to allow for species that shelter in the vine thicket but use resources in the surrounding woodlands.

Some occurrences are at risk from weed invasions (particularly lantana **Lantana camara**), pig damage and adverse fire regimes.

This decision combines and replaces Flora decision 22 and Fauna decision 23.

eiu_l_15

Einasleigh Upland regional ecosystems with a remaining extent that is less than 10,000ha have a naturally restricted distribution, and their threatened status is a reflection of this. They are susceptible to what would normally be viewed as local threats or impacts, and are therefore most vulnerable of all ecosystems to rapid and potentially total loss of natural values. In most cases their restricted distribution relates to geomorphic and/or micro-climatic settings that are also restricted and these areas therefore have particular ecological and scientific values. These values relate to the unique combination of ecological characteristics, and to the unusual habitat conditions they provide for particular species or genotypes. Where the status has been upgraded to Endangered due to the impact of threatening processes their susceptibility to further loss of values is extreme.

eiu_l_26

Extensive plateau area dominated by fine to medium grained biotite granites, continuous with the Wet Tropics and extending westward into the rainshadow areas of the Einasleigh Uplands.

Includes high ecosystem diversity along a wide environmental gradient and high species diversity. The predominantly heathy and low sclerophyll communities have disjunct occurrences of taxa. e.g. **Actinotus gibbonsii**, and other species at the limits of their ranges as well as a number of EVR species. Although the area is still poorly known, EVR species present include the Endangered **Acacia ramiflora**, the Rare **Acacia longipedunculata**, **Acacia polyadenia**, **Bulbophyllum globuliforme**, **Dodonaea uncinata**, **Eucalyptus lockyeri subsp. exuta**, and **Lysiana filifolia**, and the Vulnerable **Corymbia leptoloma**, **Cycas platyphylla**, **Homoranthus porteri**, and **Marsdenia brevifolia**.

This decision consolidates and replaces eiu_fl_7

eiu_l_32

This terrestrial corridors decision identifies major themes of habitat connectivity across the bioregion. They identify north/south and east/west links that cover higher altitude areas along watersheds and mountain ranges, and areas characterised by a relative continuity of similar or related habitats, using the methodology outlined in EPA 2008. Identified corridor centrelines are buffered according to the significance of the centreline and the landscape context within which it occurs

Decision eiu_l_22 Corridor Special Management Areas identifies areas where values associated with landscape scale habitat connectivity have been compromised.

eiu_l_33

Riparian corridors in the Einasleigh Uplands are particularly significant for biodiversity, both as a climatic refuge and as a major element of habitat continuity. This decision is based on the bioregional corridor values of major riparian areas. The refugial and other values of riparian areas are covered by decision eiu_l_03.

The watercourse centrelines were buffered by 200m to indicate the general location of this habitat continuity theme, in line with the state-wide approach for riparian corridors in undeveloped bioregions.

wet_fa_22

Areas of WET remnant vegetation modelled as being of either high richness for rainforest dependent/partly dependent amphibian, avian, mammalian, or reptile taxa.

This special area representation is derived from research produced through a collaborative fauna modelling project (Williams 2006). Part of the project resulted in the construction of approximately 170 rainforest vertebrate species distribution models. Additionally, species richness, diversity and endemic richness maps were subsequently produced. Rainforest taxa were defined as those species which were obligate to periodic users of Wet Tropic rainforests.

For the purpose of the current special area representation, the extent shown in the adjoining thumbnail captures remnant vegetation which overlapped areas modelled as being of either high amphibian, avian, mammal, or reptile richness. For each taxonomic group, the area of high rainforest taxa richness was defined as the highest modelled 10% area (limited to areas within remnant vegetation) within the WET. The resultant outputs, were then combined to provide a flattened extent area capturing the four major vertebrate taxonomic faunal groups of modelled high species richness.

wet_fl_24

A relatively large area at the southern extent of the bioregion. Vegetation communities include: microphyll rainforest, notophyll vine forests, wet sclerophyll forest, vine thickets and hoop pine emergent. The eastern and southern portions of the range are composed of notophyll rainforest. Multiple ecotones associated with changes in gradient over the range result in an unusual sequence of vegetation communities. Ecotones transitions are broader and more gradual comparative to similar ecotones in the north, and regional ecosystem variation occurs within ecotones.

The range is relatively species rich, with survey work identifying approximately 120 species per 0.1 hectares in areas across the range. Examples of endemics present include: **Corymbia leptoloma**, **Crepidomanes majoriae**, **Gastrodia urceolate**, **Elaeocarpus coorangooloo**, **Archidendron vaillantii, Bulbophyllum evasum, Cardwellia sublimis, Cryptocarya putida, Dendrobium agrostophyllum, Endiandra bessaphila, Glochidion hylandii, Laccospadix australasicus, Motherwellia haplosciadea, Peperomia bellendenkerensis, Rhodamnia sessiliflora** and **Solanum magnifolium**.

Numerous species also occur at their range limit. Examples of species at or near northern range limit: **Livistona australis, Argyrodendron actinophyllum** subsp. **diversifolium, Cassia** sp. (Paluma Range G.Sankowsky+ 450) and **Acacia rhodoxylon.** Examples of species at or near southern range limit: **Cardwellia sublimis, Cryptocarya putida, Flindersia brayleyana** and **Flindersia pimenteliana.**

wet_l_15

Predominantly situated at the Western margins of the WET and extending from Mt Windsor south to Mt Zero, the feature also incorporates Einasleigh elements. The transition from dry, moist through to tall wet sclerophyll up to the rainforest margin is a highly dynamic zone influenced by climate and fire regimes (and is one of the few WET landscape systems that can carry a crown fire). The considerable environmental heterogeneity associated with the transition often incorporates the tension zone between lowland and upland species, resulting in a high diversity of vertebrate taxa, including many endemics. The largest contiguous remaining tracts of wet sclerophyll adjacent to rainforest occur along western margin of Coane, Seaview and Cardwell ranges and in upper Daintree area (Stanton et al. 2014). Reduced fire exposure is considered a significant threat to the wet sclerophyll communities from rainforest incursion (Stanton et al. 2014).

The panel noted that the system has an adaptive capacity to climate change with potential movement of vegetation communities along an elevation gradient. This feature also acts as an important corridor along the western bioregion boundary, and areas with the greatest long-term climatic stability for wet sclerophyll forest have been identified as the sections encompassing the western edge of the Atherton, Kirrama and Paluma uplands (VanDerWal et al. 2009).

A number of threatened fauna inhabit this ecotone including **Delma mitella**, **Dasyurus hallucatus**, **Dasyurus maculatus gracilis**, **Bettongia tropica**, **Petauroides volans** and **Petaurus australis** unnamed subsp. (NQ). Disjunct taxa also occur, e.g. **Cormobates leucophaea minor**, **Falcunculus frontatus**, **Antechinus flavipes** and **Isoodon obesulus peninsulae**.

Presence of widespread endemics, e.g. **Bolemoreus frenatus, Xanthotis macleayanus** and **Arses kaupi**. The snail **Steorra estherlilleyae** is narrowly restricted to this habitat west of Paluma. Other invertebrates associated with wet sclerophyll forest include **Temnoplectron cooki**, **Onthophagus pinaroo**, **Pamborus elegans** and **Anomalomorpha monteithi** (Yeates Monteith 2008). Many WET taxa also reach their western and southern limits in this community. Tall eucalypts provide hollows for gliders, possums and large cockatoos, e.g. **Calyptorhynchus lathami**. This habitat is also important for winter feeding by **Pteropus conspicillatus**.

With respect to flora, some of the threatened species present include: **Prostanthera clotteniana**, **Tylophora rupicola**, **Corymbia leptoloma**, **Corymbia rhodops**, **Parsonsia wildensis**, **Plectranthus amoenus**,

Calochlaena villosa, and **Dodonaea uncinata**.

Examples of Wet Tropic endemic flora include: **Actephila flavescens, Acrothamnus spathaceus, Alpinia arctiflora, Argyrodendron peralatum, Athertonia diversifolia, Brackenridgea australiana, Bulbophyllum gadgarrense, Comesperma rhyoliticum, Corymbia leptoloma, Desmos goezeanus, Elaeocarpus carolinae, Endiandra bessaphila, Gmelina fasciculiflora, Hibbertia melhanioides var. baileyana, Lastreopsis tinarooensis, Medicosma glandulosa, Myrsine smithii, Persoonia tropica, Sarcochilus borealis, Solanum magnifolium** and **Symplocos glabra**. Examples of disjunct flora include: **Acacia ulicifolia, Alectryon semicinereus, Archidendron hendersonii, Boletellus emodensis, Cantharellus concinnus, Fistulinella mollis, Hibiscus diversifolius, Knoxia sumatrensis, Lomandra laxa, Notelaea ovata** and **Platycerium superbum.**

wet_l_25

Tracts are defined as patches of continuous remnant vegetation. The size of any tract is a major indicator of ecological significance and is strongly correlated with the long-term viability of biodiversity values. Larger tracts are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller tracts. These areas can be considered core nodes/refugia in which a large proportion of the bioregions biodiversity is represented.

A modified tract size analysis (Criterion C) (EHP 2014) was used to identify and delineate discrete tracts of remnant vegetation at a bioregion scale. For the purpose of the assessment, a core area was identified as a relatively contiguous area of remnant vegetation (disregarding small perforations, or linear breaks) and which was generally greater than 5km in width (based upon the minimum width of the terrestrial corridor network). Tracts of greater than 2,000ha were included.

wet_l_30a

The broad purpose of landscape-scale connections, is to provide for ecological and evolutionary processes at a bioregional scale. Maintaining connectivity across a landscape, either through "continuous linkages" or via "stepping-stones" of remnant vegetation, is important for the long-term conservation of biodiversity.

Corridor triggered remnant vegetation is focused upon areas between core tracts/nodes (as identified under the special area decision wet_l_25) within the bioregion. For further information regarding the broad principles and intent, as well as more specific information relating to the Wet Tropics terrestrial corridor network, refer to Section 3.3.2.1 and Table 14.

wet_l_31b

Riparian corridors encompass some of the most diverse, dynamic and complex habitats incorporating both environmental and topographic gradients. Comparatively, such areas tend to exhibit high species richness with respect to both flora and fauna, provide important resources in terms of water, food, shelter, nesting and nursery sites and act as a refugia during periods of drought, or in response to longer terms impacts associated with climatic change.

At the landscape scale, networks of major and minor riparian linkages are a significant element of habitat continuity and provide important migratory and dispersal pathways for a substantial number of species (especially birds, insects and flora, but also for many arboreal mammals and reptiles). In some areas of fragmented landscapes, watercourses often provide the only remaining habitat connectivity due to the extensive clearing and surrounding modified landscape.

Within the WET, the panel determined that remnant vegetation within 200m and 100m of major and minor waterways should be designated as being of State and Regional significance respectively. The significance of selected riverine systems were also modified in some instances (Table 16). Corridor triggered remnant vegetation focuses upon identifying key connections between remaining core tracts/nodes (as identified under the special area decisions wet_l_25) within the bioregion. For further information regarding the broad principles and intent, as well as more specific information relating to the Wet Tropics riparian corridor network, refer to Section 3.3.2.2.

Aquatic Conservation Assessments

Introduction

The Aquatic Biodiversity Assessment and Mapping Method or AquaBAMM (Clayton *et al.* 2006), was developed to assess conservation values of wetlands in queensland, and may also have application in broader geographical contexts. It is a comprehensive method that uses available data, including data resulting from expert opinion, to identify relative wetland conservation/ecological values within a specified study area (usually a catchment). The product of applying this method is an Aquatic Conservation Assessment (ACA) for the study area.

An ACA using AquaBAMM is non-social, non-economic and identifies the conservation/ecological values of wetlands at a user-defined scale. It provides a robust and objective conservation assessment using criteria, indicators and measures that are founded upon a large body of national and international literature. The criteria, each of which may have variable numbers of indicators and measures, are naturalness (aquatic), naturalness (catchment), diversity and richness, threatened species and ecosystems, priority species and ecosystems, special features, connectivity and representativeness. An ACA using AquaBAMM is a powerful decision support tool that is easily updated and simply interrogated through a geographic information system (GIS).

Where they have been conducted, ACAs can provide a source of baseline wetland conservation/ecological information to support natural resource management and planning processes. They are useful as an independent product or as an important foundation upon which a variety of additional environmental and socio-economic elements can be added and considered (i.e. an early input to broader 'triple-bottom-line' decision-making processes). An ACA can have application in:

- determining priorities for protection, regulation or rehabilitation of wetlands and other aquatic ecosystems
- on-ground investment in wetlands and other aquatic ecosystems
- contributing to impact assessment of large-scale development (e.g. dams)
- water resource and strategic regional planning prcesses

For a detailed explanation of the methodology please refer to the summary and expert panel reports relevant to the ACA utilised in this assessment. These reports can be accessed at Wetland *Info*:

http://wetlandinfo.des.qld.gov.au/wetlands/assessment/assessment-methods/aca

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

http://qspatial.information.qld.gov.au/geoportal/

Explanation of Criteria

Under the AquaBAMM, eight criteria are assessed to derive an overall conservation value. Similar to the Biodiversity Assessment and Mapping Methodology, the criteria may be primarily diagnostic (quantitative) or primarily expert opinion (qualitative) in nature. The following sections provide a brief description of each of the 8 criteria.

Criteria 1. Naturalness - Aquatic: This attribute reflects the extent to which a wetland's (riverine, non-riverine, estuarine) aquatic state of naturalness is affected through relevant influencing indicators which include: presence of exotic flora and fauna; presence of aquatic communities; degree of habitat modification and degree of hydrological modification.

Criteria 2. Naturalness - Catchment: The naturalness of the terrestrial systems of a catchment can have an influence on many wetland characteristics including: natural ecological processes e.g. nutrient cycling, riparian vegetation, water chemistry, and flow. The indicators utilised to assess this criterion include: presence of exotic flora and/or fauna; riparian, catchment and flow modification.

Criteria 3. Naturalness - Diversity and Richness: This criterion is common to many ecological assessment methods and can include both physical and biological features. It includes such indicators as species richness, riparian ecosystem richness and geomorphological diversity.

Criteria 4. Threatened Species and Ecosystems: This criterion evaluates ecological rarity characteristics of a wetland. This includes both species rarity and rarity of communities / assemblages. The communities and assemblages are best represented by regional ecosystems. Species rarity is determined by NCA and EPBC status with Endangered, Vulnerable or Near-threatened species being included in the evaluation. Ecosystem rarity is determined by regional ecosystem biodiversity status i.e. Endangered, Of Concern, or Not of Concern.

Criteria 5. Priority Species and Ecosystems: Priority flora and fauna species lists are expert panel derived. These are aquatic, semi-aquatic and riparian species which exhibit at least 1 particular trait in order to be eligible for consideration. For

flora species the traits included:

- It forms significant macrophyte beds (in shallow or deep water).
- It is an important food source.
- It is important/critical habitat.
- It is implicated in spawning or reproduction for other fauna and/or flora species.
- It is at its distributional limit or is a disjunct population.
- It provides stream bank or bed stabilisation or has soil binding properties.
- It is a small population and subject to threatening processes.

Fauna species are included if they meet at least one of the following traits:

- It is endemic to the study area (>75 per cent of its distribution is in the study area/catchment).
- It has experienced, or is suspected of experiencing, a serious population decline.
- It has experienced a significant reduction in its distribution and has a naturally restricted distribution in the study area/catchment.
- It is currently a small population and threatened by loss of habitat.
- It is a significant disjunct population.
- It is a migratory species (other than birds).
- A significant proportion of the breeding population (>one per cent for waterbirds, >75 per cent other species) occurs in the waterbody (see Ramsar criterion 6 for waterbirds).
- Limit of species range.

See the individual expert panel reports for the priority species traits specific to an ACA.

Criteria 6. Special Features: Special features are areas identified by flora, fauna and ecology expert panels which exhibit characteristics beyond those identified in other criteria and which the expert panels consider to be of the highest ecological importance. Special feature traits can relate to, but are not solely restricted to geomorphic features, unique ecological processes, presence of unique or distinct habitat, presence of unique or special hydrological regimes e.g. spring-fed streams. Special features are rated on a 1 - 4 scale (4 being the highest).

Criteria 7. Connectivity: This criterion is based on the concept that appropriately connected aquatic ecosystems are healthy and resilient, with maximum potential biodiversity and delivery of ecosystem services.

Criteria 8. Representativeness: This criterion applies primarily to non-riverine assessments, evaluates the rarity and uniqueness of a wetland type in relation to specific geographic areas. Rarity is determined by the degree of wetland protection within "protected Areas" estate or within an area subject to the *Fisheries Act 1994*, *Coastal Protection and Management Act 1995*, or *Marine Parks Act 2004*. Wetland uniqueness evaluates the relative abundance and size of a wetland or wetland management group within geographic areas such as catchment and subcatchment.

Riverine Wetlands

Riverine wetlands are all wetlands and deepwater habitats within a channel. The channels are naturally or artificially created, periodically or continuously contain moving water, or connecting two bodies of standing water. AquaBAMM, when applied to riverine wetlands uses a discrete spatial unit termed subsections. A subsection can be considered as an area which encompasses discrete homogeneous stream sections in terms of their natural attributes (i.e. physical, chemical, biological and utilitarian values) and natural resources. Thus in an ACA, an aquatic conservation significance score is calculated for each subsection and applies to all streams within a subsection, rather than individual streams as such.

Please note, the area figures provided in Tables 16 and 17, are derived using the extent of riverine subsections within the AOI. Refer to **Map 5** for further information. A summary of the conservation significance of riverine wetlands within the AOI is provided in the following table.

Table 16: Overall level/s of riverine aquatic conservation significance

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
Very High	16,258.69	76.17

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
High	7.1	0.03
Medium	5,079.61	23.8
Low	0.0	0.0
Very Low	0.0	0.0

The individual aquatic conservation criteria ratings for riverine wetlands within the AOI are listed below.

Table 17: Level/s of riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic	12,450.25	58.3	8,839.30	41.4			55.83	0.3
2. Naturalness catchment	21,309.50	99.8	35.88	0.2				
3. Diversity and richness	35.88	0.2	19.95	0.1	10,297.04	48.2	10,992.51	51.5
4. Threatened species and ecosystems	15,671.27	73.4	5,674.11	26.6				
5. Priority species and ecosystems	8,513.44	39.9	357.05	1.7				
6. Special features	16,258.68	76.2						
7. Connectivity			11,801.52	55.3	394.54	1.8	9,149.32	42.9
8. Representative-ness								

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to riverine wetlands within the AOI.

Table 18: Expert panel decisions for assigning overall levels of riverine aquatic conservation significance

Decision number	Special feature	Catchment	Criteria/Indicator/Measure	Conservation rating (1-4)
bp_r_ec_02	Upper Burdekin/ Wet Tropics	Burdekin Upper	6.2.1 6.3.3	4
bp_r_ec_04	Keelbottom Creek, Star Creek, Little Star Creek and Running River	Burdekin Upper	6.2.1 6.3.1	4

4 is the highest rating/value

Expert panel decision descriptions:

bp_r_ec_02

This area contains distinct special ecological processes providing extremely valuable fauna habitat areas. This area is biogeographically interesting in terms of rainforest streams with 'inland' drainage. There has also been a major reduction in populations of key top order predator Anguillid eels since the construction of the Burdekin Falls Dam.

bp_r_ec_04

The creeks and rivers covered by this decision are granite based pool systems with moderate elevation located on the western side of the range. The streams are in a very high rainfall catchment area allowing many rainforest elements to occur in the riparian zone. These creeks provide the best examples of all the creeks of this type in the Burdekin Upper study area.

Non-riverine Wetlands

Non-riverine wetlands include both lacustrine and palustrine wetlands, however, do not currently incorporate estuarine, marine or subterranean wetland types. A summary of the conservation significance of non-riverine wetlands within the AOI is provided in the following table. Refer to **Map 6** for further information.

Table 19: Overall level/s of non-riverine aquatic conservation significance

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
(No Records)		

The following table provides an assessment of non-riverine wetlands within the AOI and associated aquatic conservation criteria values.

Table 20: Level/s of non-riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
(No Records)								

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to non-riverine wetlands within the AOI.

Table 21: Expert panel decisions for assigning overall levels of non-riverine aquatic conservation significance.

Decision number	Special feature	Catchment	Criteria/Indicator/Measure	Conservation rating (1-4)
(No Records)				

4 is the highest rating/value

Expert panel decision descriptions:

(No Records)

Threatened and Priority Species

Introduction

This chapter contains a list of threatened and priority flora and/or fauna species that have been recorded on, or within 4km of the Assessment Area.

The information presented in this chapter with respect to species presence is derived from compiled databases developed primarily for the purpose of BPAs and ACAs. Data is collated from a number of sources and is updated periodically.

It is important to note that the list of species provided in this report, may differ when compared to other reports generated from other sources such as the State government's WildNet, Herbrecs or the federal government's EPBC database for a number of reasons.

Records for threatened and priority species are filtered and checked based on a number of rules including:

- Taxonomic nomenclature - current scientific names and status,
- Location - cross-check co-ordinates with location description,
- Taxon by location - requires good knowledge of the taxon and history of the record,
- Duplicate records - identify and remove,
- Expert panels - check records and provide new records,
- Flora cultivated records excluded,
- Use precise records less than or equal to 2000m,
- Use recent records greater than or equal to 1975 animals, greater than or equal to 1950 plants.

Threatened Species

Threatened species are those species classified as "Endangered" or "Vulnerable" under the *Environment Protection and Biodiversity Conservation Act 1999* or "Endangered", "Vulnerable" or "Near threatened" under the *Nature Conservation Act 1992*.

The following threatened species have been recorded on, or within approximately 4km of the AOI.

Table 22: Threatened species recorded on, or within 4km of the AOI

Species	Common name	NCA status	EPBC status	Back on Track rank	Migratory species*	Wetland species**	Identified flora/fauna
Acacia longipedunculata		NT		Low			FL
Aristida granitica		E	E	Low			FL
Bettongia tropica	northern bettong	E	E	Critical			FA
Bulbophyllum globuliforme		NT	V	Low			FL
Calyptorhynchus lathami	glossy black-cockatoo	V					FA
Calyptorhynchus lathami erebus	glossy black-cockatoo (northern)	V		Low			FA
Casuarius casuarius johnsonii (southern population)	southern cassowary (southern population)	E	E	Critical			FA
Corymbia leptoloma		V	V	Low			FL
Dodonaea uncinata		NT		Low			FL
Geophaps scripta scripta	squatter pigeon (southern subspecies)	V	V	Medium			FA
Glossocardia orthochaeta		E		Low			FL
Marsdenia brevifolia		V	V	High			FL
Murina florium	tube-nosed insectivorous bat	V		High			FA

Species	Common name	NCA status	EPBC status	Back on Track rank	Migratory species*	Wetland species**	Identified flora/fauna
Petauroides volans	greater glider	V	V	Low			FA
Petauroides volans minor	northern greater glider	V	V				FA
Petrogale sharmani	Sharman's rock-wallaby	V	V	Low			FA
Pseudophryne covacevichae	magnificent broodfrog	V	V	Low		Y	FA

NB. Please note that the threatened species listed in this section are based upon the most recently compiled DES internal state-wide threatened species dataset. This dataset may contain additional records that were not originally available for inclusion in the relevant individual BPAs and ACAs.

**JAMBA - Japan-Australia Migratory Bird Agreement; CAMBA - China-Australia Migratory Bird Agreement; ROKAMBA - Republic of Korea-Australia Migratory Bird Agreement; CMS - Convention on the Conservation of Migratory Species.*

***Y - wetland indicator species.*

BPA Priority Species

A list of BPA priority species that have been recorded on, or within approximately 4km of the AOI is contained in the following table.

Table 23: Priority species recorded on, or within 4km of the AOI

Species	Common name	Back on Track rank	Identified flora/fauna
Acacia nesophila		Low	FL
Acacia whitei		Low	FL
Acanthiza katherina	Mountain Thornbill	Low	FA
Aepyprymnus rufescens	Rufous Bettong	Low	FA
Ailuroedus maculosus	Spotted Catbird	Low	FA
Allocasuarina inophloia		Low	FL
Colluricincla boweri	Bower's Shrike-thrush	Low	FA
Corymbia abergiana	range bloodwood	Low	FL
Diuris aurea			FL
Dockrillia racemosa	tableland pencil orchid		FL
Eugenia reinwardtiana	beach cherry		FL
Gossia bidwillii			FL
Gossia hillii			FL
Gossia myrsinocarpa			FL
Heliotropium ballii			FL
Heteromyias cinereifrons	Grey-headed Robin	Low	FA
Hibbertia exutiacies			FL
Hibbertia longifolia			FL
Hibbertia scandens			FL
Hibbertia stelligera			FL
Hibbertia stirlingii		Low	FL
Hibbertia stricta			FL
Hovea nana		Low	FL
Lomandra confertifolia			FL

Species	Common name	Back on Track rank	Identified flora/fauna
Lomandra confertifolia subsp. pallida			FL
Lomandra filiformis			FL
Lomandra filiformis subsp. filiformis			FL
Lomandra longifolia			FL
Lysicarpus angustifolius	budgeroo	Low	FL
Melaleuca viridiflora			FL
Mimulus uvedaliae			FL
Phyllanthus collinus			FL
Phyllanthus fuernrohrii			FL
Phyllanthus virgatus			FL
Pimelea chlorina			FL
Pseudechis australis	King Brown Snake	Low	FA
Ptiloris victoriae	Victoria's Riflebird	Low	FA
Sauropus anemoniflorus		Data Deficient	FL
Steorra jimfergusoni	Dark Paluma Banded Snail		FA
Stylidium eriorhizum			FL
Stylidium tenerum		Low	FL
Tephrosia astragaloides			FL
Tephrosia filipes			FL
Tephrosia filipes subsp. filipes			FL
Tephrosia juncea			FL
Tephrosia sp. (Copperfield River P.I.Forster PIF14768)			FL
Thelymitra fragrans			FL
Xanthorrhoea johnsonii			FL
Xanthorrhoea latifolia subsp. latifolia			FL

NB. Please note that the list of priority species is based on those species identified in the BPAs, however records for these species may be more recent than the originals used. furthermore, the BPA priority species databases are updated from time to time. At each update, the taxonomic details for all species are amended as necessary to reflect current taxonomic name and/or status changes.

ACA Priority Species

A list of ACA priority species used in riverine and non-riverine ACAs that have been recorded on, or within approximately 4km of the AOI are contained in the following tables.

Table 24: Priority species recorded on, or within 4 km of the AOI - riverine

Species	Common name	Back on Track rank	Identified flora/fauna
Ceyx azureus	Azure Kingfisher	L	FA
Eucalyptus tereticornis			FL
Leersia hexandra	swamp rice grass		FL
Melaleuca leucadendra	broad-leaved tea-tree		FL
Mogurnda adspersa	Southern Purplespotted Gudgeon	L	FA

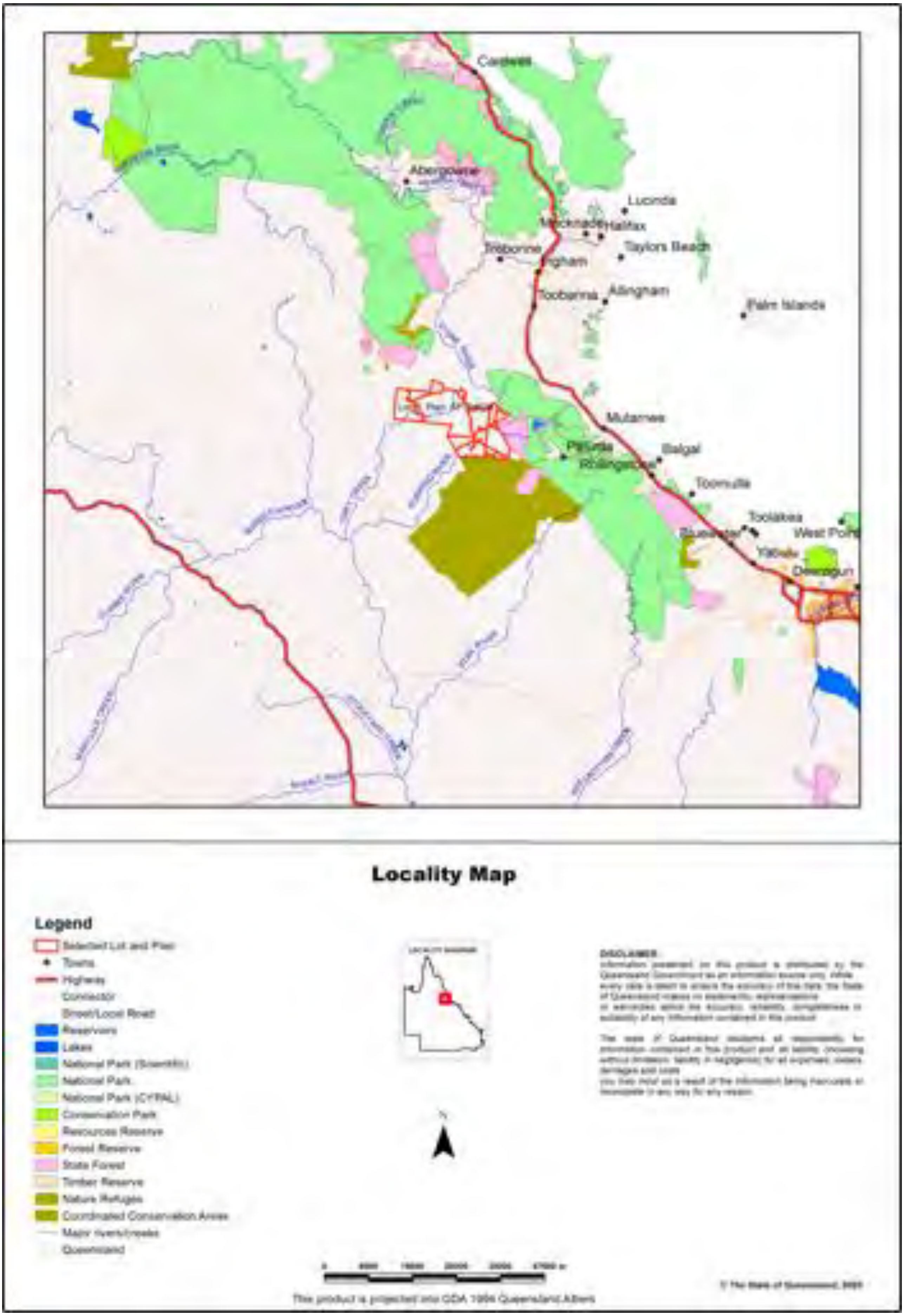
Table 25: Priority species recorded on, or within 4 km of the AOI - non-riverine

Species	Common name	Back on Track rank	Identified flora/fauna
Ceyx azureus	Azure Kingfisher	L	FA
Eucalyptus tereticornis			FL
Leersia hexandra	swamp rice grass		FL
Mogurnda adspersa	Southern Purplespotted Gudgeon	L	FA

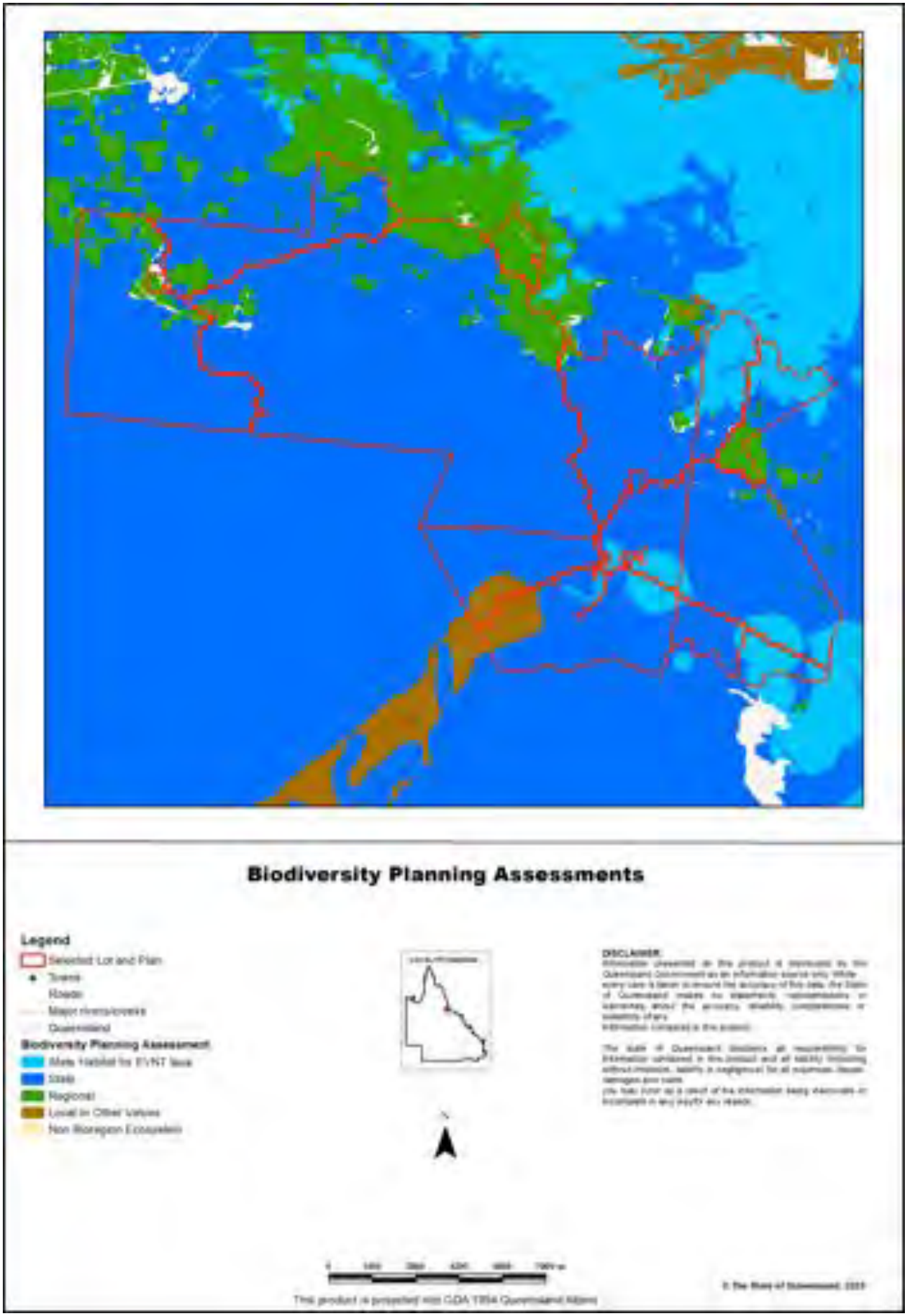
NB. Please note that the priority species records used in the above two tables are comprised of those adopted for the released individual ACAs. The ACA riverine and non-riverine priority species databases are updated from time to time to reflect new release of ACAs. At each update, the taxonomic details for all ACAs records are amended as necessary to reflect current taxonomic name and/or status changes.

Maps

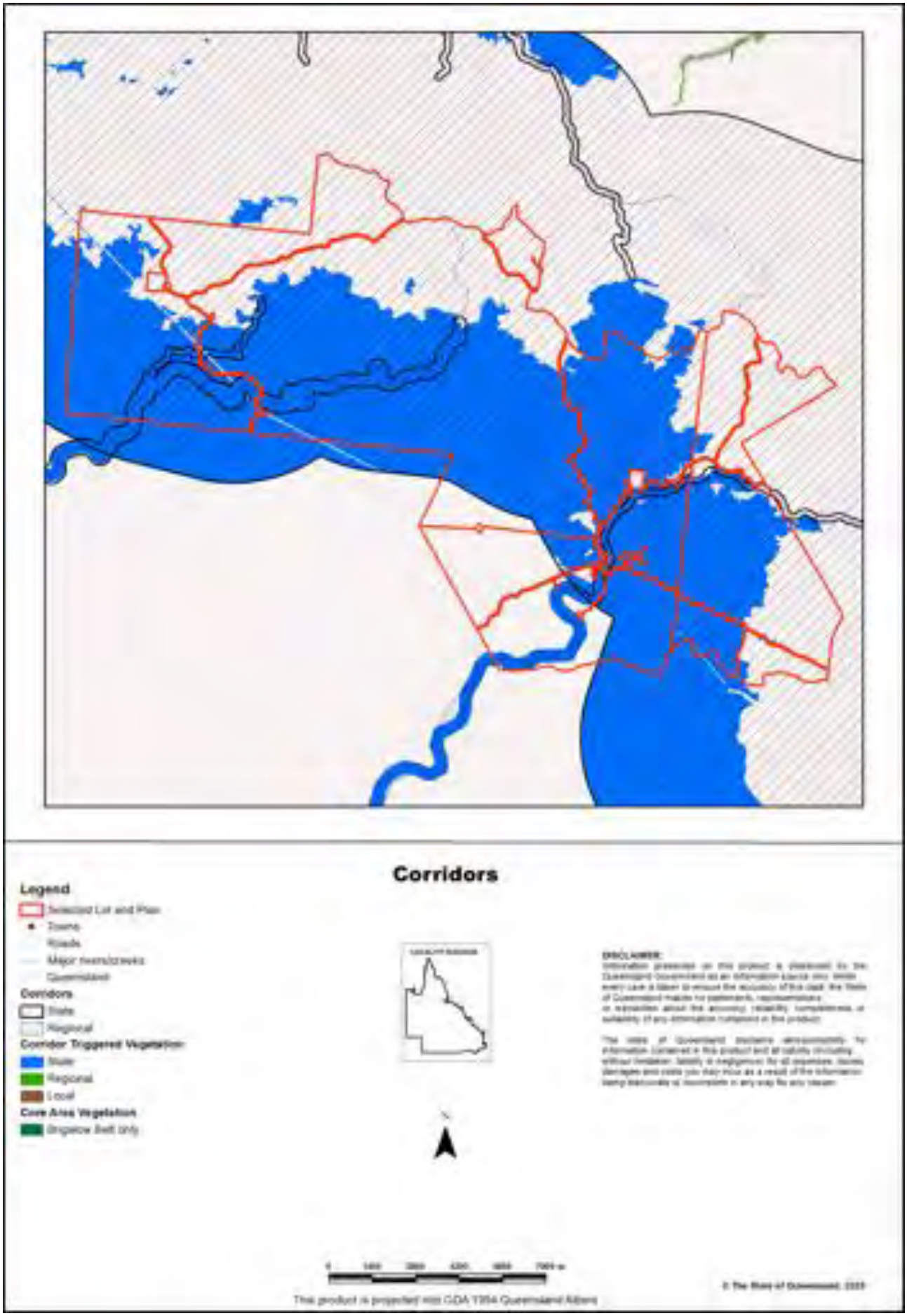
Map 1 - Locality Map



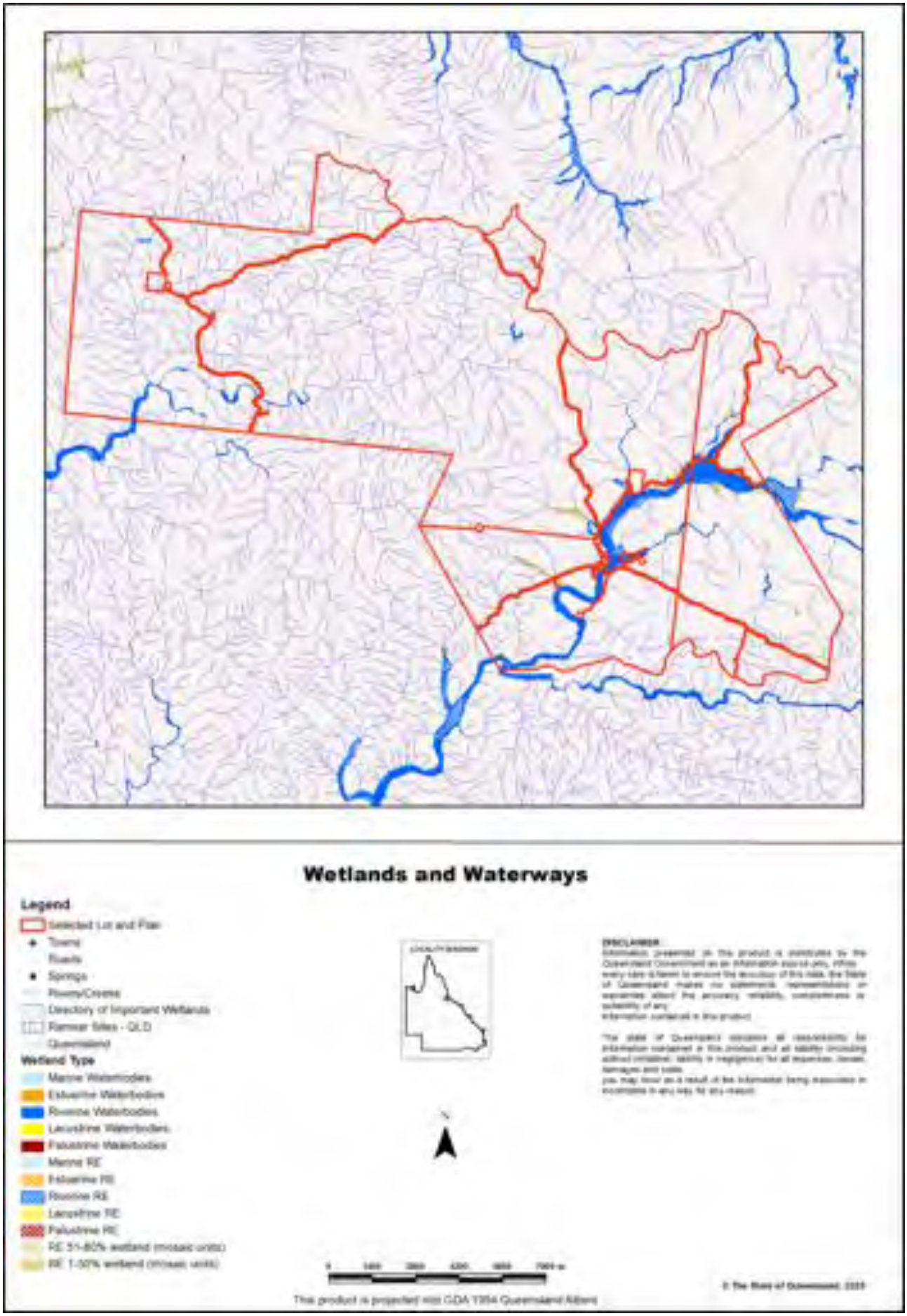
Map 2 - Biodiversity Planning Assessment (BPA)



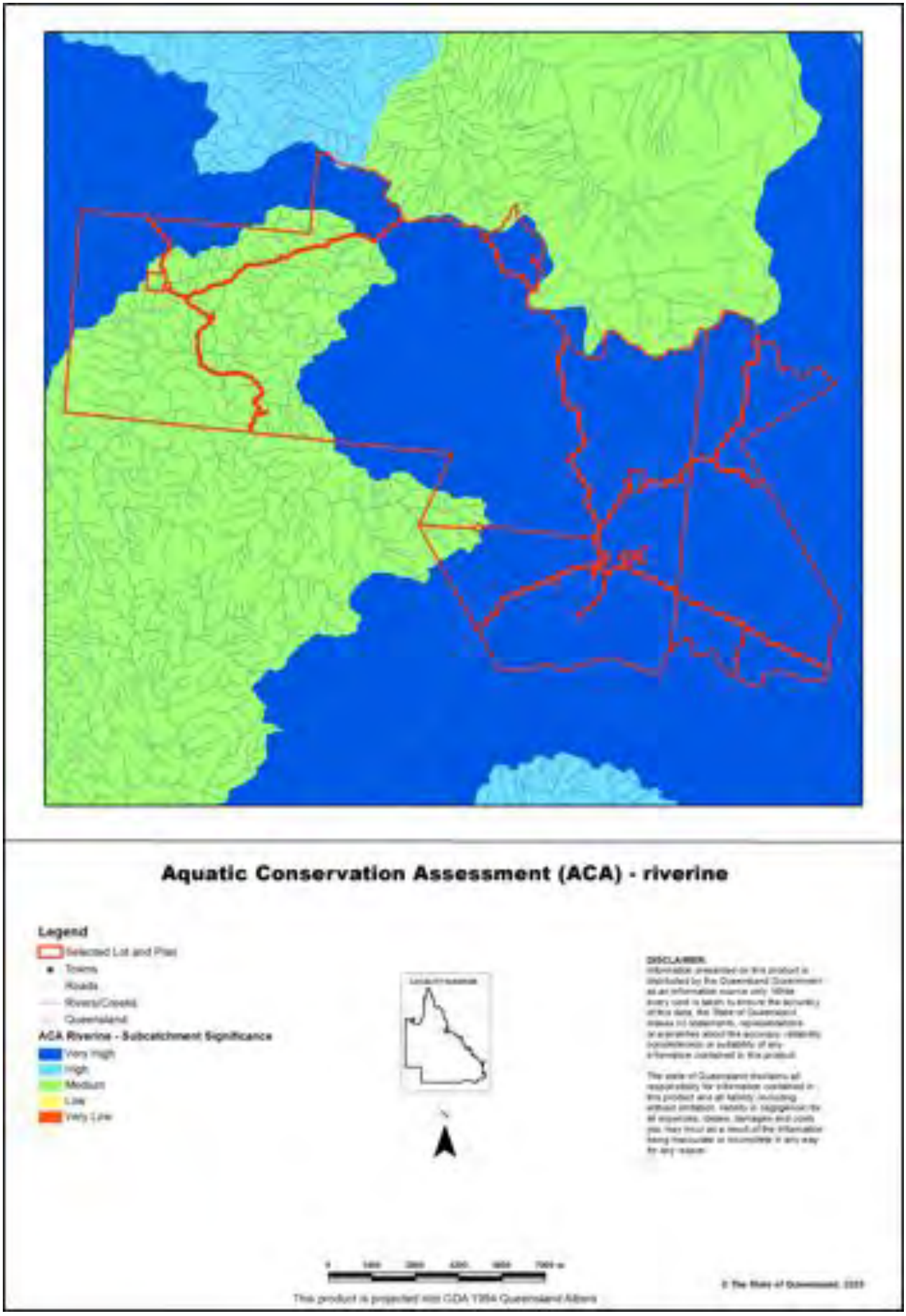
Map 3 - Corridors



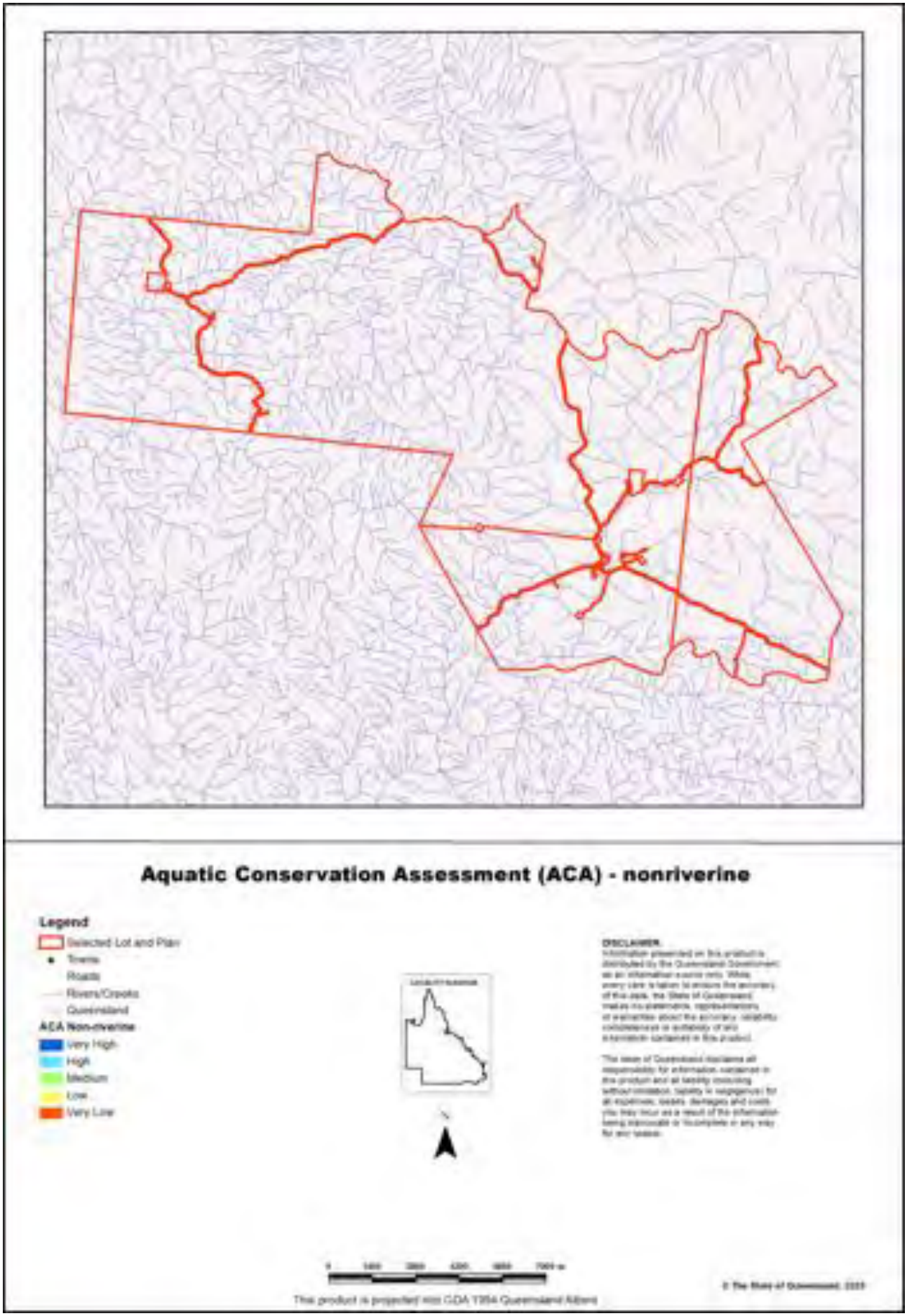
Map 4 - Wetlands and waterways



Map 5 - Aquatic Conservation Assessment (ACA) - riverine



Map 6 - Aquatic Conservation Assessment (ACA) - non-riverine



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Appendices

Appendix 1 - Source Data

Theme	Datasets
Aquatic Conservation Assessments Non-riverine*	Combination of the following datasets: Cape York Peninsula Non-riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Non-riverine v1.3 Lake Eyre and Bulloo Basins v1.1 QMDB Non-riverine ACA v1.4 Southeast Queensland ACA v1.1 WBB Non-riverine ACA v1.1
Aquatic Conservation Assessments Riverine*	Combination of the following datasets: Cape York Peninsula Riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Riverine v1.1 Lake Eyre and Bulloo Basins v1.1 QMDB Riverine ACA v1.4 Southeast Queensland ACA v1.1 WBB Riverine ACA v1.1
Biodiversity Planning Assessments*	Combination of the following datasets: Brigalow Belt BPA v2.1 Cape York Peninsula BPA v1.1 Central Queensland Coast BPA v1.3 Channel Country BPA v1.1 Desert Uplands BPA v1.3 Einasleigh Uplands BPA v1.1 Gulf Plains BPA v1.1 Mitchell Grass Downs BPA v1.1 Mulga Lands BPA v1.4 New England Tableland v2.3 Southeast Queensland v4.1 Wet Tropics v1.1
Statewide BPA Corridors*	Statewide corridors v1.5
Threatened Species	An internal DES database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
BPA Priority Species	An internal DES database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.
ACA Priority Species	An internal DES database compiled from Wildnet, Herbrecs, Corveg, the QLD Museum, as well as other incidental sources.

***These datasets are available at:**

http://dds.information.qld.gov.au/DDS

Appendix 2 - Acronyms and Abbreviations

AOI	- Area of Interest
ACA	- Aquatic Conservation Assessment
AQUABAMM	- Aquatic Biodiversity Assessment and Mapping Methodology
BAMM	- Biodiversity Assessment and Mapping Methodology
BoT	- Back on Track
BPA	- Biodiversity Planning Assessment
CAMBA	- China-Australia Migratory Bird Agreement
DES	- Department of Environment and Science
EPBC	- *Environment Protection and Biodiversity Conservation Act 1999*
EVNT	- Endangered, Vulnerable, Near Threatened
GDA94	- Geocentric Datum of Australia 1994
GIS	- Geographic Information System
JAMBA	- Japan-Australia Migratory Bird Agreement
NCA	- *Nature Conservation Act 1992*
RE	- Regional Ecosystem
REDD	- Regional Ecosystem Description Database
ROKAMBA	- Republic of Korea-Australia Migratory Bird Agreement

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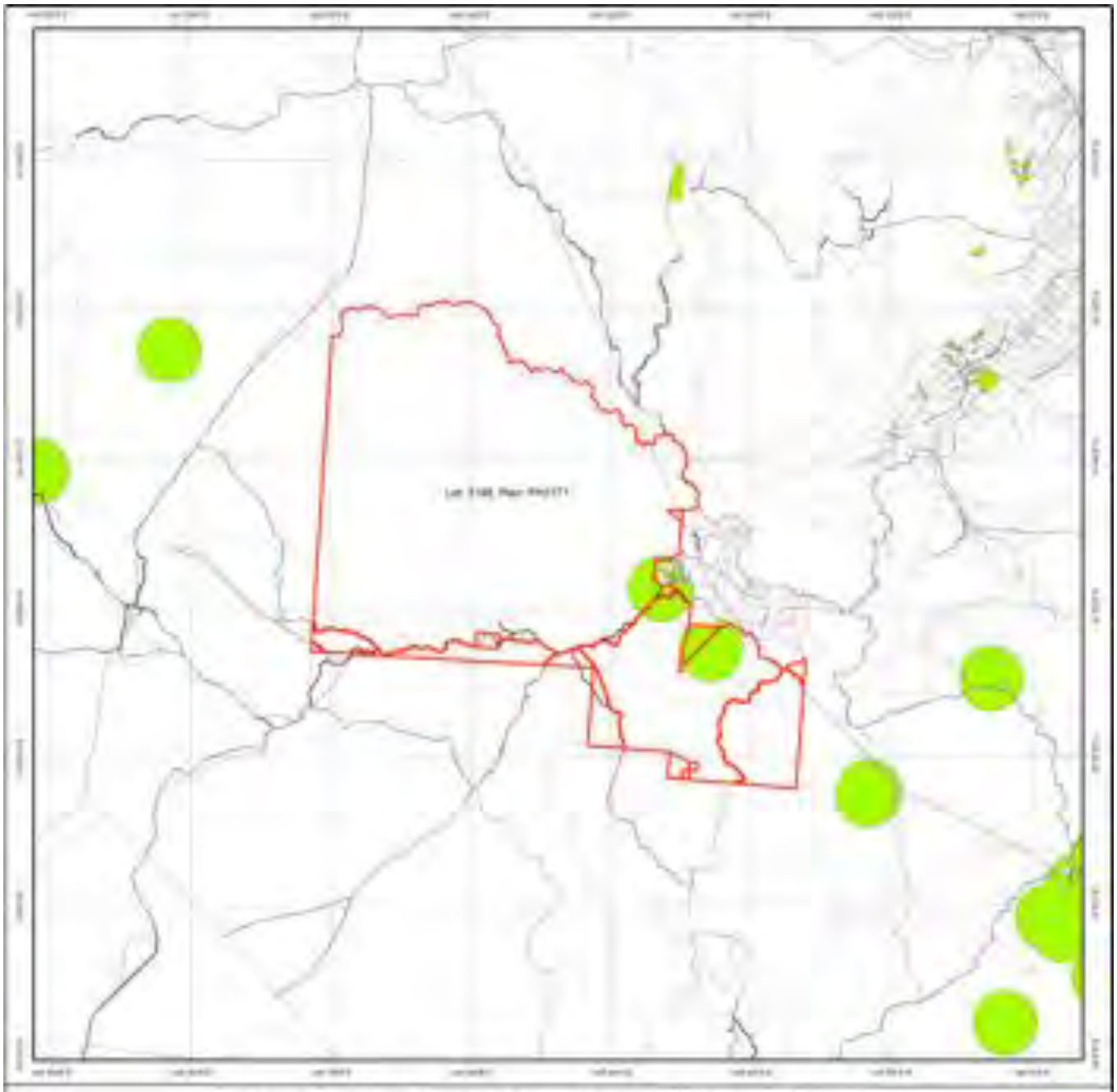
Lot: 3198 Plan: PH2177



Protected Plants Flora Survey Trigger Map

Legend

- Selected Lot and Plan
- High risk area
- Other land parcel boundaries
- Freeways / motorways / highways
- Secondary roads / streets

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

Land parcel boundaries are provided as locational aid only.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Science at pamp@ehp.qld.gov.au

Disclaimer:
While every care is taken to ensure the accuracy of the data used to generate this product, the Queensland Government makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damages) and costs which might be incurred as a consequence of reliance on the data, or as a result of the data being inaccurate or incomplete in any way and for any reason.

This product is projected into GDA 1994 Queensland Albers

Protected plants flora survey trigger map

The protected plants flora survey trigger map identifies 'high risk areas' where endangered, vulnerable or near threatened plants are known to exist or are likely to exist. Under the *Nature Conservation Act 1992* (the Act) it is an offence to clear protected plants that are 'in the wild' unless you are authorised or the clearing is exempt, for more information see section 89 of the Act.

Please see the Department of Environment and Science webpage on the clearing of protected plants for information on what exemptions may apply in your circumstances, whether you may need to undertake a flora survey, and whether you may need a protected plants clearing permit.

Updates to the data informing the flora survey trigger map

The flora survey trigger map will be reviewed, and updated if necessary, at least every 12 months to ensure the map reflects the most up-to-date and accurate data available.

Species information

Please note that flora survey trigger maps do not identify species associated with 'high risk areas'. While some species information may be publicly available, for example via the Queensland Spatial Catalogue, the Department of Environment and Science does not provide species information on request. Regardless of whether species information is available for a particular high risk area, clearing plants in a high risk area may require a flora survey and/or clearing permit. Please see the Department of Environment and Science webpage on the clearing of protected plants for more information.

20/07/2020 13:41:14
Lot: 2 Plan: SP205224

Protected Plants Flora Survey Trigger Map

Legend

- Selected Lot and Plan
- High risk area
- Other land parcel boundaries
- Freeways / motorways / highways
- Secondary roads / streets

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

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GDA 1994 Queensland Albers

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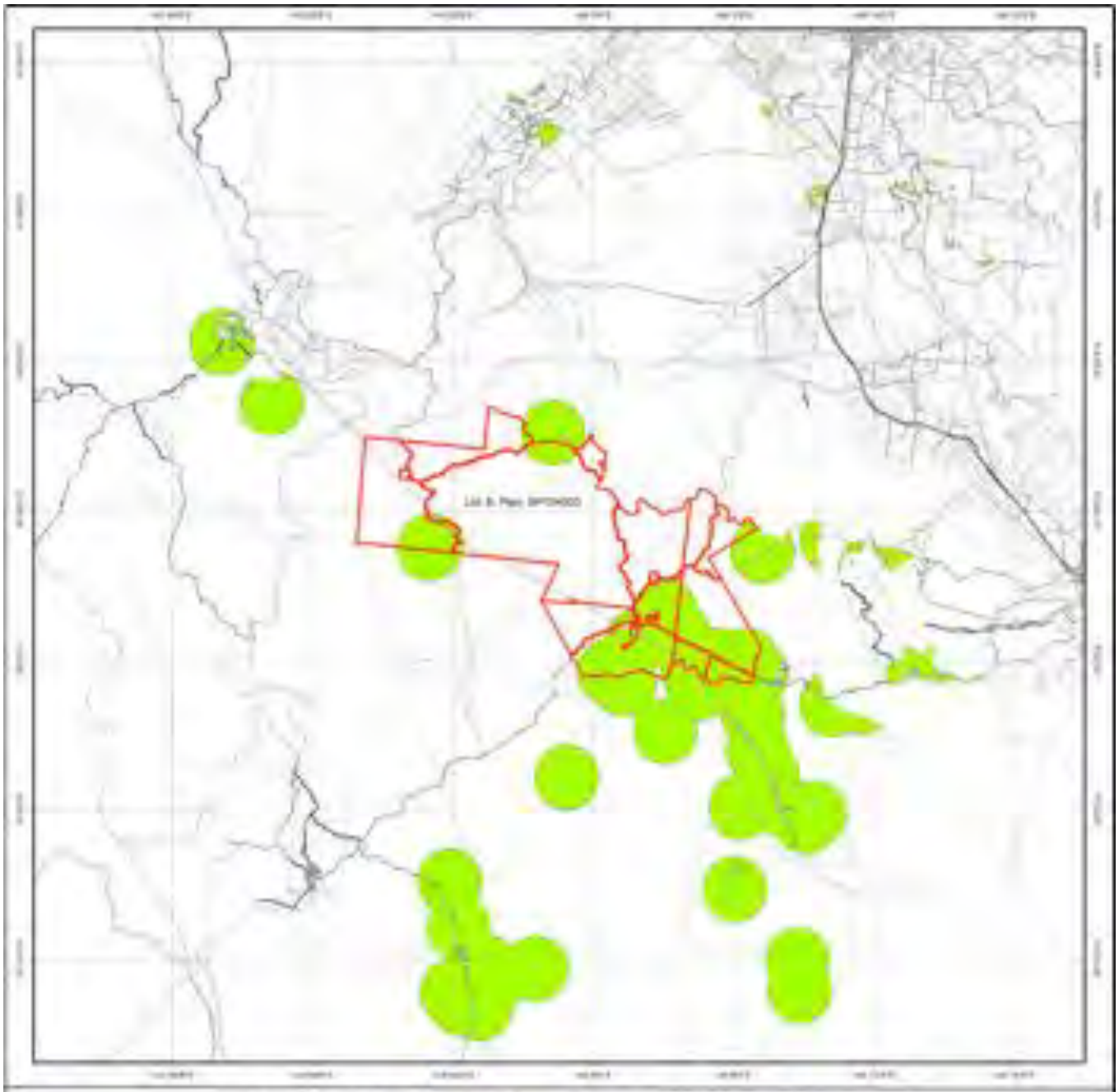
Lot: 8 Plan: SP104503



Protected Plants Flora Survey Trigger Map

Legend

- Selected Lot and Plan
- High risk area
- Other land parcel boundaries
- Freeways / motorways / highways
- Secondary roads / streets

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

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N

This product is projected into: GDA 1994 Queensland Albers

Protected plants flora survey trigger map

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20/07/2020 13:42:50
Lot: 3 Plan: WG274

Protected Plants Flora Survey Trigger Map

Legend

- Selected Lot and Plan
- High risk area
- Other land parcel boundaries
- Freeways / motorways / highways
- Secondary roads / streets

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

Land parcel boundaries are provided as locational aid only.

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N

0 500 1,000 1,500 2,000 m

This product is protected into GDA 1994 Queensland Albers

Protected plants flora survey trigger map

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Queensland Government

Department of Environment and Science

Environmental Reports

Matters of State Environmental Significance

For the selected area of interest
Lot: 3198 Plan: PH2177

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or area of interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "central coordinates" option, the resulting assessment area encompasses an area extending for a 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: Planning.Support@des.qld.gov.au

Disclaimer

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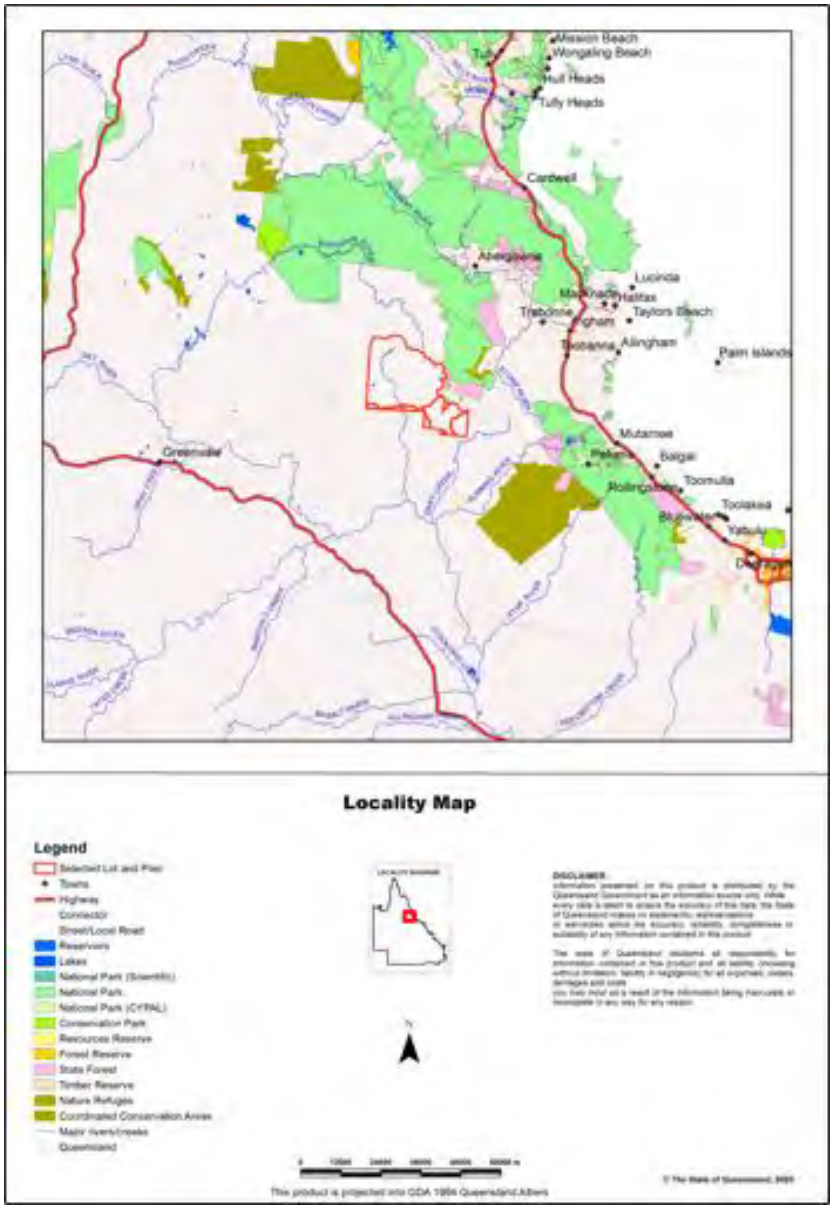
Table of Contents

Assessment Area Details

The following table provides an overview of the area of interest (AOI) with respect to selected topographic and environmental values.

Table 1: Summary table, details for AOI Lot: 3198 Plan: PH2177

Size (ha)	51,794.36
Local Government(s)	Charters Towers Regional
Bioregion(s)	Einasleigh Uplands, Wet Tropics
Subregion(s)	Paluma - Seaview, Herberton - Wairuna, Broken River
Catchment(s)	Herbert, Burdekin



Matters of State Environmental Significance (MSES)

MSES Categories

Queensland's State Planning Policy (SPP) includes a biodiversity State interest that states:

'The sustainable, long-term conservation of biodiversity is supported. Significant impacts on matters of national or state environmental significance are avoided, or where this cannot be reasonably achieved; impacts are minimised and residual impacts offset.'

The MSES mapping product is a guide to assist planning and development assessment decision-making. Its primary purpose is to support implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations. Similarly, the SPP biodiversity policy does not override or replace specific requirements of other Acts or regulations.

The SPP defines matters of state environmental significance as:

- Protected areas (including all classes of protected area except coordinated conservation areas) under the *Nature Conservation Act 1992* ;

- Marine parks and land within a 'marine national park', 'conservation park', 'scientific research', 'preservation' or 'buffer' zone under the *Marine Parks Act 2004* ;

- Areas within declared fish habitat areas that are management A areas or management B areas under the Fisheries Regulation 2008;

- Threatened wildlife under the *Nature Conservation Act 1992* and special least concern animals under the Nature Conservation (Wildlife) Regulation 2006;

- Regulated vegetation under the *Vegetation Management Act 1999* that is:

    • Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems;

    • Category C areas on the regulated vegetation management map that are 'endangered' or 'of concern' regional ecosystems;

    • Category R areas on the regulated vegetation management map;

    • Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse and drainage feature map;

    • Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map;

- Strategic Environmental Areas under the *Regional Planning Interests Act 2014* ;

- Wetlands in a wetland protection area of wetlands of high ecological significance shown on the Map of Queensland Wetland Environmental Values under the Environment Protection Regulation 2019;

- Wetlands and watercourses in high ecological value waters defined in the Environmental Protection (Water) Policy 2009, schedule 2;

- Legally secured offset areas.

MSES Values Present

The MSES values that are present in the area of interest are summarised in the table below:

Table 2: Summary of MSES present within the AOI

1a Protected Areas- estates	0.0 ha	0.0 %
1b Protected Areas- nature refuges	0.0 ha	0.0 %
2 State Marine Parks- highly protected zones	0.0 ha	0.0 %
3 Fish habitat areas (A and B areas)	0.0 ha	0.0 %
4 Strategic Environmental Areas (SEA)	0.0 ha	0.0 %
5 High Ecological Significance wetlands on the map of Referable Wetlands	0.0 ha	0.0 %
6a High Ecological Value (HEV) wetlands	0.0 ha	0.0 %
6b High Ecological Value (HEV) waterways **	0.0 km	Not applicable
7a Threatened (endangered or vulnerable) wildlife	1916.27 ha	3.7%
7b Special least concern animals	19.83 ha	0.0%
7c i Koala habitat area - core (SEQ)	0.0 ha	0.0 %
7c ii Koala habitat area - locally refined (SEQ)	0.0 ha	0.0 %
8a Regulated Vegetation - Endangered/Of concern in Category B (remnant)	1302.78 ha	2.5%
8b Regulated Vegetation - Endangered/Of concern in Category C (regrowth)	4.94 ha	0.0%
8c Regulated Vegetation - Category R (GBR riverine regrowth)	190.12 ha	0.4%
8d Regulated Vegetation - Essential habitat	1045.34 ha	2.0%
8e Regulated Vegetation - intersecting a watercourse **	1158.7 km	Not applicable
8f Regulated Vegetation - within 100m of a Vegetation Management Wetland	3.84 ha	0.0%
9a Legally secured offset areas- offset register areas	0.0 ha	0.0 %
9b Legally secured offset areas- vegetation offsets through a Property Map of Assessable Vegetation	0.0 ha	0.0 %

Additional Information with Respect to MSES Values Present

MSES - State Conservation Areas

1a. Protected Areas - estates

(no results)

1b. Protected Areas - nature refuges

(no results)

2. State Marine Parks - highly protected zones

(no results)

3. Fish habitat areas (A and B areas)

(no results)

Refer to **Map 1 - MSES - State Conservation Areas** for an overview of the relevant MSES.

MSES - Wetlands and Waterways

4. Strategic Environmental Areas (SEA)

(no results)

5. High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values

(no results)

6a. Wetlands in High Ecological Value (HEV) waters

(no results)

6b. Waterways in High Ecological Value (HEV) waters

(no results)

Refer to **Map 2 - MSES - Wetlands and Waterways** for an overview of the relevant MSES.

MSES - Species

7a. Threatened (endangered or vulnerable) wildlife

Values are present

7b. Special least concern animals

Values are present

7c i. Koala habitat area - core (SEQ)

Not applicable

7c ii. Koala habitat area - locally refined (SEQ)

Not applicable

Threatened (endangered or vulnerable) wildlife habitat suitability models

Species	Common name	NCA status	Presence
Boronia keysii		V	None
Calyptorhynchus lathami	Glossy black cockatoo	V	None
Casuarius casuarius johnsonii	Sthn population cassowary	E	Core
Crinia tinnula	Wallum froglet	V	None
Denisonia maculata	Ornamental snake	V	None
Litoria freycineti	Wallum rocketfrog	V	None
Litoria olongburensis	Wallum sedgefrog	V	None
Melaleuca irbyana		E	None
Petaurus gracilis	Mahogany Glider	E	None
Petrogale persephone	Proserpine rock-wallaby	E	None
Phascolarctos cinereus	Koala - outside SEQ*	V	None
Pezoporus wallicus wallicus	Eastern ground parrot	V	None
Taudactylus Pleione	Kroombit tinkerfrog	E	None
Xeromys myoides	Water Mouse	V	None

**For koala model, this includes areas outside SEQ. Check 7c SEQ koala habitat for presence/absence.*

Threatened (endangered or vulnerable) wildlife species records

Scientific name	Common name	NCA status	EPBC status	Migratory status
Petrogale sharmani	Sharman's rock-wallaby	V	V	
Phascolarctos cinereus	koala	V	V	
Petauroides volans	greater glider	V	V	
Acacia tingoorensis		V		
Poephila cincta cincta	black-throated finch (white-rumped subspecies)	E	E	

Special least concern animal species records

Scientific name	Common name	Migratory status
Ornithorhynchus anatinus	platypus	

**Nature Conservation Act 1992 (NCA) Status- Endangered (E), Vulnerable (V) or Special Least Concern Animal (SL). Environment Protection and Biodiversity Conservation Act 1999 (EPBC) status: Critically Endangered (CE) Endangered (E), Vulnerable (V)*

Migratory status (M) - China and Australia Migratory Bird Agreement (C), Japan and Australia Migratory Bird Agreement (J), Republic of Korea and Australia Migratory Bird Agreement (R), Bonn Migratory Convention (B), Eastern Flyway (E)

To request a species list for an area, or search for a species profile, access Wildlife Online at:
https://www.qld.gov.au/environment/plants-animals/species-list/

Refer to **Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals** and **Map 3b - MSES - Species - Koala habitat area (SEQ)** for an overview of the relevant MSES.

MSES - Regulated Vegetation

For further information relating to regional ecosystems in general, go to:
https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/
For a more detailed description of a particular regional ecosystem, access the regional ecosystem search page at:
https://environment.ehp.qld.gov.au/regional-ecosystems/

8a. Regulated Vegetation - Endangered/Of concern in Category B (remnant)

Regional ecosystem	Vegetation management polygon	Vegetation management status
7.3.39a	O-dom	rem_oc
7.3.28d	O-dom	rem_oc
7.5.3a	O-dom	rem_oc
7.5.4a	O-dom	rem_oc
7.5.2a	O-dom	rem_oc
7.5.2c	O-dom	rem_oc
7.3.19a	O-dom	rem_oc
7.5.4c	O-dom	rem_oc
7.3.43a	O-dom	rem_oc
7.8.18a	O-dom	rem_oc
7.5.2d	O-dom	rem_oc
7.5.2b	O-dom	rem_oc
7.5.4f	O-dom	rem_oc
7.5.4b	O-dom	rem_oc
7.3.26a	O-dom	rem_oc
7.5.2f	O-dom	rem_oc
7.8.18c	O-dom	rem_oc
7.3.49a	O-dom	rem_oc
7.12.10b	O-dom	rem_oc
7.12.69b	O-dom	rem_oc
9.5.5a/7.5.2c	O-subdom	rem_oc
7.12.66b	O-dom	rem_oc

8b. Regulated Vegetation - Endangered/Of concern in Category C (regrowth)

Regional ecosystem	Vegetation management polygon	Vegetation management status
7.8.18a	O-dom	hvr_oc
7.3.19a	O-dom	hvr_oc
7.5.2b	O-dom	hvr_oc

8c. Regulated Vegetation - Category R (GBR riverine regrowth)

Regulated vegetation map category	Map number	RVM rule
R	8060	4

8d. Regulated Vegetation - Essential habitat

Values are present

8e. Regulated Vegetation - intersecting a watercourse**

A vegetation management watercourse is mapped as present

8f. Regulated Vegetation - within 100m of a Vegetation Management wetland

Regulated vegetation map category	Map number	RVM rule
B	8060	2
R	8060	4

Refer to **Map 4 - MSES - Regulated Vegetation** for an overview of the relevant MSES.

MSES - Offsets

9a. Legally secured offset areas - offset register areas

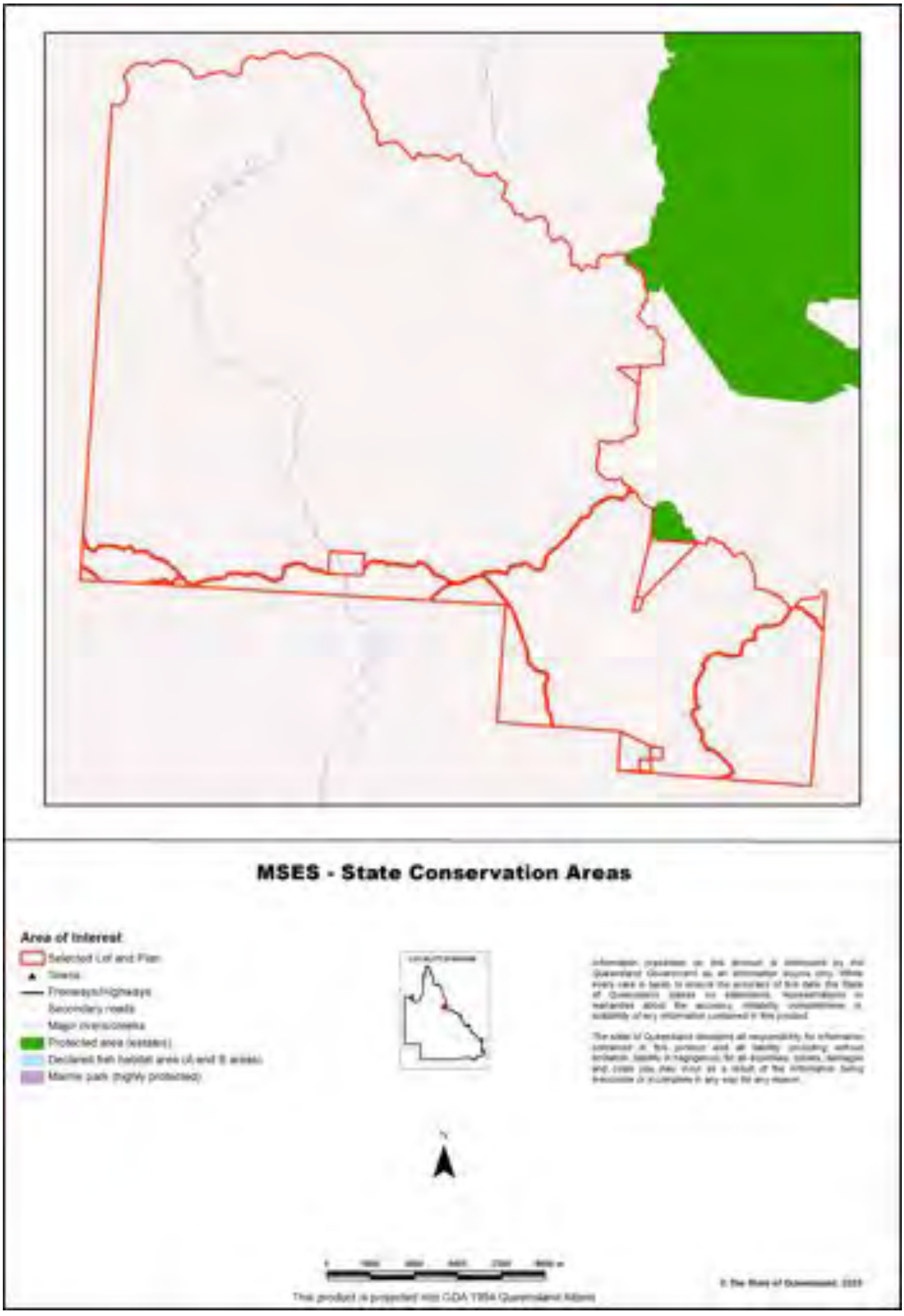
(no results)

9b. Legally secured offset areas - vegetation offsets through a Property Map of Assessable Vegetation

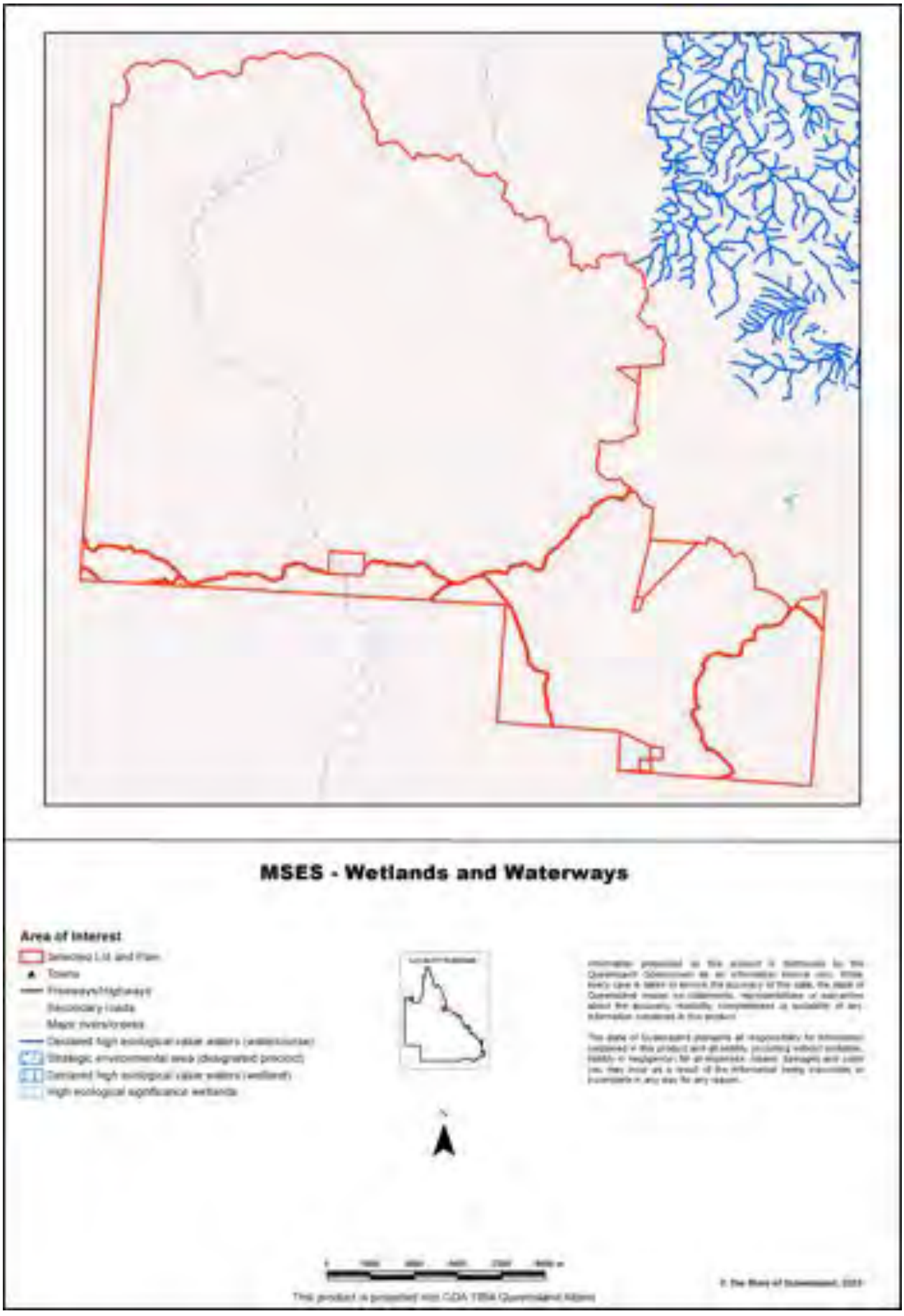
(no results)

Refer to **Map 5 - MSES - Offset Areas** for an overview of the relevant MSES.

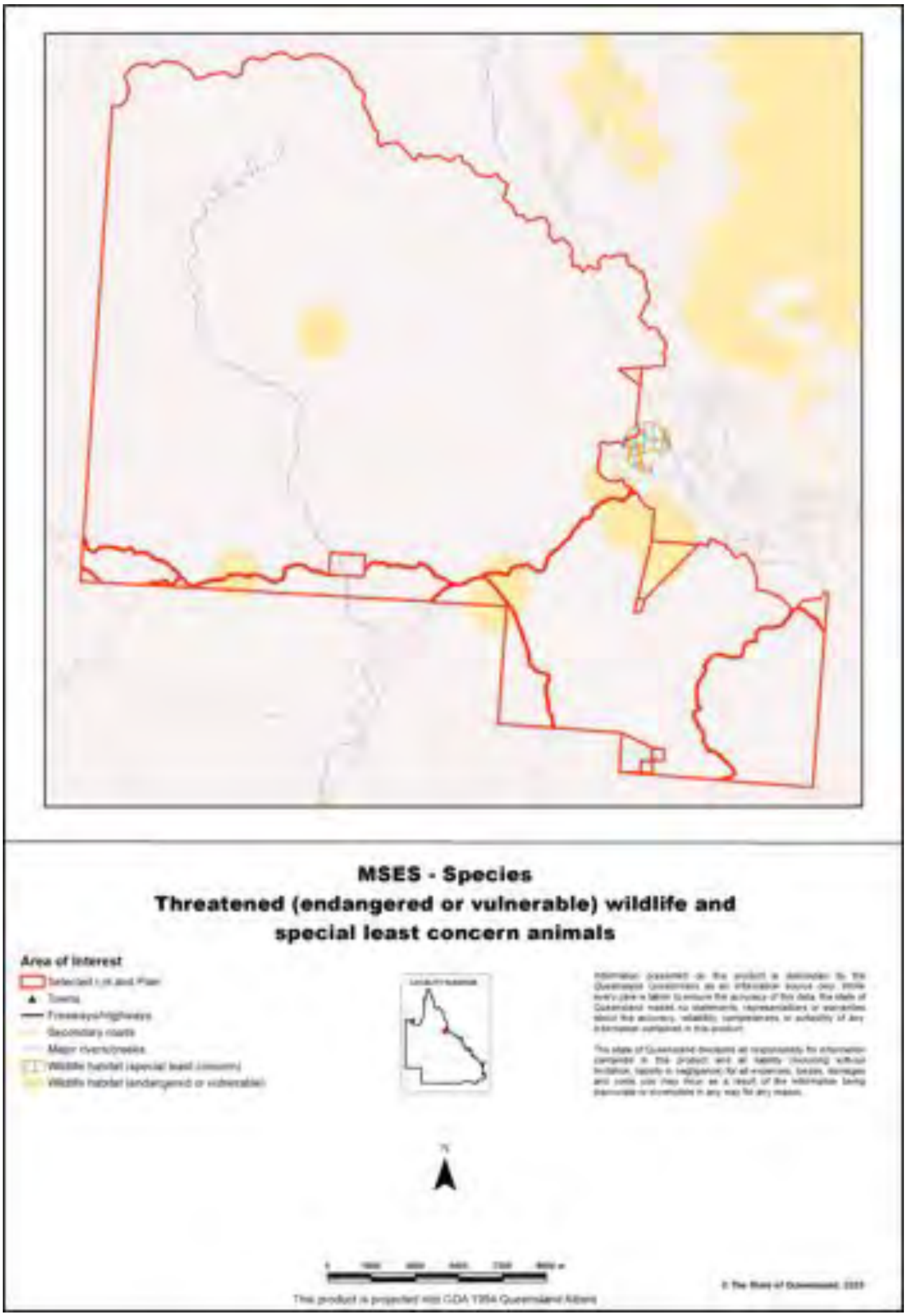
Map 1 - MSES - State Conservation Areas



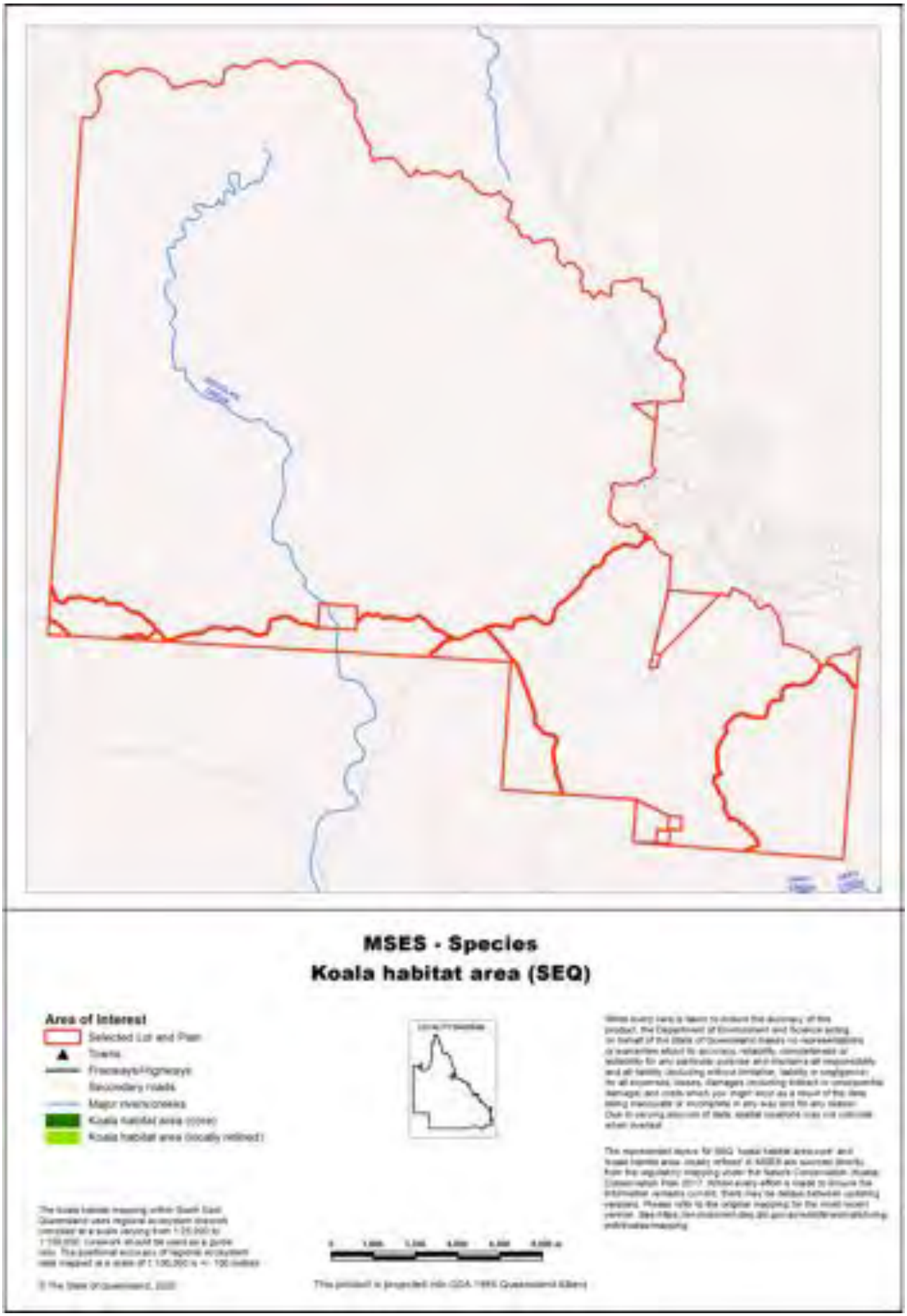
Map 2 - MSES - Wetlands and Waterways



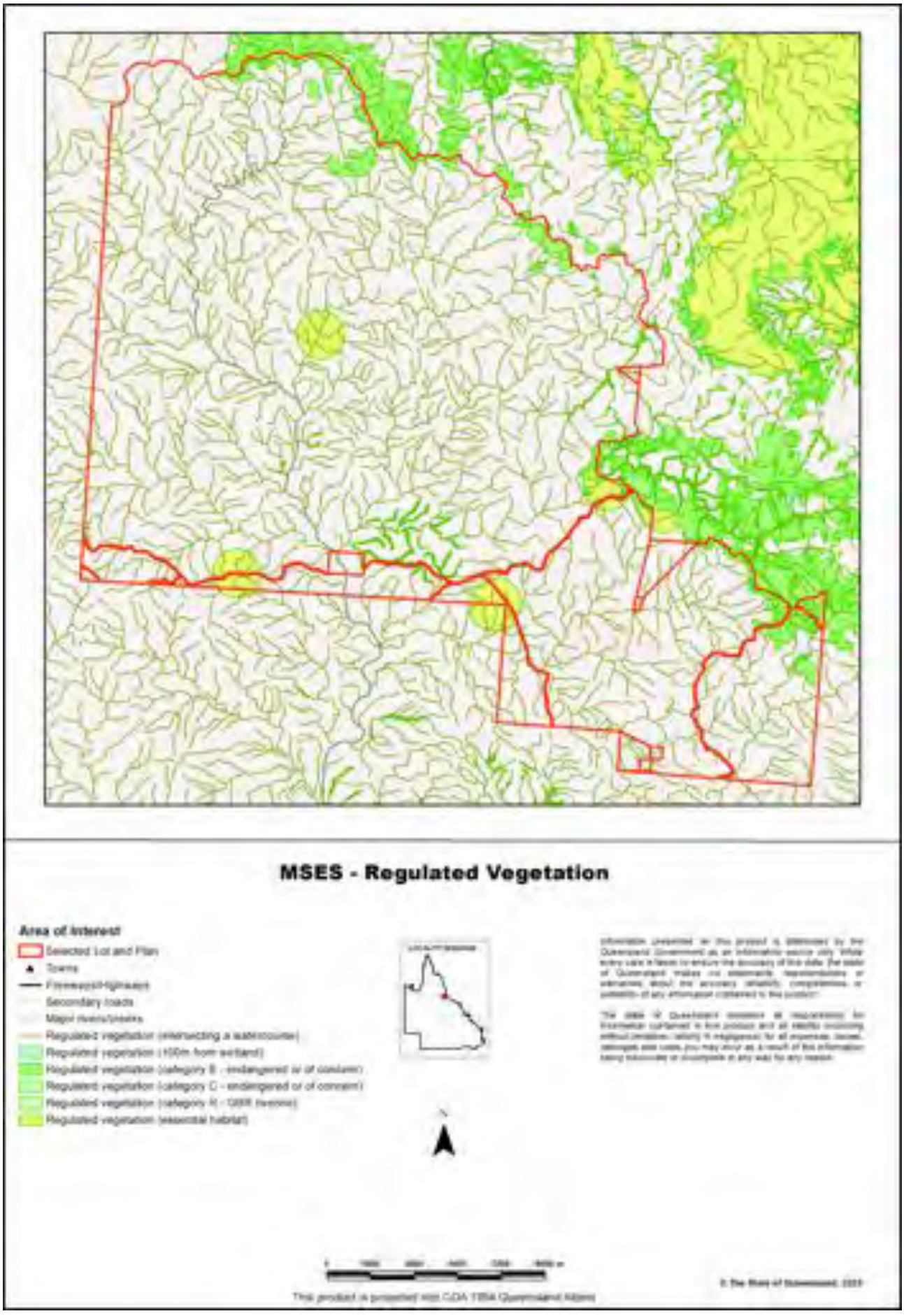
Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals



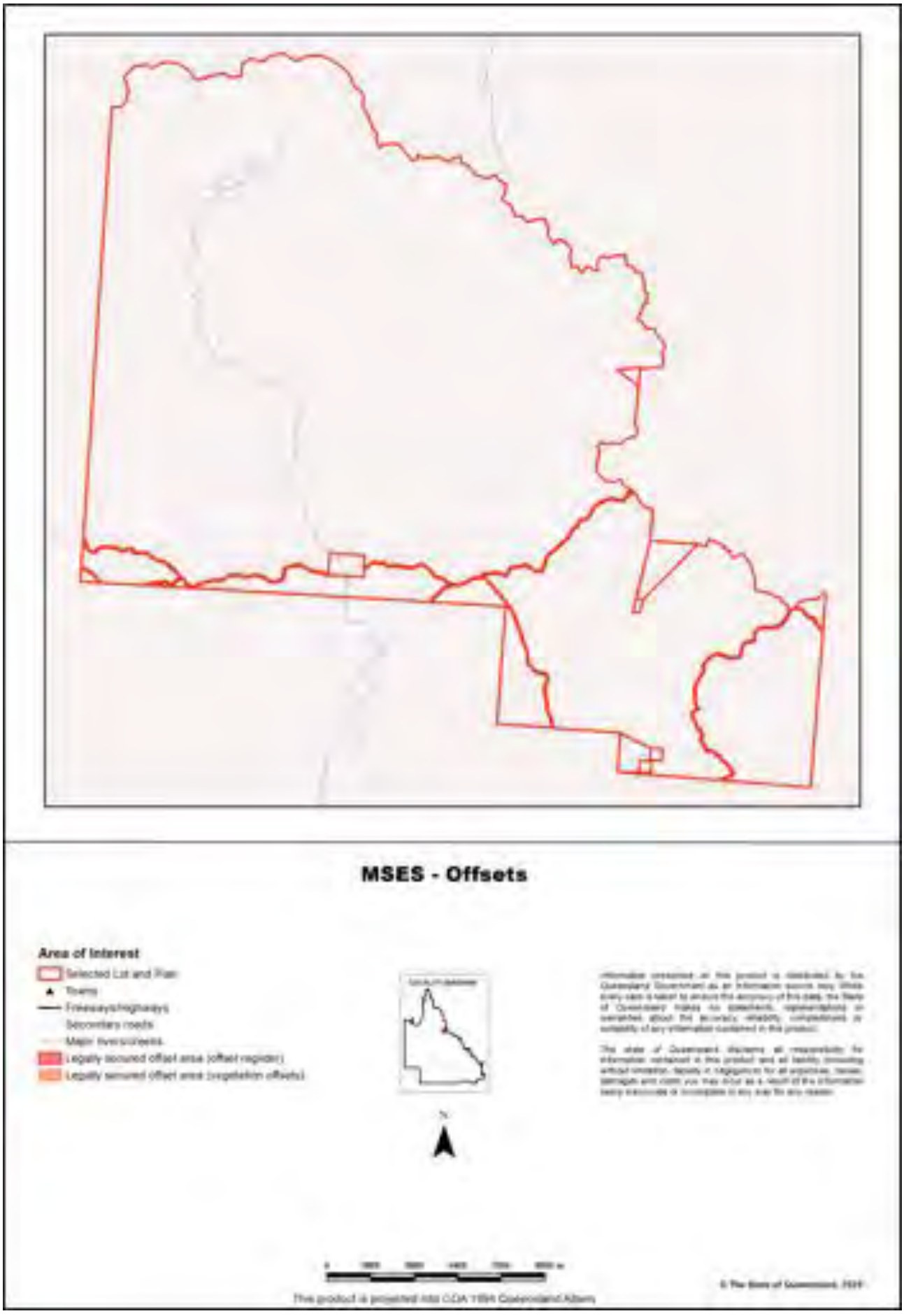
Map 3b - MSES - Species - Koala habitat area (SEQ)



Map 4 - MSES - Regulated Vegetation



Map 5 - MSES - Offset Areas



Appendices

Appendix 1 - Matters of State Environmental Significance (MSES) methodology

MSES mapping is a regional-scale representation of the definition for MSES under the State Planning Policy (SPP). The compiled MSES mapping product is a guide to assist planning and development assessment decision-making. Its primary purpose is to support implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations. Similarly, the SPP biodiversity policy does not override or replace specific requirements of other Acts or regulations.

The Queensland Government's "Method for mapping - matters of state environmental significance for use in land use planning and development assessment" can be downloaded from:

http://www.ehp.qld.gov.au/land/natural-resource/method-mapping-mses.html .

Appendix 2 - Source Data

The datasets listed below are available on request from:

http://qldspatial.information.qld.gov.au/catalogue/custom/index.page

- Matters of State environmental significance

Note: MSES mapping is not based on new or unique data. The primary mapping product draws data from a number of underlying environment databases and geo-referenced information sources. MSES mapping is a versioned product that is updated generally on a twice-yearly basis to incorporate the changes to underlying data sources. Several components of MSES mapping made for the current version may differ from the current underlying data sources. To ensure accuracy, or proper representation of MSES values, it is strongly recommended that users refer to the underlying data sources and review the current definition of MSES in the State Planning Policy, before applying the MSES mapping.

Individual MSES layers can be attributed to the following source data available at QSpatial:

MSES layers	**current QSpatial data (http://qspatial.information.qld.gov.au)**
Protected Areas-Estates and Nature Refuges	- Protected areas of Queensland - Nature Refuges - Queensland
Marine Park-Highly Protected Zones	Moreton Bay marine park zoning 2008
Fish Habitat Areas	Queensland fish habitat areas
Strategic Environmental Areas-designated	Regional Planning Interests Act - Strategic Environmental Areas
HES wetlands	Map of Queensland Wetland Environmental Values
Wetlands in HEV waters	HEV waters: - EPP Water (multiple locations) intent for waters Source Wetlands: - Queensland Wetland Mapping (Current version 4, 2015) Source Watercourses: - Vegetation management watercourse and drainage feature map (1:100000 and 1:250000)
Wildlife habitat (threatened and special least concern)	-WildNet database species records - habitat suitability models (various) - SEQ koala habitat areas under the Koala Conservation Plan 2019
VMA regulated regional ecosystems	Vegetation management regional ecosystem and remnant map
VMA Essential Habitat	Vegetation management - essential habitat map
VMA Wetlands	Vegetation management wetlands map
Legally secured offsets	Vegetation Management Act property maps of assessable vegetation. For offset register data-contact DES
Regulated Vegetation Map	Vegetation management - regulated vegetation management map

Appendix 3 - Acronyms and Abbreviations

AOI	- Area of Interest
DES	- Department of Environment and Science
EP Act	- *Environmental Protection Act 1994*
EPP	- Environmental Protection Policy
GDA94	- Geocentric Datum of Australia 1994
GEM	- General Environmental Matters
GIS	- Geographic Information System
MSES	- Matters of State Environmental Significance
NCA	- *Nature Conservation Act 1992*
RE	- Regional Ecosystem
SPP	- State Planning Policy
VMA	- *Vegetation Management Act 1999*

Queensland Government

Department of Environment and Science

Environmental Reports

Matters of State Environmental Significance

For the selected area of interest
Lot: 2 Plan: SP205224

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or area of interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "central coordinates" option, the resulting assessment area encompasses an area extending for a 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: Planning.Support@des.qld.gov.au

Disclaimer

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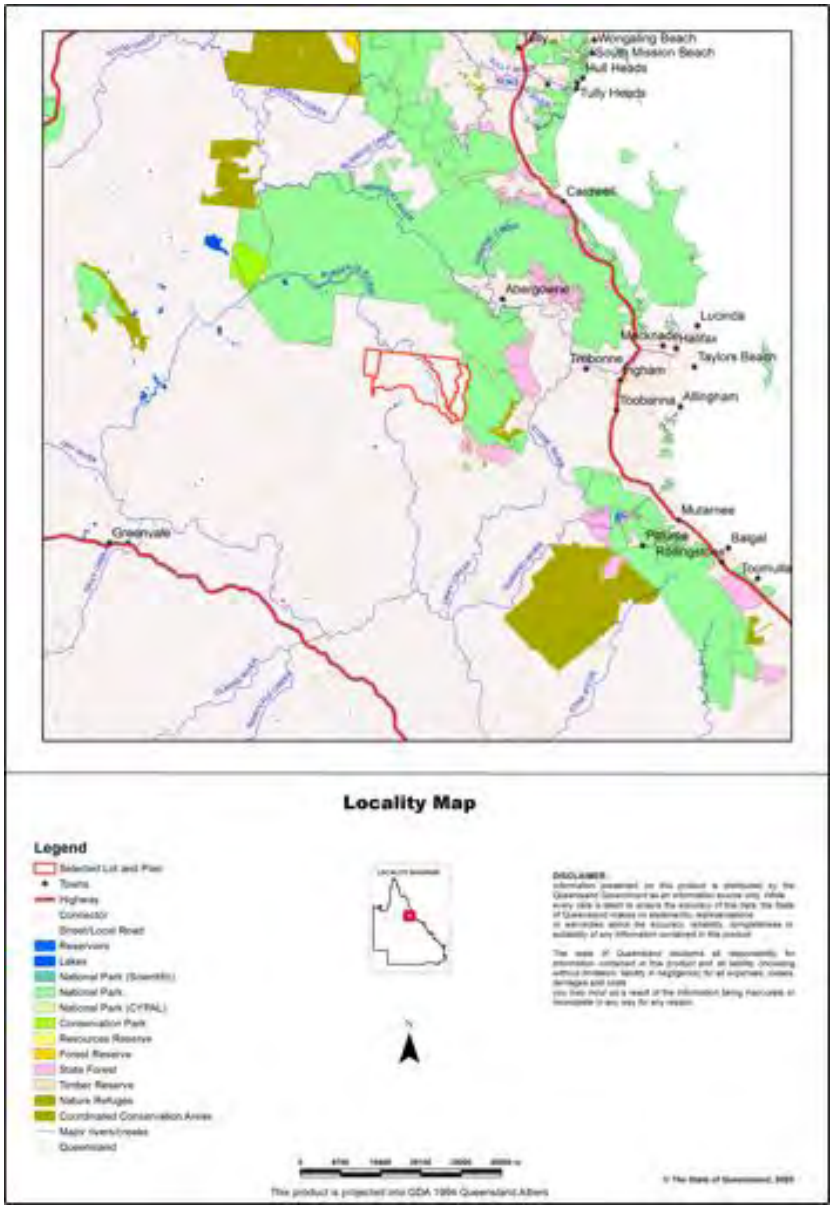
Assessment Area Details

The following table provides an overview of the area of interest (AOI) with respect to selected topographic and environmental values.

Table 1: Summary table, details for AOI Lot: 2 Plan: SP205224

Size (ha)	25,607.13
Local Government(s)	Charters Towers Regional
Bioregion(s)	Einasleigh Uplands, Wet Tropics
Subregion(s)	Paluma - Seaview, Herberton - Wairuna, Broken River
Catchment(s)	Herbert, Burdekin



Matters of State Environmental Significance (MSES)

MSES Categories

Queensland's State Planning Policy (SPP) includes a biodiversity State interest that states:

'The sustainable, long-term conservation of biodiversity is supported. Significant impacts on matters of national or state environmental significance are avoided, or where this cannot be reasonably achieved; impacts are minimised and residual impacts offset.'

The MSES mapping product is a guide to assist planning and development assessment decision-making. Its primary purpose is to support implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations. Similarly, the SPP biodiversity policy does not override or replace specific requirements of other Acts or regulations.

The SPP defines matters of state environmental significance as:

- Protected areas (including all classes of protected area except coordinated conservation areas) under the *Nature Conservation Act 1992* ;

- Marine parks and land within a 'marine national park', 'conservation park', 'scientific research', 'preservation' or 'buffer' zone under the *Marine Parks Act 2004* ;

- Areas within declared fish habitat areas that are management A areas or management B areas under the Fisheries Regulation 2008;

- Threatened wildlife under the *Nature Conservation Act 1992* and special least concern animals under the Nature Conservation (Wildlife) Regulation 2006;

- Regulated vegetation under the *Vegetation Management Act 1999* that is:

    • Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems;

    • Category C areas on the regulated vegetation management map that are 'endangered' or 'of concern' regional ecosystems;

    • Category R areas on the regulated vegetation management map;

    • Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse and drainage feature map;

    • Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map;

- Strategic Environmental Areas under the *Regional Planning Interests Act 2014* ;

- Wetlands in a wetland protection area of wetlands of high ecological significance shown on the Map of Queensland Wetland Environmental Values under the Environment Protection Regulation 2019;

- Wetlands and watercourses in high ecological value waters defined in the Environmental Protection (Water) Policy 2009, schedule 2;

- Legally secured offset areas.

MSES Values Present

The MSES values that are present in the area of interest are summarised in the table below:

Table 2: Summary of MSES present within the AOI

1a Protected Areas- estates	0.0 ha	0.0 %
1b Protected Areas- nature refuges	0.0 ha	0.0 %
2 State Marine Parks- highly protected zones	0.0 ha	0.0 %
3 Fish habitat areas (A and B areas)	0.0 ha	0.0 %
4 Strategic Environmental Areas (SEA)	0.0 ha	0.0 %
5 High Ecological Significance wetlands on the map of Referable Wetlands	1.36 ha	0.0%
6a High Ecological Value (HEV) wetlands	0.0 ha	0.0 %
6b High Ecological Value (HEV) waterways **	0.0 km	Not applicable
7a Threatened (endangered or vulnerable) wildlife	3159.47 ha	12.3%
7b Special least concern animals	894.27 ha	3.5%
7c i Koala habitat area - core (SEQ)	0.0 ha	0.0 %
7c ii Koala habitat area - locally refined (SEQ)	0.0 ha	0.0 %
8a Regulated Vegetation - Endangered/Of concern in Category B (remnant)	4285.09 ha	16.7%
8b Regulated Vegetation - Endangered/Of concern in Category C (regrowth)	1.11 ha	0.0%
8c Regulated Vegetation - Category R (GBR riverine regrowth)	34.39 ha	0.1%
8d Regulated Vegetation - Essential habitat	2879.96 ha	11.2%
8e Regulated Vegetation - intersecting a watercourse **	475.4 km	Not applicable
8f Regulated Vegetation - within 100m of a Vegetation Management Wetland	64.03 ha	0.3%
9a Legally secured offset areas- offset register areas	0.0 ha	0.0 %
9b Legally secured offset areas- vegetation offsets through a Property Map of Assessable Vegetation	0.0 ha	0.0 %

Additional Information with Respect to MSES Values Present

MSES - State Conservation Areas

1a. Protected Areas - estates

(no results)

1b. Protected Areas - nature refuges

(no results)

2. State Marine Parks - highly protected zones

(no results)

3. Fish habitat areas (A and B areas)

(no results)

Refer to **Map 1 - MSES - State Conservation Areas** for an overview of the relevant MSES.

MSES - Wetlands and Waterways

4. Strategic Environmental Areas (SEA)

(no results)

5. High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values

Natural wetlands that are 'High Ecological Significance' (HES) on the Map of Queensland Wetland Environmental Values are present.

6a. Wetlands in High Ecological Value (HEV) waters

(no results)

6b. Waterways in High Ecological Value (HEV) waters

Natural waterways that occur in HEV (maintain) freshwater and estuarine areas under the Environmental Protection (water) Policy are present.

Refer to **Map 2 - MSES - Wetlands and Waterways** for an overview of the relevant MSES.

MSES - Species

7a. Threatened (endangered or vulnerable) wildlife

Values are present

7b. Special least concern animals

Values are present

7c i. Koala habitat area - core (SEQ)

Not applicable

7c ii. Koala habitat area - locally refined (SEQ)

Not applicable

Threatened (endangered or vulnerable) wildlife habitat suitability models

Species	Common name	NCA status	Presence
Boronia keysii		V	None
Calyptorhynchus lathami	Glossy black cockatoo	V	None
Casuarius casuarius johnsonii	Sthn population cassowary	E	Core
Crinia tinnula	Wallum froglet	V	None
Denisonia maculata	Ornamental snake	V	None
Litoria freycineti	Wallum rocketfrog	V	None
Litoria olongburensis	Wallum sedgefrog	V	None
Melaleuca irbyana		E	None
Petaurus gracilis	Mahogany Glider	E	None
Petrogale persephone	Proserpine rock-wallaby	E	None
Phascolarctos cinereus	Koala - outside SEQ*	V	None
Pezoporus wallicus wallicus	Eastern ground parrot	V	None
Taudactylus Pleione	Kroombit tinkerfrog	E	None
Xeromys myoides	Water Mouse	V	None

**For koala model, this includes areas outside SEQ. Check 7c SEQ koala habitat for presence/absence.*

Threatened (endangered or vulnerable) wildlife species records

Scientific name	Common name	NCA status	EPBC status	Migratory status
Petauroides volans	greater glider	V	V	
Phascolarctos cinereus	koala	V	V	
Litoria dayi	Australian lacelid	E	V	

Special least concern animal species records

Scientific name	Common name	Migratory status
Tachyglossus aculeatus	short-beaked echidna	

**Nature Conservation Act 1992 (NCA) Status- Endangered (E), Vulnerable (V) or Special Least Concern Animal (SL). Environment Protection and Biodiversity Conservation Act 1999 (EPBC) status: Critically Endangered (CE) Endangered (E), Vulnerable (V)*

Migratory status (M) - China and Australia Migratory Bird Agreement (C), Japan and Australia Migratory Bird Agreement (J), Republic of Korea and Australia Migratory Bird Agreement (R), Bonn Migratory Convention (B), Eastern Flyway (E)

To request a species list for an area, or search for a species profile, access Wildlife Online at:

https://www.qld.gov.au/environment/plants-animals/species-list/

Refer to **Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals** and **Map 3b - MSES - Species - Koala habitat area (SEQ)** for an overview of the relevant MSES.

MSES - Regulated Vegetation

For further information relating to regional ecosystems in general, go to:
https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/
For a more detailed description of a particular regional ecosystem, access the regional ecosystem search page at:
https://environment.ehp.qld.gov.au/regional-ecosystems/

8a. Regulated Vegetation - Endangered/Of concern in Category B (remnant)

Regional ecosystem	Vegetation management polygon	Vegetation management status
7.12.66b	O-dom	rem_oc
7.3.49a	O-dom	rem_oc
7.3.28d	O-dom	rem_oc
7.12.37b	O-dom	rem_oc
7.12.17	O-dom	rem_oc
7.12.66c	O-dom	rem_oc
7.3.28b	O-dom	rem_oc
7.3.25b	O-dom	rem_oc
7.3.28a	O-dom	rem_oc
7.3.26a	O-dom	rem_oc
7.12.60a	O-dom	rem_oc
7.5.4a	O-dom	rem_oc
7.12.60b	O-dom	rem_oc
7.3.39c	O-dom	rem_oc
7.3.39b	O-dom	rem_oc
7.3.19a	O-dom	rem_oc
7.5.4b	O-dom	rem_oc
7.5.2a	O-dom	rem_oc
7.5.2d	O-dom	rem_oc
7.12.69b	O-dom	rem_oc
7.5.2e	O-dom	rem_oc
7.12.35	O-dom	rem_oc

8b. Regulated Vegetation - Endangered/Of concern in Category C (regrowth)

Regional ecosystem	Vegetation management polygon	Vegetation management status
7.5.4b	O-dom	hvr_oc

8c. Regulated Vegetation - Category R (GBR riverine regrowth)

Regulated vegetation map category	Map number	RVM rule
R	8060	4

8d. Regulated Vegetation - Essential habitat

Values are present

8e. Regulated Vegetation - intersecting a watercourse**

A vegetation management watercourse is mapped as present

8f. Regulated Vegetation - within 100m of a Vegetation Management wetland

Regulated vegetation map category	Map number	RVM rule
B	8060	2
R	8060	4

Refer to **Map 4 - MSES - Regulated Vegetation** for an overview of the relevant MSES.

MSES - Offsets

9a. Legally secured offset areas - offset register areas

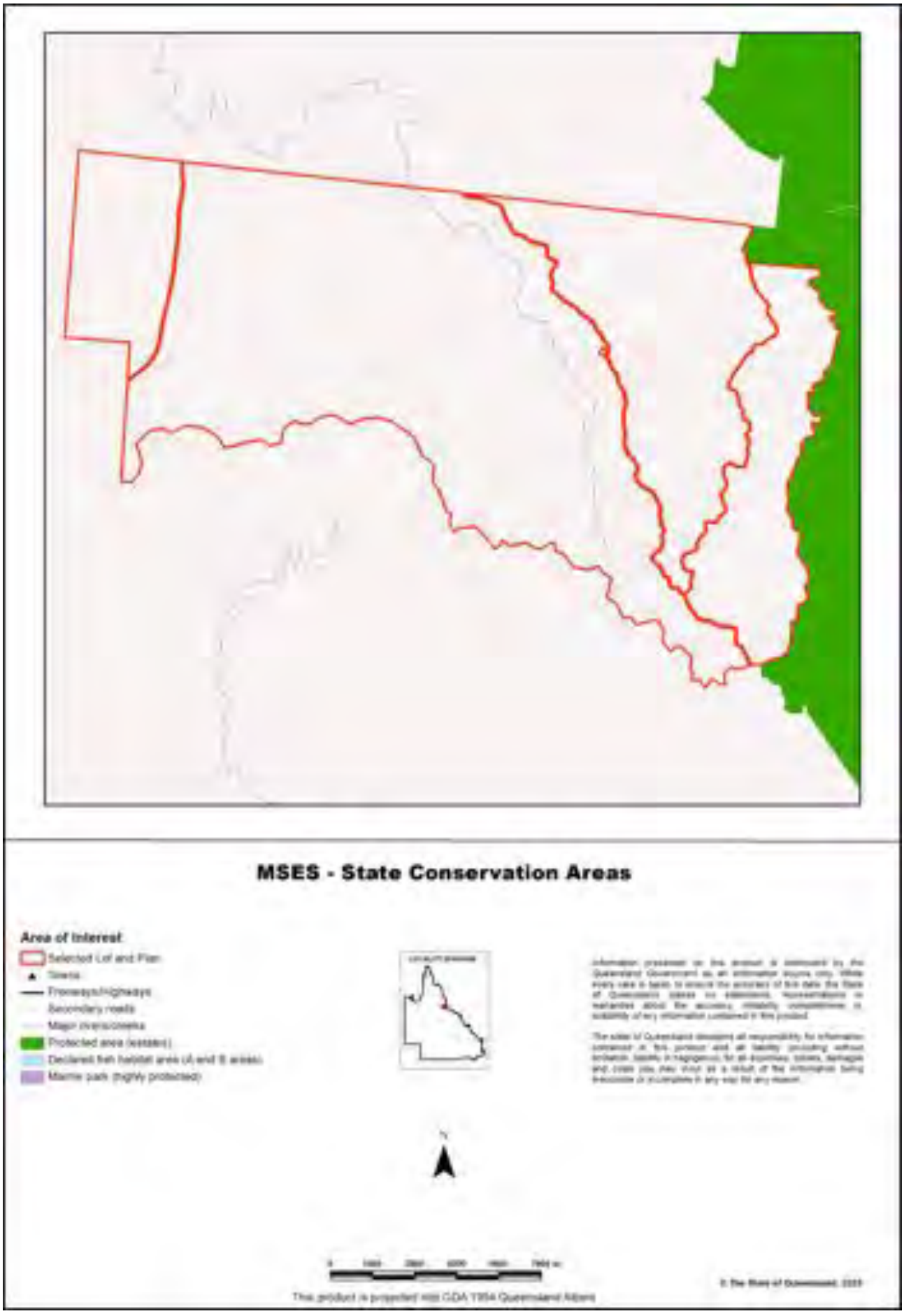
(no results)

9b. Legally secured offset areas - vegetation offsets through a Property Map of Assessable Vegetation

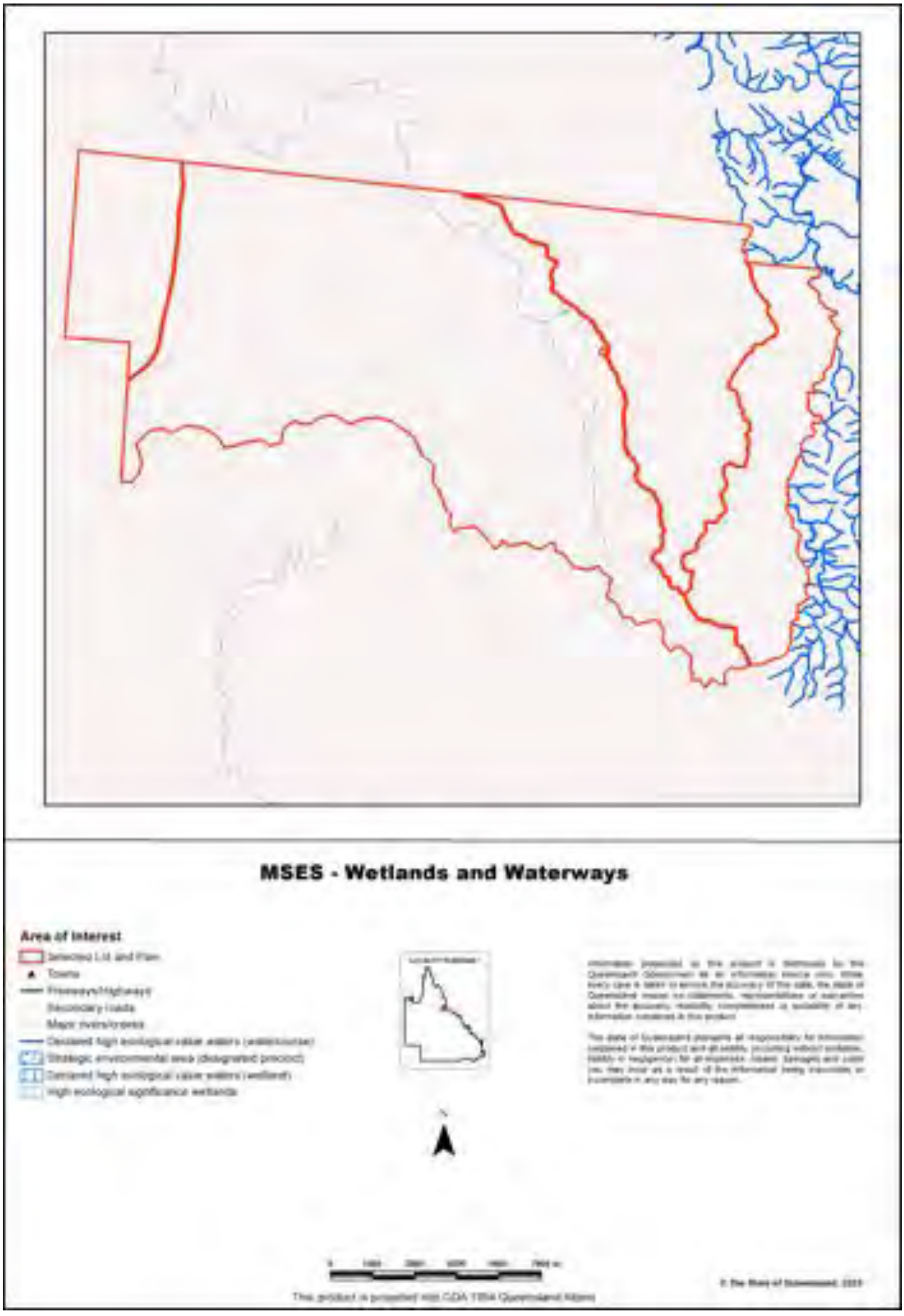
(no results)

Refer to **Map 5 - MSES - Offset Areas** for an overview of the relevant MSES.

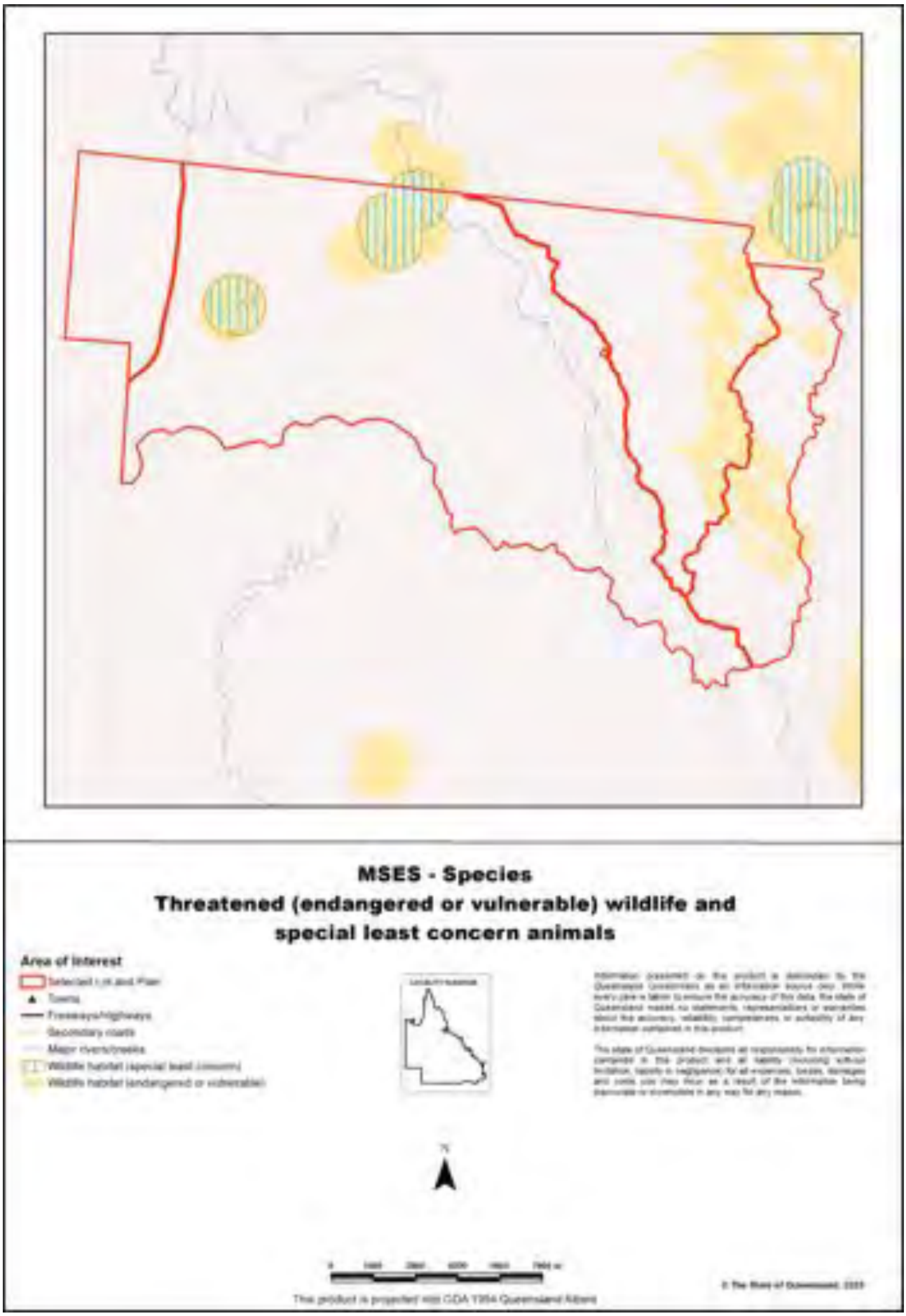
Map 1 - MSES - State Conservation Areas



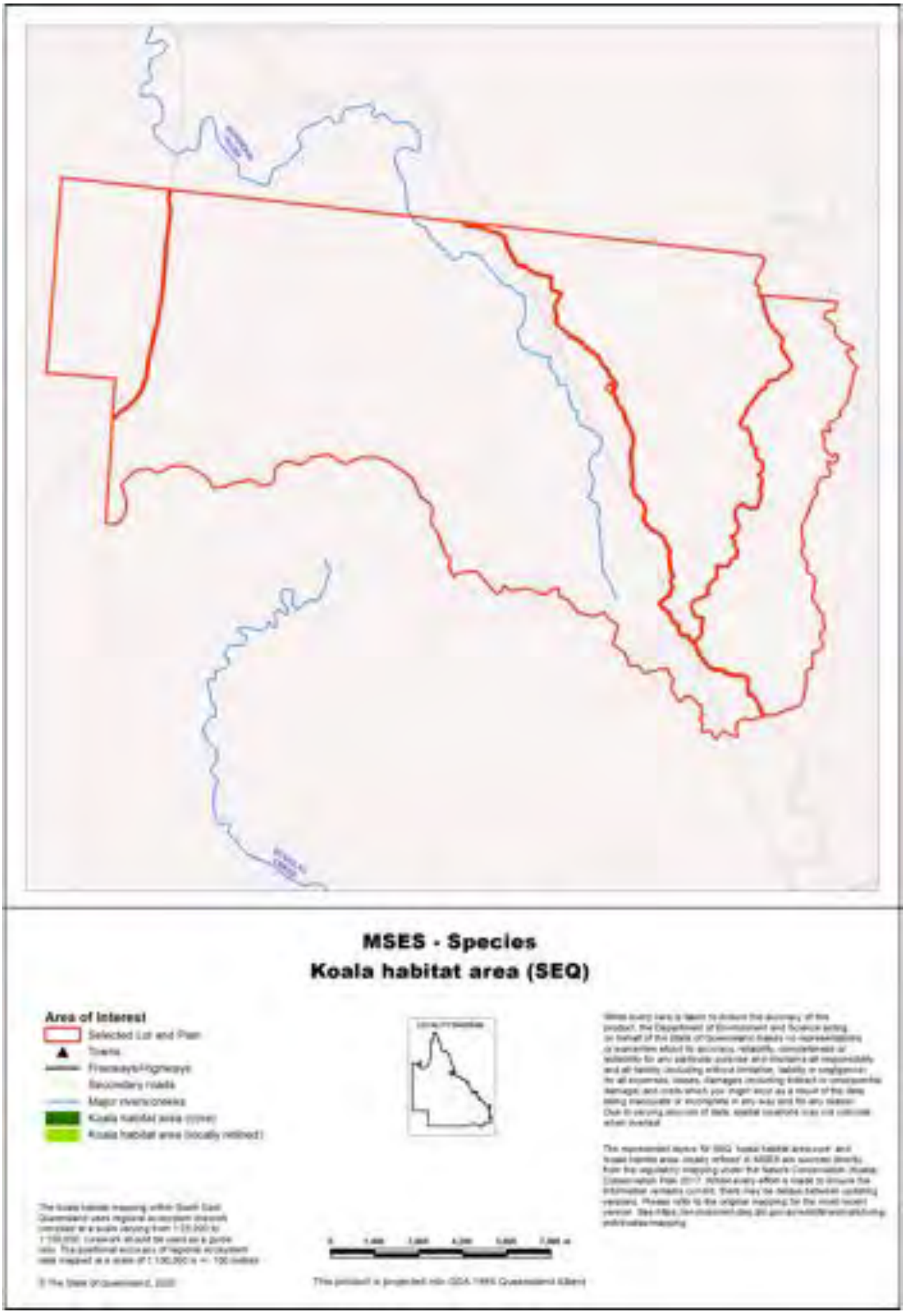
Map 2 - MSES - Wetlands and Waterways



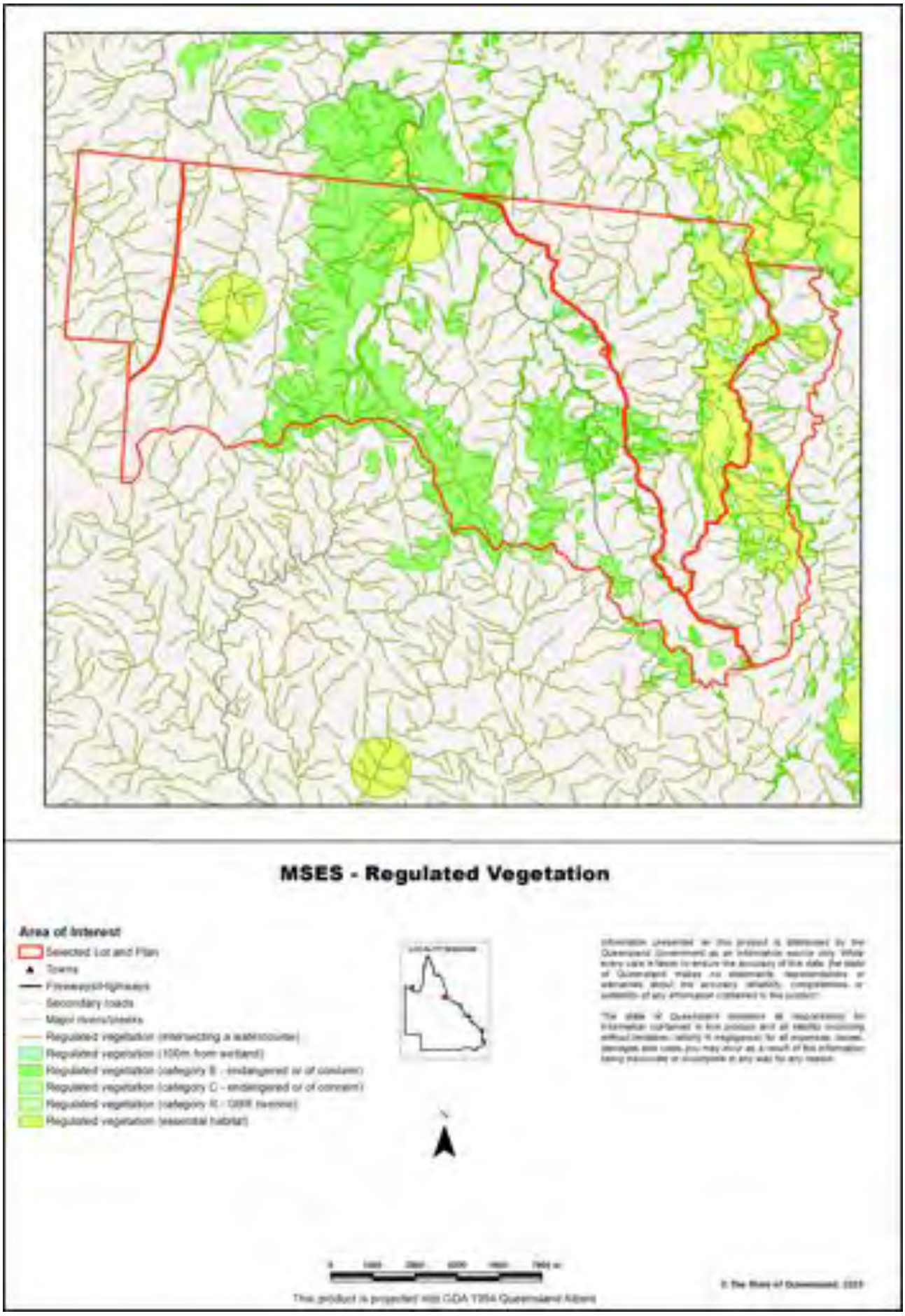
Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals



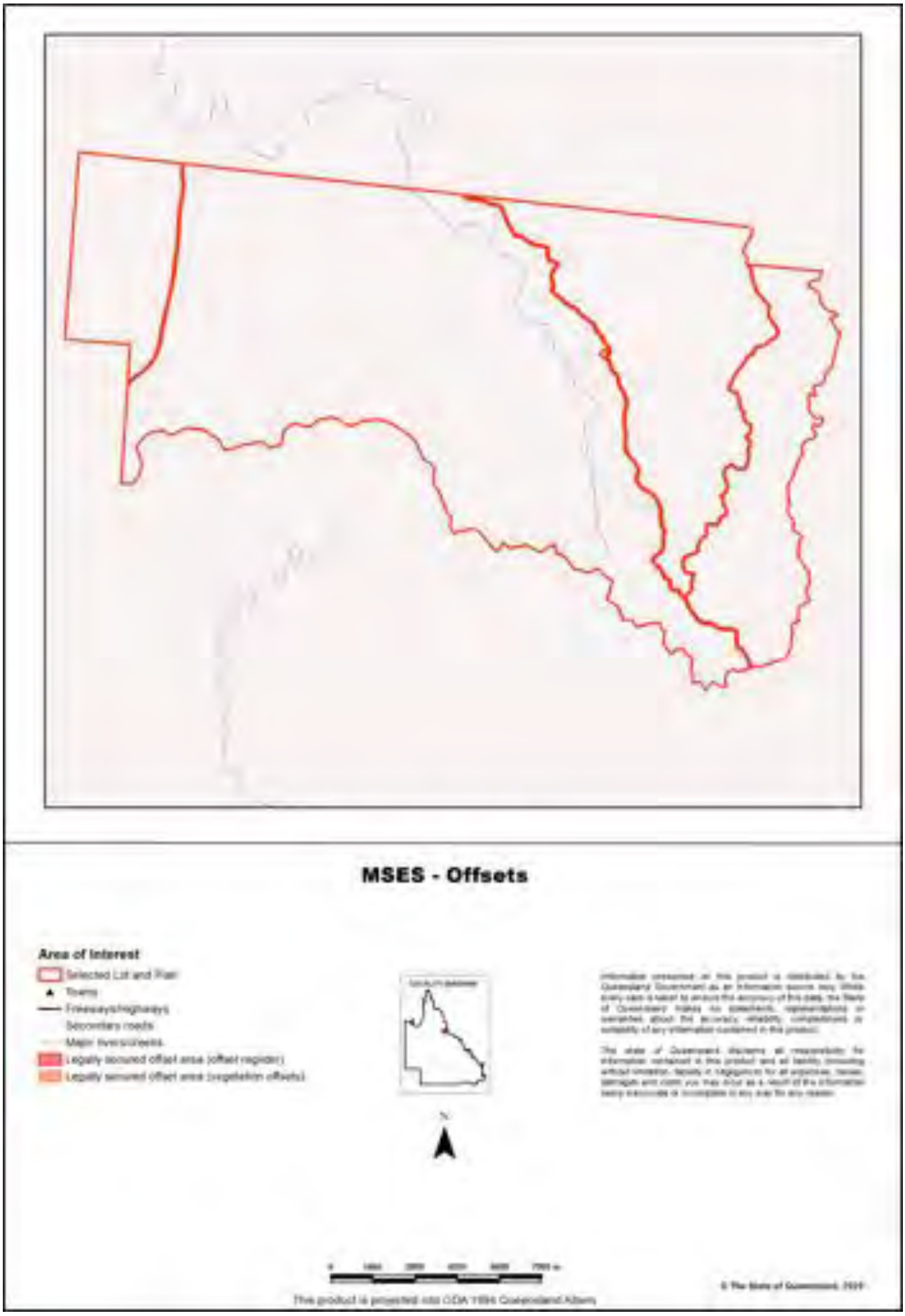
Map 3b - MSES - Species - Koala habitat area (SEQ)



Map 4 - MSES - Regulated Vegetation



Map 5 - MSES - Offset Areas



Appendices

Appendix 1 - Matters of State Environmental Significance (MSES) methodology

MSES mapping is a regional-scale representation of the definition for MSES under the State Planning Policy (SPP). The compiled MSES mapping product is a guide to assist planning and development assessment decision-making. Its primary purpose is to support implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations. Similarly, the SPP biodiversity policy does not override or replace specific requirements of other Acts or regulations.

The Queensland Government's "Method for mapping - matters of state environmental significance for use in land use planning and development assessment" can be downloaded from:

http://www.ehp.qld.gov.au/land/natural-resource/method-mapping-mses.html .

Appendix 2 - Source Data

The datasets listed below are available on request from:

http://qldspatial.information.qld.gov.au/catalogue/custom/index.page

- Matters of State environmental significance

Note: MSES mapping is not based on new or unique data. The primary mapping product draws data from a number of underlying environment databases and geo-referenced information sources. MSES mapping is a versioned product that is updated generally on a twice-yearly basis to incorporate the changes to underlying data sources. Several components of MSES mapping made for the current version may differ from the current underlying data sources. To ensure accuracy, or proper representation of MSES values, it is strongly recommended that users refer to the underlying data sources and review the current definition of MSES in the State Planning Policy, before applying the MSES mapping.

Individual MSES layers can be attributed to the following source data available at QSpatial:

MSES layers	**current QSpatial data (http://qspatial.information.qld.gov.au)**
Protected Areas-Estates and Nature Refuges	- Protected areas of Queensland - Nature Refuges - Queensland
Marine Park-Highly Protected Zones	Moreton Bay marine park zoning 2008
Fish Habitat Areas	Queensland fish habitat areas
Strategic Environmental Areas-designated	Regional Planning Interests Act - Strategic Environmental Areas
HES wetlands	Map of Queensland Wetland Environmental Values
Wetlands in HEV waters	HEV waters: - EPP Water (multiple locations) intent for waters Source Wetlands: - Queensland Wetland Mapping (Current version 4, 2015) Source Watercourses: - Vegetation management watercourse and drainage feature map (1:100000 and 1:250000)
Wildlife habitat (threatened and special least concern)	-WildNet database species records - habitat suitability models (various) - SEQ koala habitat areas under the Koala Conservation Plan 2019
VMA regulated regional ecosystems	Vegetation management regional ecosystem and remnant map
VMA Essential Habitat	Vegetation management - essential habitat map
VMA Wetlands	Vegetation management wetlands map
Legally secured offsets	Vegetation Management Act property maps of assessable vegetation. For offset register data-contact DES
Regulated Vegetation Map	Vegetation management - regulated vegetation management map

Appendix 3 - Acronyms and Abbreviations

AOI	- Area of Interest
DES	- Department of Environment and Science
EP Act	- *Environmental Protection Act 1994*
EPP	- Environmental Protection Policy
GDA94	- Geocentric Datum of Australia 1994
GEM	- General Environmental Matters
GIS	- Geographic Information System
MSES	- Matters of State Environmental Significance
NCA	- *Nature Conservation Act 1992*
RE	- Regional Ecosystem
SPP	- State Planning Policy
VMA	- *Vegetation Management Act 1999*

Queensland Government

Department of Environment and Science

Environmental Reports

Matters of State Environmental Significance

For the selected area of interest
Lot: 3 Plan: WG274

Environmental Reports - General Information

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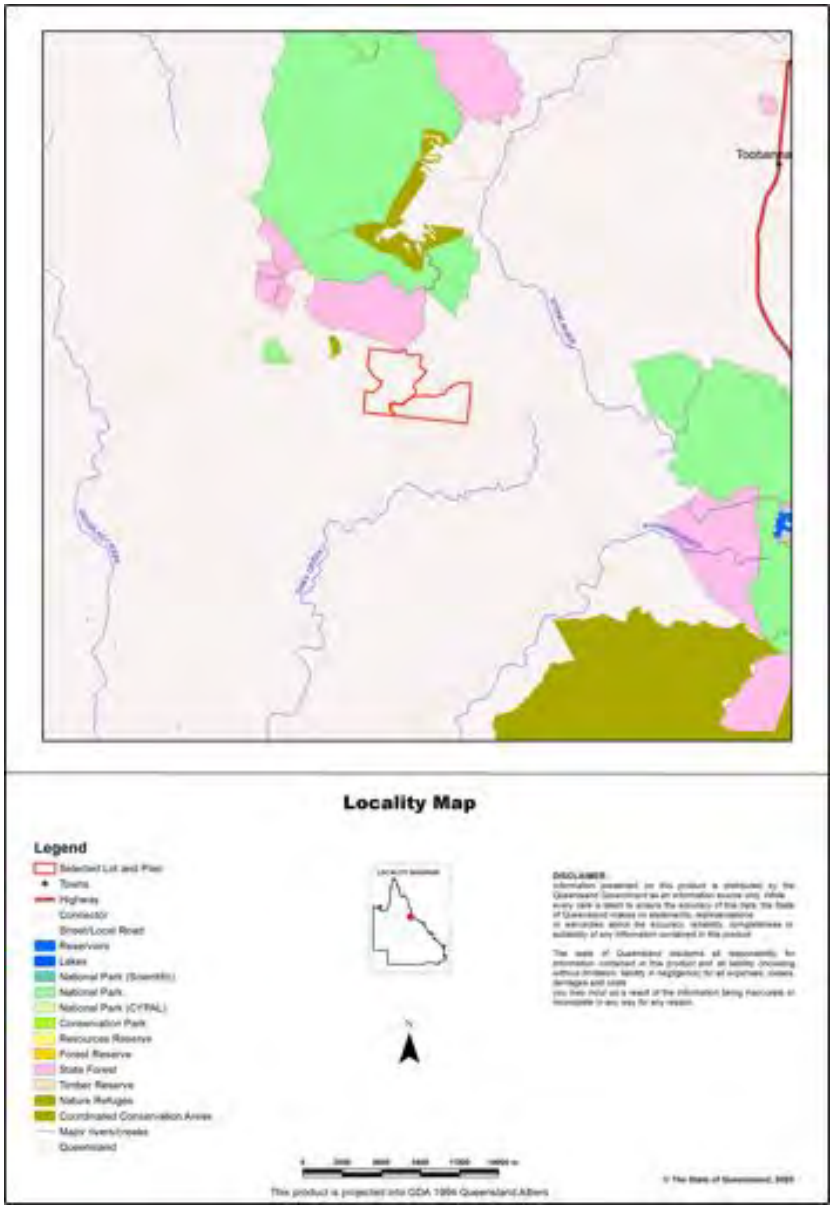
Assessment Area Details

The following table provides an overview of the area of interest (AOI) with respect to selected topographic and environmental values.

Table 1: Summary table, details for AOI Lot: 3 Plan: WG274

Size (ha)	2,371.05
Local Government(s)	Hinchinbrook Shire
Bioregion(s)	Wet Tropics
Subregion(s)	Paluma - Seaview
Catchment(s)	Herbert, Burdekin



Matters of State Environmental Significance (MSES)

MSES Categories

Queensland's State Planning Policy (SPP) includes a biodiversity State interest that states:

'The sustainable, long-term conservation of biodiversity is supported. Significant impacts on matters of national or state environmental significance are avoided, or where this cannot be reasonably achieved; impacts are minimised and residual impacts offset.'

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- Protected areas (including all classes of protected area except coordinated conservation areas) under the *Nature Conservation Act 1992* ;

- Marine parks and land within a 'marine national park', 'conservation park', 'scientific research', 'preservation' or 'buffer' zone under the *Marine Parks Act 2004* ;

- Areas within declared fish habitat areas that are management A areas or management B areas under the Fisheries Regulation 2008;

- Threatened wildlife under the *Nature Conservation Act 1992* and special least concern animals under the Nature Conservation (Wildlife) Regulation 2006;

- Regulated vegetation under the *Vegetation Management Act 1999* that is:

    • Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems;

    • Category C areas on the regulated vegetation management map that are 'endangered' or 'of concern' regional ecosystems;

    • Category R areas on the regulated vegetation management map;

    • Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse and drainage feature map;

    • Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map;

- Strategic Environmental Areas under the *Regional Planning Interests Act 2014* ;

- Wetlands in a wetland protection area of wetlands of high ecological significance shown on the Map of Queensland Wetland Environmental Values under the Environment Protection Regulation 2019;

- Wetlands and watercourses in high ecological value waters defined in the Environmental Protection (Water) Policy 2009, schedule 2;

- Legally secured offset areas.

MSES Values Present

The MSES values that are present in the area of interest are summarised in the table below:

Table 2: Summary of MSES present within the AOI

1a Protected Areas- estates	0.0 ha	0.0 %
1b Protected Areas- nature refuges	0.0 ha	0.0 %
2 State Marine Parks- highly protected zones	0.0 ha	0.0 %
3 Fish habitat areas (A and B areas)	0.0 ha	0.0 %
4 Strategic Environmental Areas (SEA)	0.0 ha	0.0 %
5 High Ecological Significance wetlands on the map of Referable Wetlands	0.0 ha	0.0 %
6a High Ecological Value (HEV) wetlands	0.0 ha	0.0 %
6b High Ecological Value (HEV) waterways **	0.0 km	Not applicable
7a Threatened (endangered or vulnerable) wildlife	11.58 ha	0.5%
7b Special least concern animals	0.0 ha	0.0 %
7c i Koala habitat area - core (SEQ)	0.0 ha	0.0 %
7c ii Koala habitat area - locally refined (SEQ)	0.0 ha	0.0 %
8a Regulated Vegetation - Endangered/Of concern in Category B (remnant)	573.53 ha	24.2%
8b Regulated Vegetation - Endangered/Of concern in Category C (regrowth)	13.88 ha	0.6%
8c Regulated Vegetation - Category R (GBR riverine regrowth)	5.37 ha	0.2%
8d Regulated Vegetation - Essential habitat	11.14 ha	0.5%
8e Regulated Vegetation - intersecting a watercourse **	43.9 km	Not applicable
8f Regulated Vegetation - within 100m of a Vegetation Management Wetland	7.39 ha	0.3%
9a Legally secured offset areas- offset register areas	0.0 ha	0.0 %
9b Legally secured offset areas- vegetation offsets through a Property Map of Assessable Vegetation	0.0 ha	0.0 %

Additional Information with Respect to MSES Values Present

MSES - State Conservation Areas

1a. Protected Areas - estates

(no results)

1b. Protected Areas - nature refuges

(no results)

2. State Marine Parks - highly protected zones

(no results)

3. Fish habitat areas (A and B areas)

(no results)

Refer to **Map 1 - MSES - State Conservation Areas** for an overview of the relevant MSES.

MSES - Wetlands and Waterways

4. Strategic Environmental Areas (SEA)

(no results)

5. High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values

(no results)

6a. Wetlands in High Ecological Value (HEV) waters

(no results)

6b. Waterways in High Ecological Value (HEV) waters

(no results)

Refer to **Map 2 - MSES - Wetlands and Waterways** for an overview of the relevant MSES.

MSES - Species

7a. Threatened (endangered or vulnerable) wildlife

Values are present

7b. Special least concern animals

Not applicable

7c i. Koala habitat area - core (SEQ)

Not applicable

7c ii. Koala habitat area - locally refined (SEQ)

Not applicable

Threatened (endangered or vulnerable) wildlife habitat suitability models

Species	Common name	NCA status	Presence
Boronia keysii		V	None
Calyptorhynchus lathami	Glossy black cockatoo	V	None
Casuarius casuarius johnsonii	Sthn population cassowary	E	Core
Crinia tinnula	Wallum froglet	V	None
Denisonia maculata	Ornamental snake	V	None
Litoria freycineti	Wallum rocketfrog	V	None
Litoria olongburensis	Wallum sedgefrog	V	None
Melaleuca irbyana		E	None
Petaurus gracilis	Mahogany Glider	E	None
Petrogale persephone	Proserpine rock-wallaby	E	None
Phascolarctos cinereus	Koala - outside SEQ*	V	None
Pezoporus wallicus wallicus	Eastern ground parrot	V	None
Taudactylus Pleione	Kroombit tinkerfrog	E	None
Xeromys myoides	Water Mouse	V	None

**For koala model, this includes areas outside SEQ. Check 7c SEQ koala habitat for presence/absence.*

Threatened (endangered or vulnerable) wildlife species records

(no results)

Special least concern animal species records

(no results)

**Nature Conservation Act 1992 (NCA) Status- Endangered (E), Vulnerable (V) or Special Least Concern Animal (SL). Environment Protection and Biodiversity Conservation Act 1999 (EPBC) status: Critically Endangered (CE) Endangered (E), Vulnerable (V)*

Migratory status (M) - China and Australia Migratory Bird Agreement (C), Japan and Australia Migratory Bird Agreement (J), Republic of Korea and Australia Migratory Bird Agreement (R), Bonn Migratory Convention (B), Eastern Flyway (E)

To request a species list for an area, or search for a species profile, access Wildlife Online at:
https://www.qld.gov.au/environment/plants-animals/species-list/

Refer to **Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals** and **Map 3b - MSES - Species - Koala habitat area (SEQ)** for an overview of the relevant MSES.

MSES - Regulated Vegetation

For further information relating to regional ecosystems in general, go to:

https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/
For a more detailed description of a particular regional ecosystem, access the regional ecosystem search page at:
https://environment.ehp.qld.gov.au/regional-ecosystems/

8a. Regulated Vegetation - Endangered/Of concern in Category B (remnant)

Regional ecosystem	Vegetation management polygon	Vegetation management status
7.12.66b	O-dom	rem_oc
7.5.1a	O-dom	rem_oc
7.5.3a	O-dom	rem_oc
7.5.4a	O-dom	rem_oc
7.5.4b	O-dom	rem_oc
7.3.39c	O-dom	rem_oc
7.5.4f	O-dom	rem_oc
7.5.4c	O-dom	rem_oc
7.12.66d	O-dom	rem_oc
7.8.18a	O-dom	rem_oc
7.8.18c	O-dom	rem_oc
7.12.30a/7.5.4a	O-subdom	rem_oc
7.3.39a	O-dom	rem_oc
7.12.29a/7.5.4a	O-subdom	rem_oc

8b. Regulated Vegetation - Endangered/Of concern in Category C (regrowth)

Regional ecosystem	Vegetation management polygon	Vegetation management status
7.5.4f	O-dom	hvr_oc

8c. Regulated Vegetation - Category R (GBR riverine regrowth)

Regulated vegetation map category	Map number	RVM rule
R	8060	4

8d. Regulated Vegetation - Essential habitat

Values are present

8e. Regulated Vegetation - intersecting a watercourse**

A vegetation management watercourse is mapped as present

8f. Regulated Vegetation - within 100m of a Vegetation Management wetland

Regulated vegetation map category	Map number	RVM rule
B	8060	2

Refer to **Map 4 - MSES - Regulated Vegetation** for an overview of the relevant MSES.

MSES - Offsets

9a. Legally secured offset areas - offset register areas

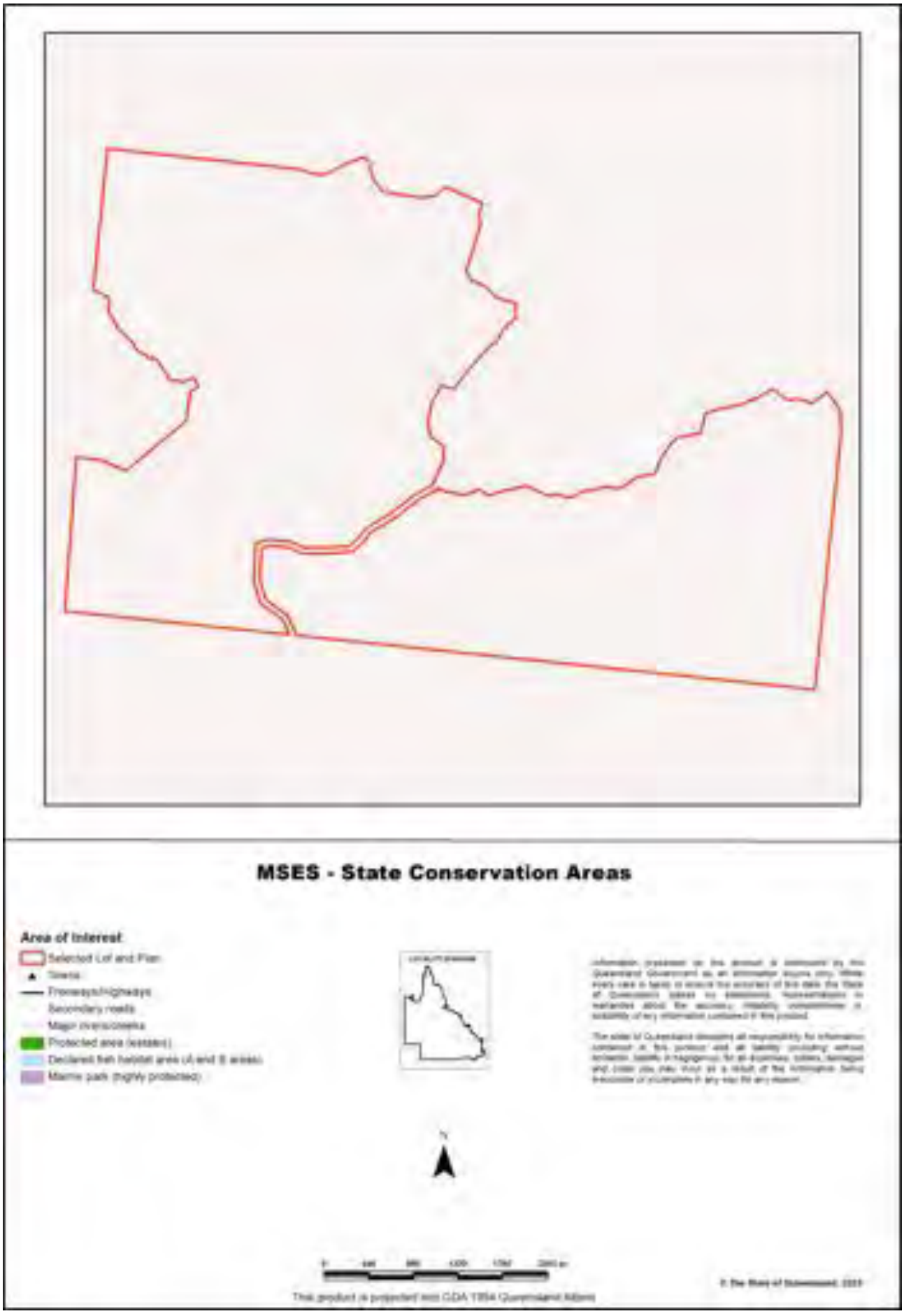
(no results)

9b. Legally secured offset areas - vegetation offsets through a Property Map of Assessable Vegetation

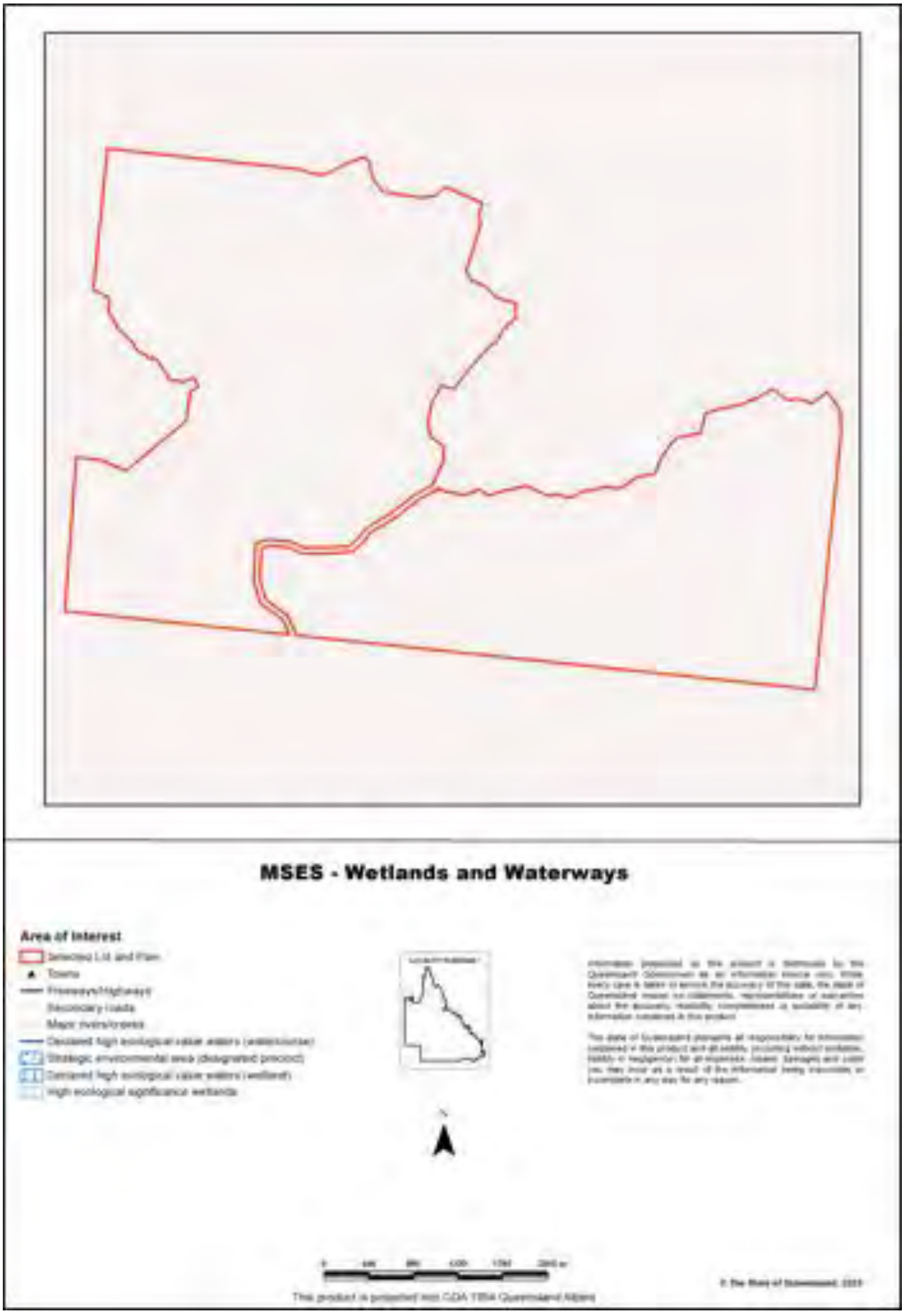
(no results)

Refer to **Map 5 - MSES - Offset Areas** for an overview of the relevant MSES.

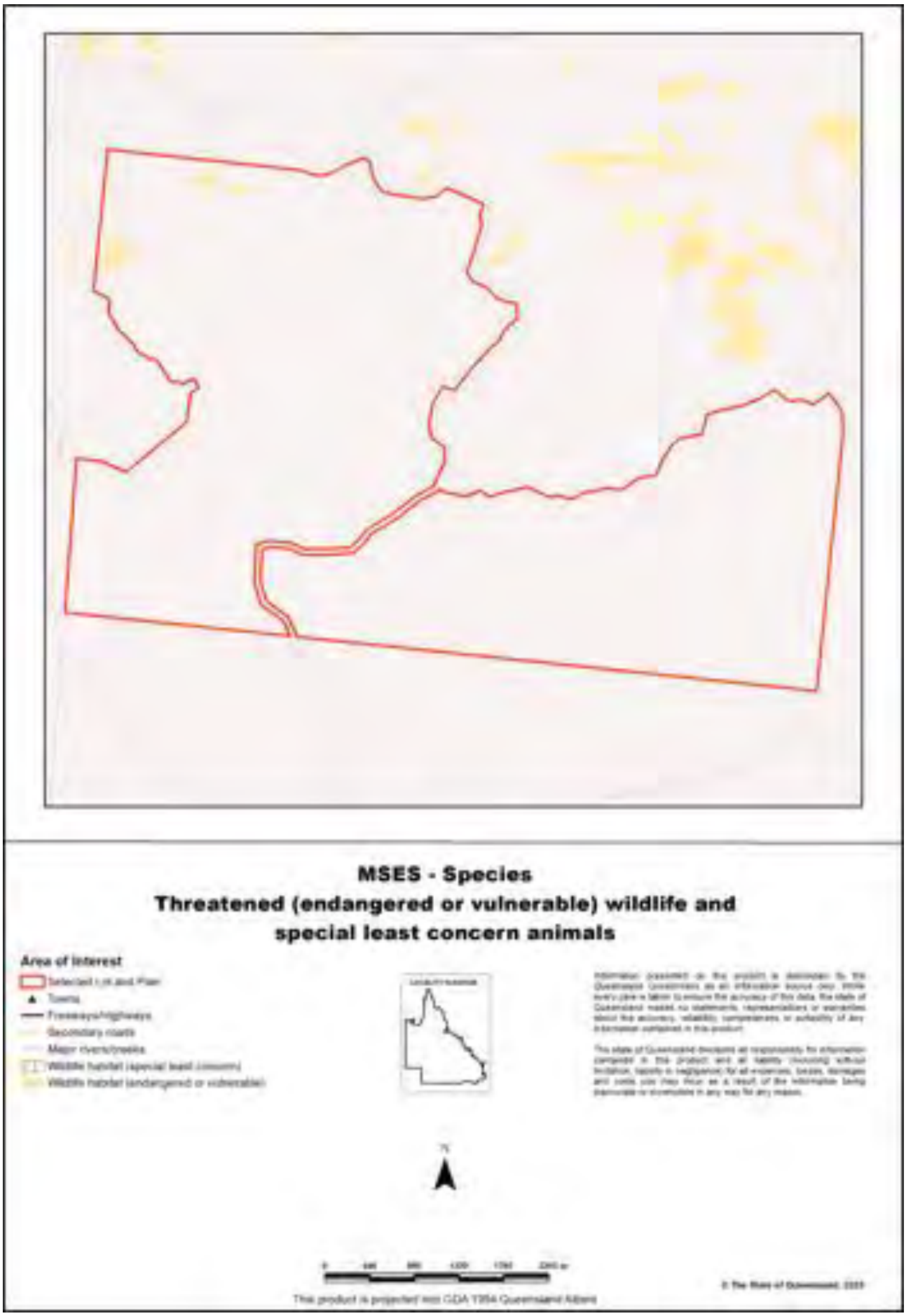
Map 1 - MSES - State Conservation Areas



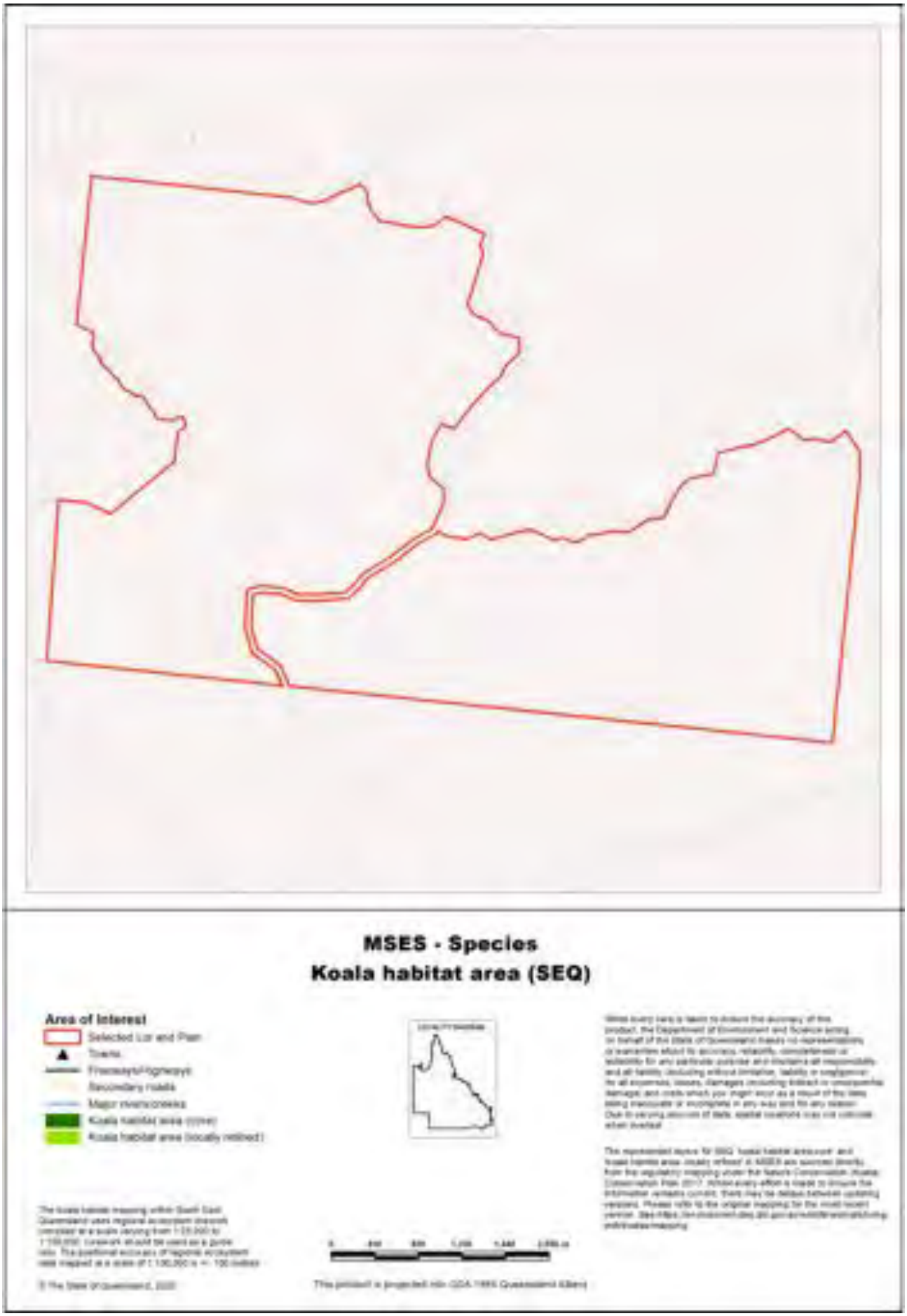
Map 2 - MSES - Wetlands and Waterways



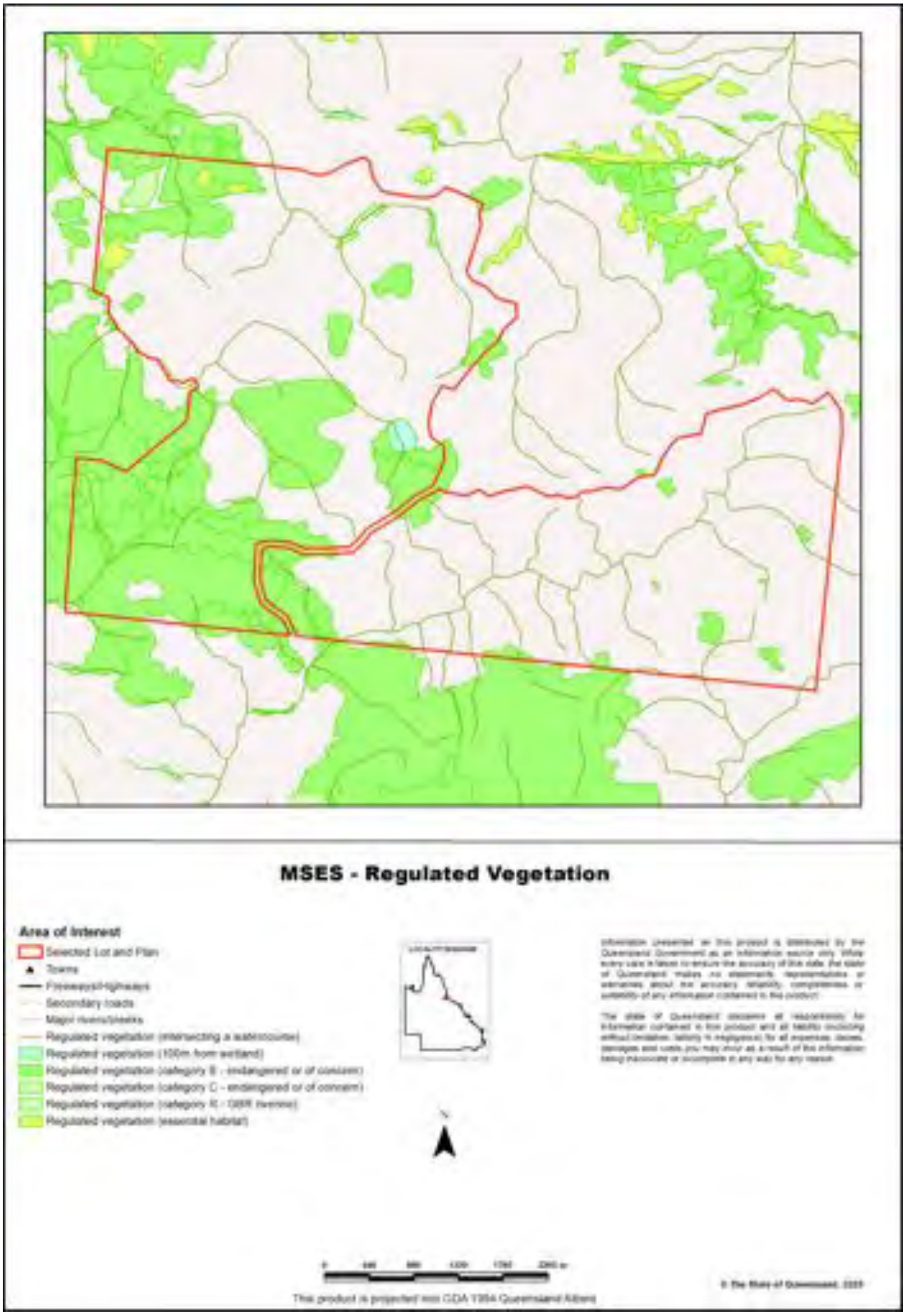
Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals



Map 3b - MSES - Species - Koala habitat area (SEQ)



Map 4 - MSES - Regulated Vegetation



Map 5 - MSES - Offset Areas