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niche Environment and Heritage

# Oakhampton Rezoning

## Biodiversity Assessment

Prepared for Walker Corporation Pty Ltd | 4 July 2022

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## Document control

| Project number | Client | Project manager | LGA |
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# Executive summary

## Project outline

### *Context*

Niche Environment and Heritage (Niche) was commissioned by Walker Corporation to undertake a Biodiversity Assessment (BA) of the land at Kezia Road and Oakhampton Road, Oakhampton (Study Area), located north of Maitland. Walker Corporation are proposing to rezone part of the Study Area located within the Aberglasslyn Urban Release Area to Part *R1 General Residential* and Part *C3 Environmental Management* zone, and maintain current *RU1 Primary Production* zoning some areas

### *Aims*

The BA aims to identity biodiversity constraints and potential associated with the potential development of the Study Area to support the rezoning proposal. Further impact assessment under State and Commonwealth legislation would be required for any proposed subdivision or development post rezoning of the land.

### *Summary of results*

Based on the results of this Biodiversity Assessment it has been determined that there are a number of biodiversity constraints associated with the Study Area as outlined below:

- The presence of native vegetation and associated habitats along the northern boundary
- The presence of a threatened species (White-bellied Sea-eagle - *Haliaeetus leucogaster*) and species from a threatened population (River Red Gum - *Eucalyptus camaldulensis*) recorded in the riparian vegetation along the northern boundary (outside Impact Area)
- Biodiversity Values (BV) Mapping within the Study Area (outside Impact Area)
- Key Fish Habitat mapped within the Study Area (outside Impact Area)
- The presence of aquatic habitats within the farm dams in the Study Area
- Coastal Environment Areas and Coastal Use Areas mapped within the Study Area.

All BV mapped areas and mapped native vegetation within the Study Area are located in the areas where existing zoning is proposed to be maintained. Impacts to BV mapped land will trigger the requirement for preparation of BDAR under the BOS. Based on the information provided by Walker Corporation, it is considered unlikely that the BOS will be triggered as Biodiversity Values and intact native vegetation do not occur in the Impact Area.

The majority of biodiversity constraints associated with the Study Area are located in the areas where existing zoning is proposed to be maintained, however some aquatic habitat and areas mapped as Key Fish Habitat, Coastal Environment Areas and Coastal Use Areas occur within land proposed to be zoned *R1 General Residential*.

### *Recommendations*

Recommendations to avoid and minimise impacts to biodiversity values within the Study Area are as follows:

- Retain native vegetation and habitats within the Study Area.

- Retain and protect River Red Gum - Eucalyptus camaldulensis as it is part of a threatened population.
- Engage an ecologist to conduct targeted field surveys for White-bellied Sea-eagle nests during the breeding season.
- If White-bellied Sea-eagles are found to utilise any part of the Study Area for breeding, a buffer should be established around the nest tree and no development should take place within the buffer during the breeding season. The recommended size of the buffer is 500 m around nests where there is intact vegetation, or 250 m in fragmented areas.
- Avoid impacts to BV mapped areas.
- Undertake consultation with NSW DPI Fisheries and NRAR to confirm acceptance of the field assessment findings in relation to Key Fish Habitats and waterway definition. This consultation process should resolve the requirements of these authorities in relation to any proposed modification to mapped waterways, dams and riparian corridors within the Study Area.
- Incorporate and document avoidance and mitigation mechanisms into the Project (see Section 4.3 and 4.4).
- Establish a suitable buffer to areas of riparian vegetation including establishing a buffer around riparian habitat associated with the Hunter River to ensure it will not be impacted by future works.
- Establish suitable buffers around waterways adjacent to the Impact Area to ensure they will not be impacted by future works.
- A Vegetation Management Plan (VMP) or Biodiversity Management Plan (BMP) should be prepared for the riparian vegetation around the Hunter River along the north boundary of the Study Area to ensure the area is managed for the protection of local flora and fauna habitats, and downstream receiving waterways.
- Planted native vegetation and non-invasive exotic trees should be retained where possible.
- Engage an aquatic ecologist to develop a Dam dewatering plan to guide the dewatering process.
- Dewatering should be supervised by an aquatic ecologist to undertake the relocation of any native fauna encountered.
- Consider potential impacts to groundwater and surface water in relation to areas identified as Watercourse land, Coastal Environment Areas and Coastal Use Areas when designing drainage infrastructure.

Potential impacts of the Project on biodiversity are likely to occur during the subdivision or development stages. As such, these recommendations should be incorporated into planning for the relevant stages when more information about the extent and nature of impacts is known.

# Table of Contents

## List of Figures



## List of Tables

# Glossary and list of abbreviations

| Term or abbreviation | Definition |
|---|---|
| AOBV | Areas of Outstanding Biodiversity Values |
| ARKS | Areas of Regional Koala Significance |
| BA | Biodiversity Assessment |
| BAM | Biodiversity Assessment Method |
| BC Act | NSW *Biodiversity Conservation Act 2016* |
| BDAR | Biodiversity Development Assessment Report |
| Biodiversity and Conservation SEPP | State Environmental Planning Policy (Biodiversity and Conservation) 2021 |
| BV Map | Biodiversity Values Map |
| BOS | NSW Biodiversity Offsets Scheme |
| DAWE | Department of Agriculture, Water and Environment (formerly DoEE) |
| DPE | Department of Planning and Environment |
| DPI | Department of Primary Industries |
| DPIE | Department of Planning, Industry and Environment (formerly DECCW, DECC, DEC, OEH, now DPE) |
| EEC | Endangered Ecological Community |
| EP&A Act | NSW *Environmental Planning and Assessment Act 1979* |
| EPBC Act | Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* |
| FM Act | *NSW Fisheries Management Act 1994* |
| ha | Hectare/s |
| IAM | Important Area Mapping |
| Impact Area | Means the area proposed be rezoned as R1 *General Residential* |
| km | kilometres |
| KTP | Key Threatening Process |
| LGA | Local Government Area |
| Locality | The Study Area and surrounds, nominally a 10 kilometre radius from the Study Area. |
| m | Metre/s |
| Maitland LEP | *Maitland Local Environmental Plan 2011* |
| MU | Bell and Driscoll 2015 vegetation community map units |
| NRAR | NSW Department of Natural Resources Access Regulator |
| PCT | Plant Community Type |
| The Project | The low density residential development to be facilitated by the proposed rezoning |
| Resilience and Hazards SEPP | *State Environmental Planning Policy (Resilience and Hazards*) 2021 |
| SAII | Serious And Irreversible Impact |
| Study Area | Means the lots encompassing the Study Area and surrounding land (refer to Figure 1 and Figure 3). |
| TEC | Threatened Ecological Community |

| | |
|---|---|
| WM Act | Water Management Act 2000 |

# 1. Introduction

## 1.1 Context

Niche Environment and Heritage (Niche) was commissioned by Walker Corporation Pty Ltd (Walker Corporation) to undertake a Biodiversity Assessment (BA) of the land at Kezia Road and Oakhampton Road, Oakhampton, north of Maitland (Figure 1) (Study Area). Walker Corporation are proposing to rezone part of the Study Area located within the Aberglasslyn Urban Release Area to Part *R1 General Residential* and Part *C3 Environmental Management* zone, and maintain current *RU1 Primary Production* zoning some areas (Figure 2a). The purpose of the proposed rezoning is to facilitate low density residential development (the Project) (Figure 2b) within the area proposed to be zoned *R1 General Residential* (the Impact Area). The BA aims to identity biodiversity constraints and potential associated with the potential development of the Study Area to support the rezoning proposal. Further impact assessment under State and Commonwealth legislation would be required for any proposed subdivision or development post rezoning of the land.

## 1.2 Location

The Study Area is located at Kezia Road and Oakhampton Road, Oakhampton approximately 4 kilometres (km) north of Maitland, within the Maitland local government area (LGA) (Figure 1). The Study Area (Figure 3) is approximately 92.61 hectares (ha) and is comprised of the lots listed in Table 1. The Study Area is currently zoned as *RU1 Primary Production, RU2 Rural Landscape* and *C2 Environmental Conservation*. The parts of the Study Area currently zoned as *RU1 Primary Production, RU2 Rural Landscape* are included in the proposed rezoning, although some parts of the area currently zoned *RU1 Primary Production* are proposed to be maintained as the existing zoning. The area currently zoned as *C2 Environmental Conservation* is not proposed to be rezoned.

**Table 1: Properties in the Study Area**

| | Lot and DP | Street address |
|---|---|---|
| 1 | Lot 1 DP 1012258 | 42 Kezia Road |
| 2 | Lot 8 DP 248331 | 43 Kezia Road |
| 3 | Lot 7 DP 248331 | 37 Kezia Road |
| 4 | Lot 6 DP 248331 | 35 Kezia Road |
| 5 | Lot 5 DP 248331 | 29 Kezia Road |
| 6 | Lot 1 DP 562346 | 502 Oakhampton Road |
| 7 | Lot 2 DP 562346 | 486 Oakhampton Road |
| 8 | Lot 3 DP 562346 | 478 Oakhampton Road |
| 9 | Lot 4 DP 248331 | 25 Kezia Road |
| 10 | Lot 1 DP 1086271 | 487 Oakhampton Road |
| 11 | Lot 1 DP 826919 | 473 Oakhampton Road |
| 12 | Lot 66 DP 810466 | 461 Oakhampton Road |
| 13 | Lot 7 DP 998430 | 355 Oakhampton Road |
| 14 | Lot 8 DP998430 | 355 Oakhampton Road |

## 1.3 Legislation

The following legislation has been considered in this assessment:

- NSW *Environmental Planning and Assessment Act 1979* (EP&A Act)
- NSW *Biodiversity Conservation Act 2016* (BC Act)
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Maitland Local Environmental Plan 2011*
- NSW *Fisheries Management Act 1994* (FM Act)
- *Water Management Act* 2000 (WM Act)
- Chapter 2 (Coastal Management) of the *State Environmental Planning Policy (Resilience and Hazards) 2021*
- Chapters 3 and 4 (Koala Habitat Protection2020 and 2021) of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021*.

This assessment only provides guidance on relevant legislation relating to the Project.

### 1.3.1 NSW *Environmental Planning and Assessment Act 1979*

The EP&A Act provides an assessment framework for the consideration of threatened species, populations, ecological communities and their habitats. Council has advised that the Project is a Part 4 development under the EP&A Act. Therefore, the Project must be assessed under the BC Act.

### 1.3.2 NSW *Biodiversity Conservation Act 2016*

Under the BC Act, the biodiversity values of an area may be assessed by two main means:

- An ecological assessment that applies the threatened species test of significance (5-part test) to determine a significant impact, or
- Entry into the NSW Biodiversity Offsets Scheme (BOS) and production of a Biodiversity Development Assessment Report (BDAR).

The BOS Threshold is a test used to determine when it is necessary to apply the Biodiversity Assessment Method (BAM) to assess the impacts of a proposal. The *Biodiversity Conservation Regulation 2017* sets out threshold levels for when the BOS will be triggered. The Threshold has three elements:

- Whether the amount of native vegetation being cleared exceeds a threshold: Threshold clearing limits (based on minimum lot size and clearing area) outlined in the BAM specify the level of assessment that must be carried out.
- Whether a proposal is likely to have a significant impact on threatened biodiversity, through application of the five-part test: Section 7.3 of the BC Act, the test of significance, sets the criteria for determining whether a proposal is likely to have a significant impact on threatened biodiversity.
- Whether the impacts occur on an area mapped on the BV Map.

The BOS Threshold has been reviewed in relation to the Study Area, as follows:

- Clearing threshold: The Study Area is *currently zoned as RU1 Primary Production, RU2 Rural Landscape and C2 Environmental Conservation* with a minimum lot size of 40 ha (*Maitland Local Environmental Plan 2011*). A clearing threshold of 1 ha applies to a minimum lot size of less than 1,000 hectares but not less than 40 hectares. That is, should any development result in impacts to more than 1 ha of native vegetation, the BOS would be triggered and a BDAR required.

- Test of significance: The test of significance must be applied to those species and/or communities that may be subject to an impact from any proposed action, i.e. to those species/communities that are considered as having a moderate or higher likelihood of occurrence. Where impacts to native vegetation can be avoided and/or mitigated, a significant impact is unlikely.
- BV Map: The Study Area contains areas of Biodiversity Values mapped as Protected Riparian Land associated with the Hunter River adjoining to the northern boundary (see Section 3.3.1).

Where the BOS is not triggered and impacts to native vegetation can be avoided and/or mitigated, a significant impact is unlikely. Where the BOS is triggered and impacts to native vegetation will occur, the development's impacts to biodiversity must be assessed by applying the BAM and preparing a BDAR. Under the BOS a development may be liable for offsetting costs. Based on the information provided by Walker Corporation, it is considered unlikely that the BOS will be triggered as Biodiversity Values and native vegetation are not mapped as occurring in the Impact Area.

### 1.3.3 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The purpose of the EPBC Act is to ensure that actions likely to cause a significant impact on Matters of National Environmental Significance (MNES) undergo an assessment and approval process. Under the EPBC Act, an action includes a project, undertaking, development or activity. An action that 'has, will have or is likely to have a significant impact on MNES' is deemed to be a controlled action and may not be undertaken without prior approval from the Commonwealth Minister for the Department of Agriculture, Water and Environment (DAWE) (thereby requiring a Referral).

There are nine MNES that come under the EPBC Act:

- World Heritage properties
- National heritage places
- Ramsar wetlands of international significance
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- Water resources (in relation to coal seam gas development and large coal mining development).

If significant impacts to MNES are anticipated, a referral to the Commonwealth Minister for DAWE will be required.

### 1.3.4 *Maitland Local Environmental Plan 2011*

The Maitland LEP aims to make local environmental planning provisions for land in Maitland in accordance with the relevant standard environmental planning instruments. Clause 7.4 Riparian land and watercourses applies to all land that is within 40 metres of the top of the bank of a watercourse identified as "Watercourse land" on the Watercourse Map. The Hunter River located to the north of the Study Area is identified as Watercourse land.

### 1.3.5 *Water Management Act 2000*

The *Water Management Act 2000* (WM Act) provides for the protection, conservation and ecologically sustainable development of waterways. It controls the carrying out of activities in or near waterways, their ecosystems, ecological processes, biological diversity and water quality.

Controlled activities carried out in, on or under waterfront land are regulated by the WM Act. The Natural Resource Access Regulator administers controlled activities under the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront as a consequence of carrying out the proposed work. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary.

### 1.3.6 NSW *Fisheries Management Act 1994*

The key objectives of the NSW Fisheries Management Act 1994 (FM Act) include conservation of Key Fish Habitat and threatened fish species listed under the Act. Key Fish Habitats underpin the approach applied by NSW DPI to ensure effort and resources are focused on habitats that are of a high priority to the conservation of fisheries and the maintenance of fish populations generally. Small headwater streams and gullies (first and second order streams), that only flow for a short period after rain are generally excluded, as are farm dams constructed on such systems.

### 1.3.7 Planning controls

#### *1.3.7.1* Chapter 2 (Coastal Management) of the *State Environmental Planning Policy (Resilience and Hazards) 2021*

Chapter 2 (Coastal Management) of the Resilience and Hazards SEPP guides development in coastal areas and implements the objectives of the *Coastal Management Act 2016*. The SEPP defines and maps the coastal zones as coastal management areas including Coastal Wetlands and Littoral Rainforest, Proximity Areas, Coastal Vulnerability Areas, Coastal Environment Areas and Coastal Use Areas. There are Coastal Environment Areas and Coastal Use Areas mapped within the Study Area (see Section 3.3.6).

#### *1.3.7.2* Chapters 3 and 4 (Koala Habitat Protection 2020 and 2021) of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021*

There are currently two Koala Habitat Protection chapters in the Biodiversity and Conservation SEPP, chapter 3 (Koala Habitat Protection 2020) and chapter 4 (Koala Habitat Protection SEPP 2021). Chapter 4 (Koala Habitat Protection 2021) applies to the Maitland LGA in all zones except to land zoned *RU1 Primary Production*, *RU2 Rural Landscape* or *RU3 Forestry*. Chapter 3 (Koala Habitat Protection 2020) continues to apply to these zones.

The Project occurs on land predominantly zoned *RU1 Primary Production* and *RU2 Rural Landscape*, therefore chapter 3 (Koala Habitat Protection 2020) currently applies to these parts of the Study Area.

A small section of land currently zoned *C2 Environmental Conservation* occurs in the southern end of the Study Area. Chapter 4 (Koala Habitat Protection 2021) applies to land zoned *C2 Environmental Conservation* however this area will not be rezoned as part of the current rezoning application. Once land currently zoned *RU1 Primary Production* and *RU2 Rural Landscape* are rezoned as *R1 General Residential* and *C3 Environmental Management*, chapter 4 (Koala Habitat Protection 2021) will apply to those parts of the Study Area for future development applications.

# 2. Methods

## 2.1 Database and literature sources

Database searches within the locality (a 10 km radius around the Study Area) were conducted in February 2022 to identify threatened biodiversity and migratory species with known or predicted occurrence in the locality. The following databases and literature were used for this purpose:

- NSW Department of Planning, Industry and Environment (DPIE) BioNet, Atlas of NSW Wildlife (DPIE 2022a)
- NSW Threatened Species Profiles for threatened species, endangered populations and threatened ecological communities (TECs) listed under the BC Act (DPIE 2022b)
- Australian Department of Agriculture, Water and the Environment (DAWE) EPBC Act Protected Matters Report for MNES listed under the EPBC Act (DAWE 2022a)
- Australian DAWE Species Profile and Threats Database (DAWE 2022b)
- Fisheries NSW Spatial Data Portal (DPI 2022).

## 2.2 Existing mapping

Existing mapping was reviewed for known constraints, as follows:

- Existing vegetation mapping for the Study Area (including TECs) (DPIE 2012)
- NSW Biodiversity Values Map (BV Map)
- Important Area Mapping (IAM)
- Areas of Outstanding Biodiversity Values (AOBV)
- NSW Department of Primary Industries, Fisheries NSW Portal for Key Fish Habitat (DPI 2022).

## 2.3 Field survey

Terrestrial flora and fauna surveys of the Study Area were undertaken on 14 June 2022. Field survey involved the following (see Figure 4 for survey effort):

- Six Rapid Data Points (RDP) to assist in validating vegetation mapping
- Fauna habitat assessment
- Opportunistic fauna observations
- Aquatic habitat assessment.

### 2.3.1 Rapid Data Points

A total of six RDPs were completed within the Study Area to determine characteristics of the vegetation cover present. The location of the RDPs can be seen in Figure 4. Data collected at each of these points included:

- Overstorey dominants
- Midstorey dominants
- Understorey dominants
- Groundcover dominants
- Structure
- Photo point.

### 2.3.2 Fauna habitat assessment

Fauna habitat characteristics and parameters that were assessed in the Study Area included:

- Dominant vegetation, composition and structure
- Composition of ground layer (bare earth, litter etc.)
- Presence and relative abundance of key habitat features (e.g. tree hollows, large logs, exfoliating rock, foraging resources)
- Condition and disturbance factors
- Vegetation age structure.

### 2.3.3 Rapid aquatic habitat assessment

The rapid aquatic ecological survey methodology was informed by the guidelines for aquatic habitat assessment DPI (2013), as relevant to the scale and condition of aquatic habitats present within the Study Area and scope of works. The rapid aquatic ecological field survey included:

- Visual assessment and description of aquatic habitat features
- Definition and clarification of Key Fish Habitat within the Study Area
- Photograph records of existing site conditions.

Aquatic habitat characteristics and parameters that were recorded in the Study Area included:

- Type of waterbody
- Size of waterbody
- Shade cover
- Presence and relative abundance of aquatic vegetation
- Condition and disturbance factors.

### 2.3.4 Assessment of Key Fish Habitat

Areas included in desktop mapping of Key Fish Habitat were inspected and assessed against the detailed Key Fish Habitat classification scheme identified in sections 2.3.1 and 2.3.2 of DPI (2013). Key Fish Habitat classification involves the visual assessment of waterways based on the type (sensitivity of key fish habitat present) and class (classification of the waterway for fish passage).

The following relevant exceptions to Key Fish Habitat classification apply (DPI 2013):

- First and second order streams on gaining streams (based on the Strahler method of stream ordering)
- Farm dams on first and second order streams or unmapped gullies.

## 2.4 Threatened flora and fauna likelihood of occurrence

A list of subject threatened flora and fauna within the locality was determined through searches of BioNet Atlas of NSW (DPIE 2022a), the EPBC Act Protected Matters Search Tool (DAWE 2022) and the Fisheries NSW Spatial Data Portal (DPI 2022). A 10 km radius was applied to the Study Area for the searches under both NSW and Commonwealth databases to determine the candidate species.

Further analysis of the likelihood of those species occurring within the Study Area was undertaken based on the five categories for 'likelihood of occurrence' detailed in Table 2. These 'likelihood of occurrence' categories were attributed to species after consideration of criteria such as known records, presence or absence of important habitat features in the Study Area, results of the field surveys and professional judgement. This process was completed on an individual species basis.

**Table 2: Likelihood of occurrence criteria**

| Likelihood rating | Threatened flora criteria | Threatened and migratory fauna criteria |
|---|---|---|
| Known | The species was observed within the Study Area. | The species was observed within the Study Area. |
| High | It is likely that a species inhabits or utilises habitat within the Study Area. | It is likely that a species inhabits or utilises habitat within the Study Area. |
| Moderate | Potential habitat for a species occurs in the Study Area. Adequate field survey would determine if there is a 'high' or 'low' likelihood of occurrence for the species within the Study Area. | Potential habitat for a species occurs in the Study Area and the species may occasionally utilise that habitat. Species unlikely to be wholly dependent on the habitat present within the Study Area. |
| Low | It is unlikely that the species inhabits the Study Area. | It is unlikely that the species inhabits the Study Area. If present in the Study Area the species would likely be a transient visitor. The Study Area contains only very common habitat for this species which the species would not rely on for its on-going local existence. |
| None | The habitat is unsuitable for the species. | The habitat is unsuitable for the species. |

## 2.5 Limitations

The following limitations apply to this biodiversity assessment:

- Potential impacts of development within the Study Area are assumed based on potential future development which is still in the draft stage of planning.
- Some parts of the Study Area were unable to be accessed during field surveys (see Figure 4).
- No targeted surveys for threatened species were undertaken.
- No aquatic assessments within the waterbodies was undertaken, only aquatic habitat visible on the surface of and surrounding waterbodies was assessed.
- The likelihood of threatened species to occur within the Study Area is based on known records, local knowledge and habitat recorded in the Study Area.

# 3. Results

## 3.1 Existing environment

### 3.1.1 Flora and vegetation validation

Existing vegetation mapping for the area consists of Bell and Driscoll (2015) vegetation community map units (MU). The BioNet Vegetation Classification Data Collection was used to determine equivalent Plant Community Types (PCT).

The majority of the Study Area has been mapped as non-native vegetation with small areas of native vegetation communities adjoining the northern boundary (DPIE 2012) (Figure 5). The vegetation community mapped within the Study Area is:

- *MU 196 - River Oak/ White Cedar Grassy Riparian Forest of the Dungong Area and Liverpool Ranges* (equivalent PCT 1714).

The total area of existing mapped native vegetation within the Study Are is approximately 3.20 ha. The vegetation mapping in Figure 5 was validated during the field surveys. Areas of native vegetation were dominated by exotic understorey and groundcover species and generally considered to be of low condition (Appendix 4). The dominant PCT recorded in the Study Area was PCT 1714, as detailed in Appendix 4. No vegetation within the Study Area aligns with any Threatened Ecological Communities.

A total of 10 native flora species and 18 exotic flora species were recorded during field surveys (Appendix 5). One flora species from a threatened population was recorded; River Red Gum (*Eucalyptus camaldulensis*) (see Figure 4).

### 3.1.2 Fauna habitat

The Study Area occurs within a rural environment surrounded by residential and agricultural land uses. The majority of the Study Area is cleared of native vegetation as is the surrounding land, limiting the potential for native fauna habitat. Habitat within the Study Area is limited to scattered trees, dams and riparian vegetation associated with the adjoining Hunter River. The riparian vegetation is situated outside the Impact Area. Fauna habitats identified in the Study Area include:

- Riparian vegetation along the Hunter River borders the north of the Study Area. The dominant tree species in this area are Eucalypts and Casuarinas which provide foraging resources that may be used by nectivorous birds and arboreal mammals, as well as shelter habitat suitable for birds that nest in canopy trees. This area contains predominantly younger and regenerating canopy vegetation however, a small number of mature Forest red gum (*Eucalyptus tereticornis*) are present which is a primary Koala food tree. A dense and predominantly exotic midstorey layer is present which provides shelter habitat for small birds and terrestrial mammals. A small amount of leaf litter and fallen timber is present which provides potential shelter habitat for small terrestrial mammals, frogs and reptiles.
- Open grassland, dominated by exotic groundcover vegetation. This area is subject to historical disturbance from vegetation clearing and grazing livestock, and may be used as foraging and shelter habitat for local fauna, including predatory birds, small terrestrial mammals and reptiles.
- Aquatic habitats (see Section 3.1.3).

No hollow bearing trees or rocky habitats were observed within the Study Area.

A total of 16 native fauna species and one introduced fauna species were recorded during field surveys (Appendix 6). One threatened fauna species was recorded; White-bellied Sea-eagle (*Haliaeetus*

*leucogaster*) (see Figure 4). Mature canopy trees within the riparian vegetation provide suitable nesting habitat for White-bellied Sea-eagles (see Figure 4).

### 3.1.3 Aquatic habitat

The Study Area contains 11 farm dams of various sizes (numbered in Figure 4 for reference), and six mapped unnamed waterways which are classified as Strahler order 1 or 2. Some of the dams contain aquatic vegetation (see Appendix 3) which provides suitable habitat for aquatic birds and amphibians, common aquatic species such as non-threatened small-bodied native fish, freshwater turtles and eels, as well as providing a water source for other local fauna.

A review of the DPI spatial data portal (DPI 2022) shows that none of the disconnected farm dams or degraded small streams within the Study Area are mapped as indicative habitat for threatened species under the FM Act and are unlikely to support suitable habitat for threatened aquatic species.

The waterways mapped within the Study Area are small ephemeral streams that have been modified through clearing and grazing within the landscape, as well as the construction of online farm dams disconnecting flow. Drainage lines 1 and 2 (Figure 4) were assessed during field surveys. These waterways lack defined bed or banks with an absence of surface water expression observed during the field survey. While some drainage depressions are evident, with some of these features indicating slightly “wetter” conditions (i.e. relatively "lush” vegetation within the depression), they do not support aquatic habitat. It is likely that these small, degraded streams function only as drainage lines within the landscape that convey surface water following rain events.

Mapped waterways near dam 4 and 5 were not evident during field surveys. The mapped waterway to the south of dam 8 could not be accessed and therefore was not assessed.

The assessed mapped streams function more like drainage lines within the landscape and have been modified and disconnected by farm dams, it is likely that these drainage lines do not meet the definition of a waterway under the WM Act based upon:

- The lack of defined bed and banks.
- Limited evidence of flow and geomorphic integrity.
- The absence of aquatic habitat.

Dams 3 and 5 will be directly impacted by the Project as they are located within the potential development areas identified in the draft concept layout plan (Figure 2b). Dams 4, 6, 10 and 11 are located in close proximity to the potential development areas identified in the draft concept layout plan and therefore may be indirectly impacted.

### 3.1.4 Key Fish Habitat

Five dams (5-9) and three connecting drainage lines in the Study Area have been included in desktop Key Fish Habitat mapping published by DPI (2022). However, the field assessment has identified that of these, the dams that were formally assessed (5 & 7) and those that could not be accessed but were viewed from the road (6 & 8) are not consistent with the criteria for Key Fish Habitat under the detailed classification scheme described in the ‘*Policy and guidelines for fish habitat conservation and management*’ as the following exceptions apply (DPI 2013):

- First and second order streams on gaining streams (based on the Strahler method of stream ordering)
- Farm dams on first and second order streams or unmapped gullies.

It is unknown whether dam 9 is consistent with the criteria for Key Fish Habitat as this area was not included in the field surveys. Dam 9 is not located within the Impact Area.

## 3.2 Database searches

### 3.2.1 Threatened flora

A total of 25 threatened flora have previously been recorded or are considered to have potential habitat within a 10 km radius of the Study Area (subject flora). Records have been derived from both the NSW BioNet database (Figure 6) and the EPBC Act Protected Matters Search Tool. The habitat requirements for each of the subject threatened flora and likelihood of occurrence within the Study Area have been provided in Appendix 4.

Based on the habitat features present in the Study Area, two species were considered to have a moderate or higher likelihood of occurrence (Table 3). One of these species is listed under the BC Act, and one is listed under the EPBC Act.

One flora species from a threatened population was recorded; River Red Gum (*Eucalyptus camaldulensis*) (see Figure 4).

### 3.2.2 Threatened fauna

A total of 55 threatened fauna have previously been recorded or have been considered to have potential habitat within a 10 km radius of the Study Area (subject fauna). Records have been derived from both the NSW Bionet database (Figure 7) and the EPBC Act Protected Matters Search Tool (limited to terrestrial species only). The habitat requirements and likelihood of occurrence for each of the subject threatened fauna have been provided in Appendix 4.

Based on the habitat features present in the Study Area, 12 species were considered to have a moderate or higher likelihood of occurrence (Table 3), five of which are listed under both the BC Act and EPBC Act, and seven are listed just under the BC Act.

One threatened fauna species was recorded; White-bellied Sea-eagle (*Haliaeetus leucogaster*) (see Figure 4). Mature canopy trees within the riparian vegetation provide suitable nesting habitat for White-bellied Sea-eagles (see Figure 4).

**Table 3: Candidate threatened species**

| Scientific name | Common name | Biodiversity credit type* |
|---|---|---|
| **Amphibians** | | |
| *Litoria aurea* | Green and Golden Bell Frog | Species |
| **Birds** | | |
| *Anseranas semipalmata* | Magpie Goose | Ecosystem |
| *Ephippiorhynchus asiaticus* | Black-necked Stork | Ecosystem |
| *Haliaeetus leucogaster* | White-bellied Sea-Eagle | Species/Ecosystem |
| *Ninox connivens* | Barking Owl | Species/Ecosystem |
| **Mammals** | | |
| *Falsistrellus tasmaniensis* | Eastern False Pipistrelle | Ecosystem |
| *Micronomus norfolkensis* | Eastern Coastal Free-tailed Bat | Ecosystem |
| *Miniopterus australis* | Little Bent-winged Bat | Ecosystem |

| Scientific name | Common name | Biodiversity credit type* |
|---|---|---|
| *Miniopterus orianae oceanensis* | Large Bent-winged Bat | Species/Ecosystem |
| *Myotis macropus* | Southern Myotis | Species |
| *Pteropus poliocephalus* | Grey-headed Flying-fox | Species/Ecosystem |
| *Saccolaimus flaviventris* | Yellow-bellied Sheathtail-bat | Ecosystem |
| **Flora** | | |
| *Arthraxon hispidus* | Hairy-joint Grass | Species |
| *Eucalyptus camaldulensis* | Eucalyptus camaldulensis population in the Hunter catchment | N/A^ |

** Biodiversity credit types are defined under the BAM as follows: Ecosystem credit = threatened species which can be reliably predicted to occur based on the identified PCTs, Species credit = threatened species which cannot be reliably predicted to occur based on the identified PCTs.*

*^ Endangered population with no listed credit type*

### 3.2.3 Serious and irreversible impact candidates

Approval under the Local Development Pathway requires Council to consider 'Serious And Irreversible Impacts' (SAII) under the BC Act. Consent authorities under Part 4 of the E&PA Act (Council in this instance) must not grant approval if they determine that a proposed development is likely to have a serious and irreversible impact on biodiversity values identified as an SAII entity. No SAII entities are considered to have a moderate or higher likelihood of occurrence in the Study Area.

## 3.3 Biodiversity values

### 3.3.1 Biodiversity Values Map

The NSW Biodiversity Values Map (BV Map) identifies land with high biodiversity value that is particularly sensitive to impacts from development and clearing. The BV Map is relevant to:

- Development under Part 4 of the EP&A Act that is not a state significant development or complying development.
- Clearing regulated by the *State Environmental Planning Policy (Vegetation) 2017* (Vegetation SEPP).

The BOS applies to development under Part 4 of the EP&A Act if a relevant clearing or development proposal has one of the following impacts in an area on the BV Map:

- Clearing of native vegetation.
- An impact prescribed under clause 6.1 of the *Biodiversity Conservation Regulation 2017*.

Parts of the Study Area and surrounds are mapped on the BV Map as the following categories (Figure 8);

- Identified Rainforest
- Protected Riparian Land
- Threatened species or communities with potential for serious and irreversible impacts.

Areas adjoining the northern boundary of the Study Area are mapped on the BV Map as 'Protected Riparian Land' and occur in the areas where existing zoning is proposed to be maintained (Figure 8)[1]. No 'Identified Rainforest' or 'Threatened species or communities with potential for serious and irreversible impacts' are

[1] *BV mapping is shown on Figure 8 - proposed zoning is not shown on Figure 8 however it is shown in Figure 2a*

mapped as occurring within the Study Area, and no part of the Impact Area is mapped on the BV Map. Avoidance and mitigation of impacts to the Protected Riparian Land within the Study Area mapped on the BV Map would be required as part of any development. If impacts will occur to BV mapped land this will trigger the requirement for preparation of BDAR under the BOS. Based on information provided by Walker Corporation, it is considered unlikely that BV mapped land will be impacted as it occurs in the areas where existing zoning is proposed to be maintained which is not anticipated to be included in any associated development.

### 3.3.2 Important Area Mapping (IAM)

Areas mapped on the IAM are considered essential to support the critical life cycle of the subject species, e.g. breeding areas or locations important for foraging/over-wintering for migratory species. There is no IAM within the Study Area. Two IAM occur in the locality; Regent Honeyeater - approximately 8.3 km south-west of the Study Area, and Swift Parrot - approximately 10 km south-west of the Study Area (Figure 9).

### 3.3.3 Areas of Outstanding Biodiversity Value

Areas of Outstanding Biodiversity Value are special areas that contain irreplaceable biodiversity values that are critical to the future survival of biodiversity in NSW. They include unique components of genetic diversity that enable species to adapt to changing environments, habitat critical for the survival of threatened species or features that support species migration and dispersal.

Areas of declared critical habitat under the repealed *Threatened Species Conservation Act 1995* have become the first AOBV in NSW. AOBV declarations in NSW include:

- Gould's Petrel – critical habitat declaration
- Little penguin population in Sydney's North Harbour – critical habitat declaration
- Mitchell's Rainforest Snail in Stotts Island Nature Reserve – critical habitat declaration
- Wollemi Pine – critical habitat declaration.

There are no known AOBV within the Study Area.

### 3.3.4 Maitland LEP

The Maitland LEP is described in Section 1.3.4. The Hunter River located to the north of the Study Area is identified as Watercourse land in the Maitland LEP. Development consent must not be granted for areas identified as Watercourse land unless the consent authority is satisfied that:

> (a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or
>
> (b) if that impact cannot be reasonably avoided by adopting feasible alternatives—the development is designed, sited and will be managed to minimise that impact, or
>
> (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.

### 3.3.5 FM Act

Key Fish Habitat as defined in Section 1.3.6 has been mapped within the Study Area (DPI 2022) in association with the adjoining Hunter River. The majority of the Key Fish Habitat mapped within the Study Area occurs within land currently zoned *RU2 Rural Landscape* and proposed to be zoned *C3 Environmental Management*, or land where existing zoning is proposed to be maintained however, a small portion occurs within land proposed to be zoned *R1 General Residential* (Figure 8).

Small headwater streams and gullies that only flow for a short period after rain (and farm dams constructed on such systems) are generally excluded from being Key Fish Habitats (see Section 3.1.4). The waterways and waterbodies mapped within the Study Area would conform to this definition and as such would not be considered Key Fish Habitat according to the classification scheme detailed in DPI (2013).

While not meeting the classification of Key Fish Habitat, waterways and waterbodies within the Study Area would meet the definition of 'Water land' (defined under the FM Act as land submerged by water: whether permanently or intermittently, or, whether forming an artificial or natural body of water, and includes wetlands and any other land prescribed by the FM Regulations as water land). As such, permits would be required for any impacts or modifications to these waterways and waterbodies (identified in Section 5).

### 3.3.6 Resilience and Hazards SEPP (Chapter 2 - Coastal Management)

Chapter 2 (Coastal Management) of the Resilience and Hazards SEPP is described in Section 1.3.7. Land mapped as a Coastal Environment Area and Coastal Use Area occur within the Study Area, within both proposed zoning areas (Figure 8). Chapter 2 (Coastal Management) of the Resilience and Hazards SEPP states that consent for development on land mapped as a Coastal Environment Area or Coastal Use Area can only be granted if the consent authority is satisfied that;

- the development is designed, sited and will be managed to avoid an adverse impact,
- if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or
- if that impact cannot be minimised—the development will be managed to mitigate that impact.

There is potential for impacts to groundwater and surface water as a result of future development in the Impact Area which should be considered and mitigated through the design of drainage infrastructure.

### 3.3.7 Biodiversity and Conservation SEPP (Chapters 3 and 4 - Koala Habitat Protection 2020 and 2021)

Chapters 3 and 4 of the Biodiversity and Conservation SEPP are described in Section 1.3.7. Chapter 3 (Koala Habitat Protection 2020) applies to the parts of the Study Area currently zoned *RU1 Primary Production* and *RU2 Rural Landscape*. Assessment under Part 2, chapter 3 (Koala Habitat Protection 2020) of the Biodiversity and Conservation SEPP must adhere to the following steps:

1. Is the land potential Koala habitat? (areas of native vegetation where Schedule 2 of the Koala Habitat Protection SEPP 2020 listed trees constitute at least 15% of the total number of trees in the upper or lower strata). If yes, then step 2 must be considered. If no, SEPP 2020 does not preclude consent.
2. Is the land core Koala habitat? (areas with a resident Koala population). If yes, then step 3 must be considered. If no, SEPP 2020 does not preclude consent.
3. A plan of management must be prepared for areas of core Koala habitat and the consent determination must be consistent with the plan of management.

Chapter 4 (Koala Habitat Protection 2021) currently applies to the part of the Study Area zoned *C2 Environmental Conservation*, and once other areas are rezoned would apply to those parts of the Study Area for future development applications. Chapter 3 of the Biodiversity and Conservation SEPP (Koala Habitat Protection 2020) would continue to apply to areas where *RU1 Primary Production* zoning is maintained.

Assessment requirements under chapter 4 (Koala Habitat Protection 2021) are different depending on whether an approved Koala Plan of Management (KPoM) applies to the land in question. Where an

approved KPoM applies, the consent determination must be consistent with the KPoM. It is Niche's understanding that there is no approved KPoM for the Maitland LGA. As such, the assessment process must be in accordance with Clause 11 of chapter 4 (Koala Habitat Protection 2021), which states that:

- Before a council may grant consent to a development application for consent to carry out development on the land, the council must assess whether the development is likely to have any impact on Koalas or Koala habitat.
- If the council is satisfied that the development is likely to have low or no impact on Koalas or Koala habitat, the council may grant consent to the development application.
- If the council is satisfied that the development is likely to have a higher level of impact on Koalas or Koala habitat, the council must, in deciding whether to grant consent to the development application, take into account a Koala assessment report for the development.

Despite the above, the council may grant development consent if the applicant provides to the council:

- Information, prepared by a suitably qualified and experienced person, the council is satisfied demonstrates that the land subject of the development application
  - does not include any trees belonging to the Koala use tree species listed in Schedule 2 for the relevant Koala management area (Table 2), or
  - is not core koala habitat, or
- Information the council is satisfied demonstrates that the land subject of the development application
  - does not include any trees with a diameter at breast height over bark of more than 10 centimetres, or
  - includes only horticultural or agricultural plantations.

The provisions from both Koala Habitat Protection chapters of the Biodiversity and Conservation SEPP have been considered below.

As the majority of the Study Area is cleared, suitable Koala habitat is absent across most of the Study Area. A small number of primary Koala food trees Forest red gum (*Eucalyptus tereticornis*) occur within the riparian vegetation along the northern boundary of the Study Area adjacent to the Hunter River. The riparian vegetation will not be removed as part of the proposed future development.

Areas of Regional Koala Significance (ARKS) have been identified by the NSW Government using analysis of koala observation densities. Each ARKS has been assigned a rating based resilience of that population to the threats operating in that landscape. There is an ARKS rated as 'Moderate Resilience' mapped as occurring approximately 4.2 km north-east of the Study Area (Figure 9). The Hunter River to the north of the Study Area is likely to act as a barrier to Koalas dispersing from this ARKS. There are 103 records of Koalas in the locality, the majority of which occur in or around the ARKS and only a single record in the locality occurs south of the Hunter River.

Potential Koala habitat does not occur within the Impact Area as the majority of this area has been previously cleared and comprises predominantly exotic groundcover vegetation and occasional planted trees and shrubs. Potential Koala habitat present in the Study Area is confined to vegetation along the northern border of the Study Area where existing zoning is proposed to be maintained and is not anticipated to be included in any associated development. Koalas are considered unlikely to occur within the Impact Area based on the lack of potential Koala habitat, and the assumption that the Hunter River acts as a barrier to Koala dispersal. As such, impacts to Koalas as a result of the Project are considered unlikely.

# 4. Impact assessment

## 4.1 Potential impacts

The purpose of the proposed rezoning is to facilitate low density residential development within the Impact Area (the Project). As such, an assessment of the potential impacts of the Project on biodiversity is provided in Table 4. Impacts are categorised as direct or indirect as described in OEH (2018), which states:

> *"**Direct impacts** are those that directly affect the habitat and individuals. They include, but are not limited to, death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat. When applying each factor, consideration must be given to all of the likely direct impacts of the proposed activity or development.*
>
> ***Indirect impacts** occur when project-related activities affect species, populations or ecological communities in a manner other than direct loss. Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas. As with direct impacts, consideration must be given, when applying each factor, to all of the likely indirect impacts of the proposed activity or development."*

A likelihood rating of known, possible, likely or unlikely has been assigned to each of the potential impacts listed in Table 4, which illustrates that the Project could result in the following direct impacts:

- Death through trampling (possible)
- Modification to waterways (known).

The indirect impacts listed as likely to occur as a result of the Project in Table 4 include

- Predation by domestic and/or feral animals (likely)
- Loss of shade/shelter (known)
- Loss of breeding opportunities (possible)
- Loss of individuals through exposure (possible – minor)
- Edge effects (likely - minor)
- Deleterious hydrological changes (likely)
- Sedimentation and erosion (possible)
- Increased human activity within or directly adjacent to sensitive habitat areas (likely).

**Table 4: Assessment of direct and indirect impacts as a result of the Project**

| Impact | Extent of impact as a result of the Project |
|---|---|
| **Direct impacts** | |
| Removal or modification of native vegetation | **Unlikely:** vegetation removal would be limited to exotic and planted native vegetation and therefore no intact areas of native vegetation would be directly impacted. |
| Loss of individuals of a threatened species | **Unlikely:** one threatened species and one species from a threatened population were recorded in the Study Area; White-bellied Sea-eagle and River Red Gum. However, both were recorded in the riparian vegetation |

| Impact | Extent of impact as a result of the Project |
|---|---|
| | along the Hunter River which would not be directly impacted by the Project. |
| Removal or modification of threatened species habitat other than native vegetation (micro-habitat features) | **Unlikely:** the Project would not directly impact on any limiting habitat (such as tree hollows, or breeding habitat) for threatened fauna. It is considered unlikely that the dams or drainage lines present in the Study Area provide habitat for threatened species. |
| Death through trampling | **Possible:** the vegetation clearing proposed would not likely lead to death through trampling. If any dams are to be removed it is possible that it may result in death of tadpoles if present. |
| Death through poisoning | **Unlikely:** no poisons are proposed to be used as part of the Project. |
| Modification to waterways | **Known:** Multiple farm dams and drainage lines would be removed or altered as part of the Project. However, this impact is considered to be minor given the existing high level of disturbance to these waterbodies from livestock grazing and intersection by existing roads and driveways. |
| Fragmentation | **Unlikely:** The locality is already subject to a high level of historical clearing. The only connected vegetation is the riparian vegetation along the Hunter River which will not be directly impacted by the Project. |
| **Indirect impacts** | |
| Predation by domestic and/or feral animals | **Likely:** the Project is not likely to increase the presence of feral animals in the local area, however it is likely to increase the presence of domestic pets. |
| Loss of shade/shelter | **Known:** the removal of trees and understorey vegetation in the Study Area would result in the loss of shade/shelter for local fauna. However, this impact is considered to be minor given the limited value of the vegetation to be removed which comprises exotic grassland vegetation and scattered planted trees. In addition, extensive areas of equivalent and higher quality habitat would remain in surrounding areas. |
| Loss of breeding opportunities | **Possible:** no hollow-bearing trees were observed in the Study Area however, potential breeding habitat for White-bellied Sea-eagles exists in the riparian vegetation along the Hunter River. There is potential for development in close proximity to the riparian vegetation to disrupt White-bellied Sea-eagle nesting activities if they nest in the area. Measures to avoid this potential impact are discussed in Section 4.3. |
| Loss of individuals through starvation | **Unlikely:** the foraging habitat to be removed within the Study Area is not a limiting resource in the local area. Extensive areas of similar foraging habitat occur in the locality. |

| Impact | Extent of impact as a result of the Project |
|---|---|
| Loss of individuals through exposure | **Possible:** the vegetation to be removed comprises exotic grassland vegetation and scattered planted trees which provides limited foraging habitat and shelter for local fauna. This impact is considered to be minor considering the limited value of this habitat, and the surrounding habitats that would remain. It is not considered likely to lead to death of individuals through exposure. If any dams are to be removed it is possible that it may result in death of tadpoles if present. |
| Edge effects (noise, light, traffic) | **Likely:** some new edges would be created as a result of the Project. Given the open nature of the grasslands within the Study Area, edge effects are considered to be minor. |
| Deleterious hydrological changes | **Likely:** the Project is likely to result in minor changes to surface water flow through the construction of hard surfaces such as roads, and removal or modification of farm dams and drainage lines. Measures to mitigate this potential impact are discussed in Section 4.4. |
| Increased soil salinity | **Unlikely:** the Project is not likely to alter the soil salinity of the Study Area or surrounding areas. |
| Sedimentation and erosion | **Possible:** safeguards are recommended to ensure sediments are contained during and post construction. |
| Inhibition of nitrogen fixation | **Unlikely:** unlikely to be greater than current impact. |
| Weed invasion | **Unlikely:** unlikely to be greater than current impact. |
| Fertiliser drift | **Unlikely:** no fertilisers to be used as part of the Project. |
| Increased human activity within or directly adjacent to sensitive habitat areas | **Likely:** Riparian vegetation along the Hunter River is considered a sensitive habitat and an adjacent residential development would increase human activity in the area. Measures to mitigate this potential impact are discussed in Section 4.4. |

## 4.2 Key threatening processes

As part of an assessment of impacts under the BC Act, EPBC Act and FM Act, consideration must be given as to whether the action proposed constitutes, or is part of, a Key Threatening Process (KTP) or is likely to result in the operation of, or increase the impact of a KTP on threatened biodiversity.

The only KTPs that would be exacerbated by the Project are as follows:

- Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands (BC Act).
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants (BC Act)
- Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams (FM Act).

Construction of new roads and removal of some dams and drainage lines may alter natural flow regimes of rivers and streams. Whilst it is an unavoidable impact of the Project, the impact is minimal as the flow of the water within the areas that will be impacted by the development have already been altered through historical development (including the creation of dams) and no longer function as connected waterways.

## 4.3 Avoidance

Avoidance measures of the Project include the following:

- Vegetation within the proposed Impact Area comprises exotic grassland vegetation and scattered planted trees which provides limited habitat for local fauna. Riparian vegetation along the Hunter River would be retained.
- A buffer would be established around the Hunter River along the north boundary of the Study Area where no development would occur.
- If White-bellied Sea-eagles are found to utilise any part of the Study Area for breeding, it is recommended that a buffer be established around the nest tree and no development should take place within the buffer during the breeding season. The recommended size of the buffer is 500 m around nests where there is intact vegetation, or 250 m in fragmented areas (OEH n.d.).
- Six of the farm dams present within the Study Area would be retained.

## 4.4 Minimise/mitigate

The following recommendations should be implemented to minimise impacts to flora, fauna and their habitats.

- Vegetation Management Plan (VMP) or Biodiversity Management Plan (BMP) would be prepared for the riparian vegetation around the Hunter River along the north boundary of the Study Area to ensure the area is managed for the protection of local flora and fauna habitats.
- All weed material removed will be disposed of in a suitable waste facility and not mulched on site. This is to avoid the reintroduction and further spread of weeds in the area.
- The project ecologist or WIRES will be contacted by the project manager if any fauna is required to be relocated during clearing operations to prevent injury to the animal. If required fauna should be relocated to a pre-determined bushland area supporting suitable habitat within 1 km of the Study Area.
- Some large trees occur within the area proposed for clearing. No hollows were recorded in these trees, however resident fauna may still occur. Should any fauna be injured during felling of the trees, the project ecologist or WIRES will be contacted by the project manager.
- Waste material is not to be left on site once the works have been completed.
- Machinery should be washed following best practice hygiene protocols prior to being bought to site to prevent the spread of weed seed, pathogens and fungi. Hygiene protocols should be in accordance with DPI *Biosecurity Act 2015*.
- Sedimentation and erosion controls would be installed around the dam during clearing to prevent sedimentation.
- A Dam dewatering plan should be developed to guide the dewatering process.
- Dewatering should be supervised by an aquatic ecologist to undertake the relocation of any native fauna encountered.
- A drainage plan would be developed to minimise impacts to surface water flow.

# 5. Constraints

In summary, the primary biodiversity constraints associated with the Study Area are outlined below:

- The presence of native vegetation and associated habitats along the northern boundary
- The presence of a threatened species (White-bellied Sea-eagle - *Haliaeetus leucogaster*) and species from a threatened population (River Red Gum - *Eucalyptus camaldulensis*) recorded in the riparian vegetation along the northern boundary (outside Impact Area)
- Biodiversity Values (BV) Mapping within the Study Area (outside Impact Area)
- Key Fish Habitat mapped within the Study Area (outside Impact Area)
- The presence of aquatic habitats within the farm dams in the Study Area
- Coastal Environment Areas and Coastal Use Areas mapped within the Study Area.

All BV mapped areas and mapped native vegetation within the Study Area are located within areas where existing zoning is proposed to be maintained. Impacts to BV mapped land will trigger the requirement for preparation of BDAR under the BOS. Based on the information provided by Walker Corporation, it is considered unlikely that the BOS will be triggered as Biodiversity Values and intact native vegetation do not occur in the Impact Area.

The majority of biodiversity constraints associated with the Study Area are located in the areas where existing zoning is proposed to be maintained, however some aquatic habitat and areas mapped as Key Fish Habitat, Coastal Environment Areas and Coastal Use Areas occur within land proposed to be zoned *R1 General Residential*.

## 5.1 Controlled activities under WM Act

Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary. This means that a controlled activity approval must be obtained from NRAR before commencing the controlled activity. When a proposed controlled activity disturbs or substantially modifies the riparian corridor, its restoration or rehabilitation will be a requirement of the controlled activity approval. A vegetation management plan (VMP) detailing how the restoration or rehabilitation will be carried out is typically a requirement of the controlled activity in these cases.

A controlled activity approval would be required for any works within 40 metres of any waterway that meets the definition of a waterway.

### 5.1.1 Waterway mapping

The mapped streams within the Impact Area function more like drainage lines within the landscape. These mapped streams have been modified by historic land use and disconnected by farm dams. It is likely that the drainage lines within the Impact Area do not meet the definition of a waterway under the WM Act as they lack clear channel definition, surface water and do not support aquatic habitat.

Consultation with the NSW Department of Natural Resources Access Regulator (NRAR) is recommended to confirm acceptance of this finding and thereby remove the controlled activity and riparian corridor obligations around these ecological features. Acceptance of this approach would be at the discretion of NRAR. Consultation would also confirm any requirements NRAR may have for impacts to the online dams connected to these mapped streams.

### 5.1.2 Threatened species

One threatened species (White-bellied Sea-eagle - *Haliaeetus leucogaster*) and one species from a threatened population (River Red Gum - *Eucalyptus camaldulensis*) were recorded in the Study Area. Recovery strategies where available should be followed for all works which may impact threatened entities.

A targeted strategy for managing the White-bellied Sea-eagle has been developed under the Saving Our Species program (OEH n.d.). The White-bellied Sea-eagle is sensitive to disturbance when nesting, especially during the early stages of the breeding season, and may desert nests and young if confronted by humans or exposed to human activity such as residential development. The strategy states that disturbance should be minimised by not conducting activities during the breeding period and using 500 m buffers around nests where there is intact vegetation, or 250 m buffers in fragmented areas.

A Saving Our Species conservation project is currently being developed for the threatened Eucalyptus camaldulensis population in the Hunter catchment species and will be available soon (OEH 2017). Identified activities to assist this species are as follows:

- Support local Landcare groups.
- Undertake strategic grazing or grazing exclusion in conjunction with weed control.
- Retain or reintroduce periodic water inundation of habitat.
- Protect areas of known and potential habitat from clearing.
- Encourage regeneration of remnants or disturbed areas of habitat.
- Use locally-sourced seed in revegetation or regeneration projects.

## 5.2 Vegetated riparian zones

It is recommended that the riparian corridor widths detailed in the *Guidelines for controlled activities on waterfront land* (NRAR 2018) are applied to mapped waterways that meet the definition of a waterway. These recommended riparian corridor widths are based upon the Strahler order of mapped streams and are applied from the top of the highest bank on both sides of the watercourse (Table 5).

**Table 5: Recommended riparian corridor widths (NRAR 2018)**

| Stream order | VRZ width (m) each side of the watercourse | Total riparian corridor width |
|---|---|---|
| 1 | 10 | 20 + channel width |
| 2 | 20 | 40 + channel width |
| 3 | 30 | 60 + channel width |
| 4 and above (including estuaries, wetlands and parts of rivers influence by tidal waters) | 40 | 80 + channel width |

None of the mapped waterways within the Impact Area are considered to meet the definition of a waterway under the WM Act (see Section 0), however a 40 m buffer is recommended for the Hunter River to the north of the Study Area. In addition, a survey of the waterway mapped to the south of dam 8 is recommended to determine if it meets the definition of a waterway, or in the absence of a survey a 20 m buffer is recommended as a precaution.

## 5.3 Development activities requiring a permit from NSW DPI

In consideration that the findings of the field assessment of Key Fish Habitats deviate with that of the desktop mapping published by DPI (2022), consultation with NSW DPI is recommended to confirm acceptance of the findings of the field assessment.

While not meeting the classification of Key Fish Habitat, waterways and waterbodies within the Study Area would meet the definition of 'Water land'. As such, a Section 201 permit from NSW DPI would be required for any impacts or modifications to these waterways and waterbodies within the Study Area, including infilling (reclamation), removal of native freshwater vegetation (dredging) or stream realignment.

# 6. Recommendations

Recommendations to avoid and minimise impacts to biodiversity values within the Study Area are as follows:

- Retain native vegetation and habitats within the Study Area.
- Retain and protect River Red Gum - *Eucalyptus camaldulensis* as it is part of a threatened population.
- Engage an ecologist to conduct targeted field surveys for White-bellied Sea-eagle nests during the breeding season.
- If White-bellied Sea-eagles are found to utilise any part of the Study Area for breeding, a buffer should be established around the nest tree and no development should take place within the buffer during the breeding season. The recommended size of the buffer is 500 m around nests where there is intact vegetation, or 250 m in fragmented areas (Figure 8).
- Avoid impacts to BV mapped areas (Figure 8).
- Undertake consultation with NSW DPI Fisheries and NRAR to confirm acceptance of the field assessment findings in relation to Key Fish Habitats and waterway definition. This consultation process should resolve the requirements of these authorities in relation to any proposed modification to mapped waterways, dams and riparian corridors within the Study Area.
- Incorporate and document avoidance and mitigation mechanisms into the Project (see Section 4.3 and 4.4).
- Establish a suitable buffer to areas of riparian vegetation including establishing a buffer around riparian habitat associated with the Hunter River to ensure it will not be impacted by future works.
- Establish suitable buffers around waterways adjacent to the Impact Area to ensure they will not be impacted by future works.
- A Vegetation Management Plan (VMP) or Biodiversity Management Plan (BMP) should be prepared for the riparian vegetation around the Hunter River along the northern boundary of the Study Area to ensure the area is managed for the protection of local flora and fauna habitats, and downstream receiving waterways.
- Planted native vegetation and non-invasive exotic trees should be retained where possible.
- Engage an aquatic ecologist to develop a Dam dewatering plan to guide the dewatering process.
- Dewatering should be supervised by an aquatic ecologist to undertake the relocation of any native fauna encountered.
- Consider potential impacts to groundwater and surface water in relation to areas identified as Watercourse land, Coastal Environment Areas, and Coastal Use Areas when designing drainage infrastructure.

Potential impacts of the Project on biodiversity are likely to occur during the subdivision or development stages. As such, these recommendations should be incorporated into planning for the relevant stages when more information about the extent and nature of impacts is known. Further impact assessment under State and Commonwealth legislation would be required for any proposed subdivision or development post rezoning of the land.

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# Figures


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GDA 1994 MGA Zone 56

## Location Map

Biodiversity Assessment for 42 Kezia Road, Oakhampton

Niche PM: Jai Green-Barber
Niche Proj. #: 7183
Client: Walkers Corporation

Figure 1

**Figure 2a: Proposed zoning**

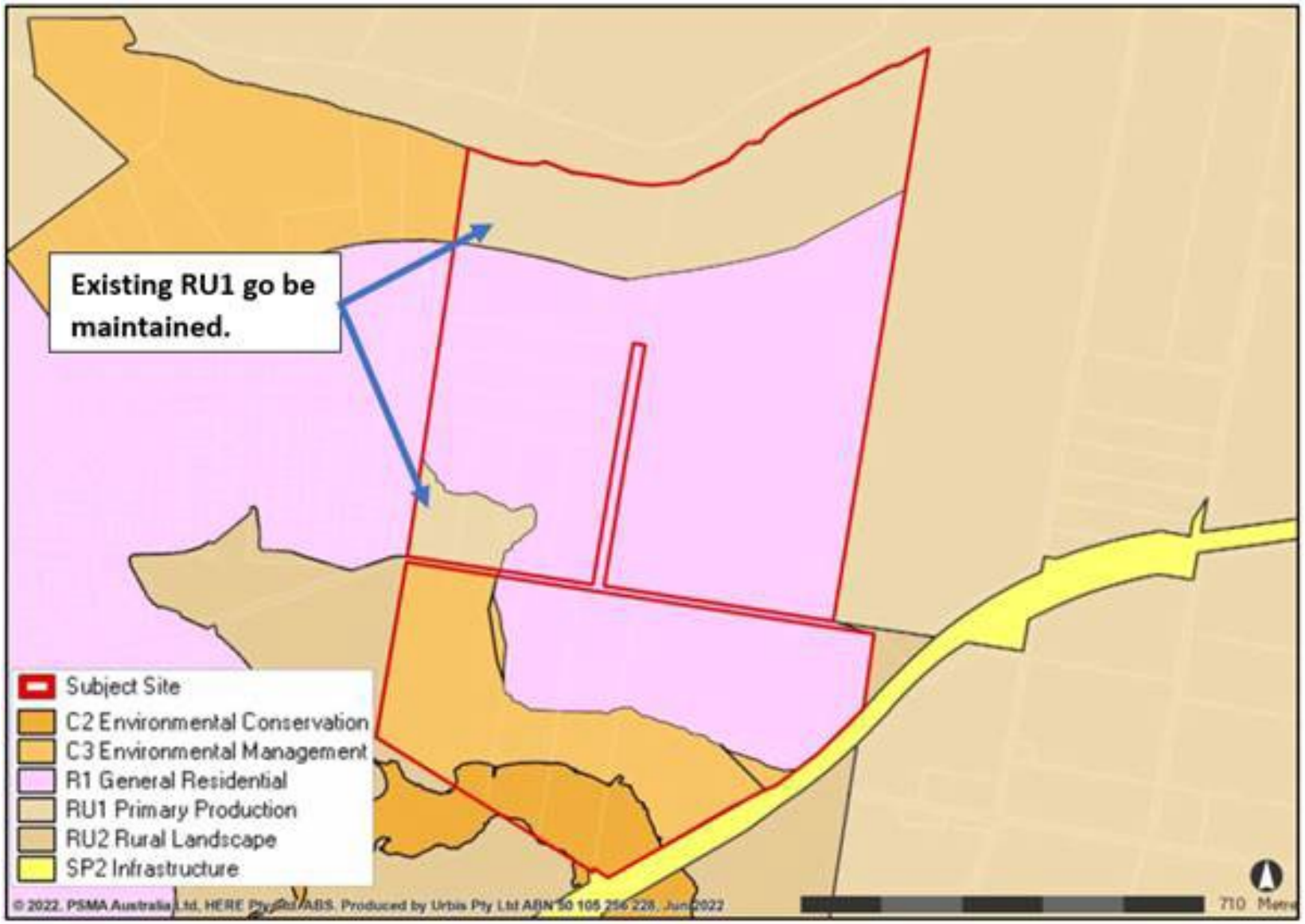

**Figure 2b: Draft concept layout plan (Urbanco 2022)**


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Niche Proj. #: 7183
Client: Walker Corporation

# Study Area

## Biodiversity Assessment for 42 Kezia Road, Oakhampton

Figure 3


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# Field survey map

## Biodiversity Assessment for 42 Kezia Road, Oakhampton

Niche PM: Jai Green-Barber
Niche Proj. #: 7183
Client: Walker Corporation

Figure 4

World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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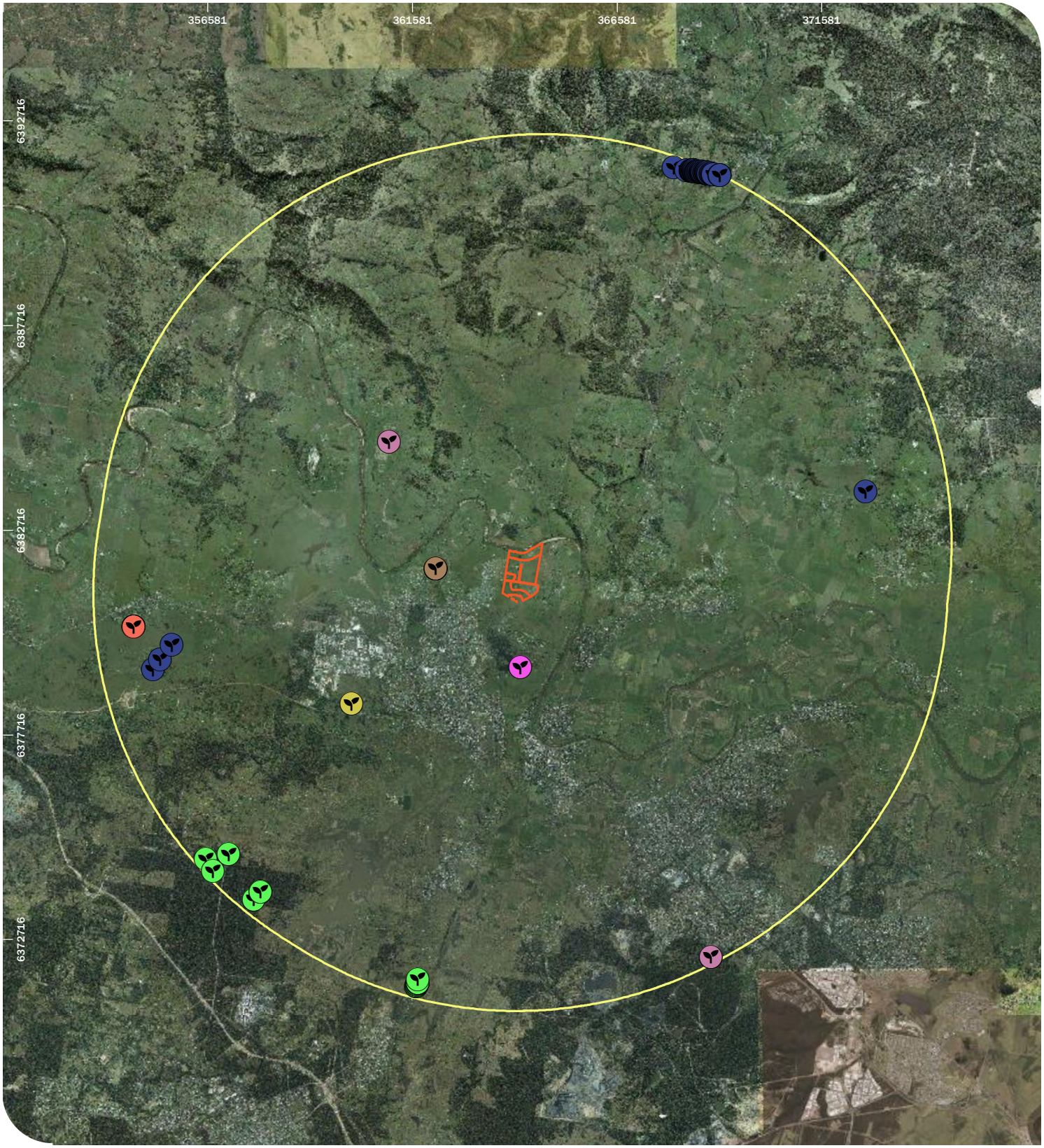
Niche Proj. #: 7183
Client: Walker Corporation

# Vegetation mapping
## Biodiversity Assessment for 42 Kezia Road, Oakhampton

Figure 5




Study Area

10km search area

Flora

Acacia bynoeana

Eucalyptus camaldulensis

Eucalyptus glaucina

Eucalyptus parramattensis subsp. decadens

Grevillea parviflora subsp. parviflora

Rhodomyrtus psidioides

Rutidosis heterogama

Syzygium paniculatum

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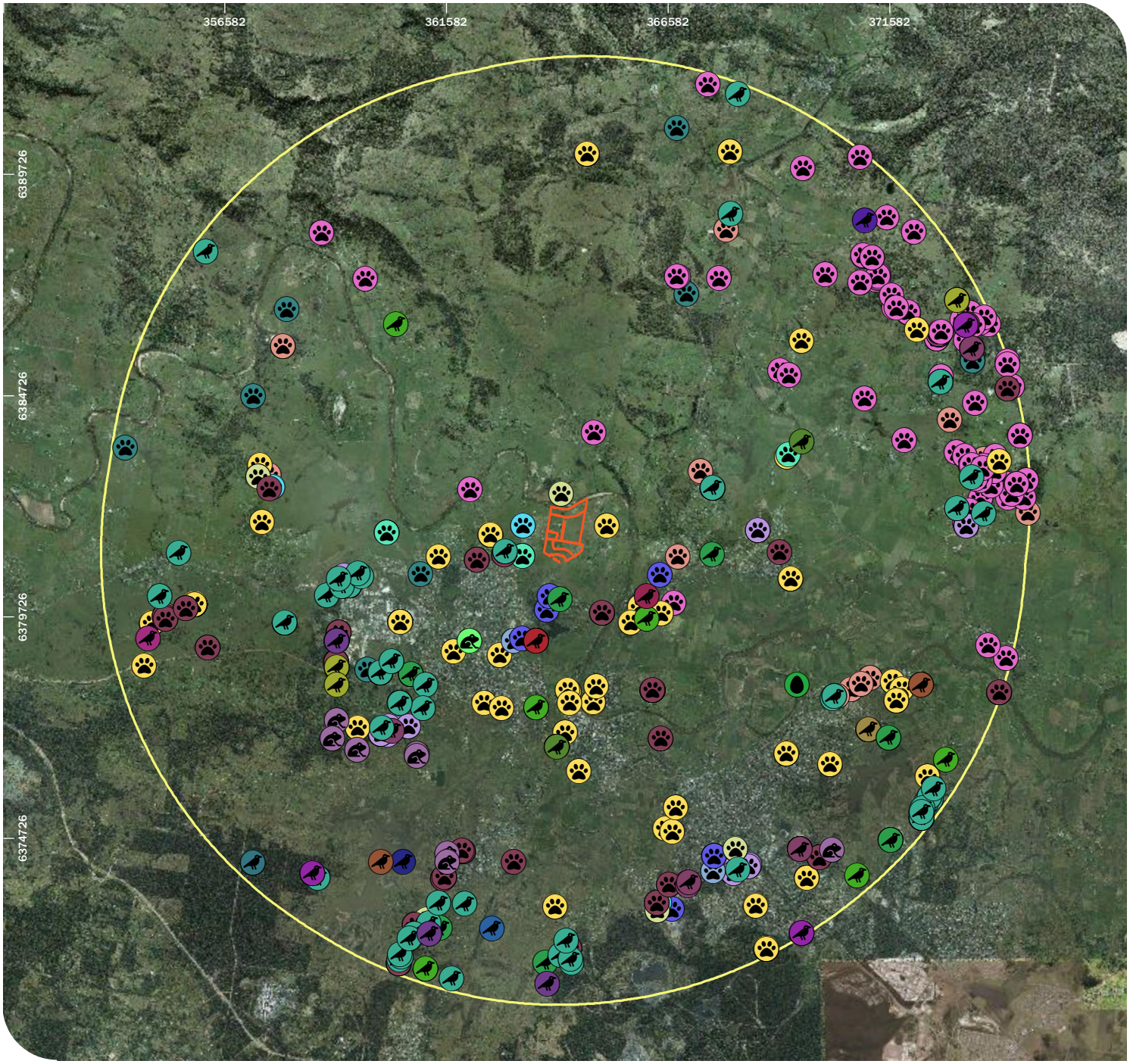
# Threatened flora within 10km of the Study Area

## Biodiversity Assessment for 42 Kezia Road, Oakhampton

Niche PM: Jai Green-Barber
Niche Proj. #: 7183
Client: Walkers Corporation

Figure 6




Study Area

10km search area

Gastropoda

Amphibia

- Green and Golden Bell Frog
- Littlejohn's Tree Frog

Aves

- Australian Painted Snipe
- Black-necked Stork
- Blue-billed Duck
- Dusky Woodswallow
- Freckled Duck
- Grey-crowned Babbler (eastern subspecies)
- Little Lorikeet
- Little Tern
- Magpie Goose
- Regent Honeyeater
- Scarlet Robin
- Speckled Warbler
- Spotted Harrier
- Varied Sittella
- White-bellied Sea-Eagle
- White-fronted Chat
- White-throated Needletail

Insecta

Mammalia

- Brush-tailed Phascogale
- Eastern Cave Bat
- Eastern Coastal Free-tailed Bat
- Eastern False Pipistrelle
- Greater Broad-nosed Bat
- Greater Glider
- Grey-headed Flying-fox
- Koala
- Large Bent-winged Bat
- Large-eared Pied Bat
- Little Bent-winged Bat
- Southern Myotis
- Spotted-tailed Quoll
- Squirrel Glider
- Yellow-bellied Sheathtail-bat

Reptilia

- Loggerhead Turtle

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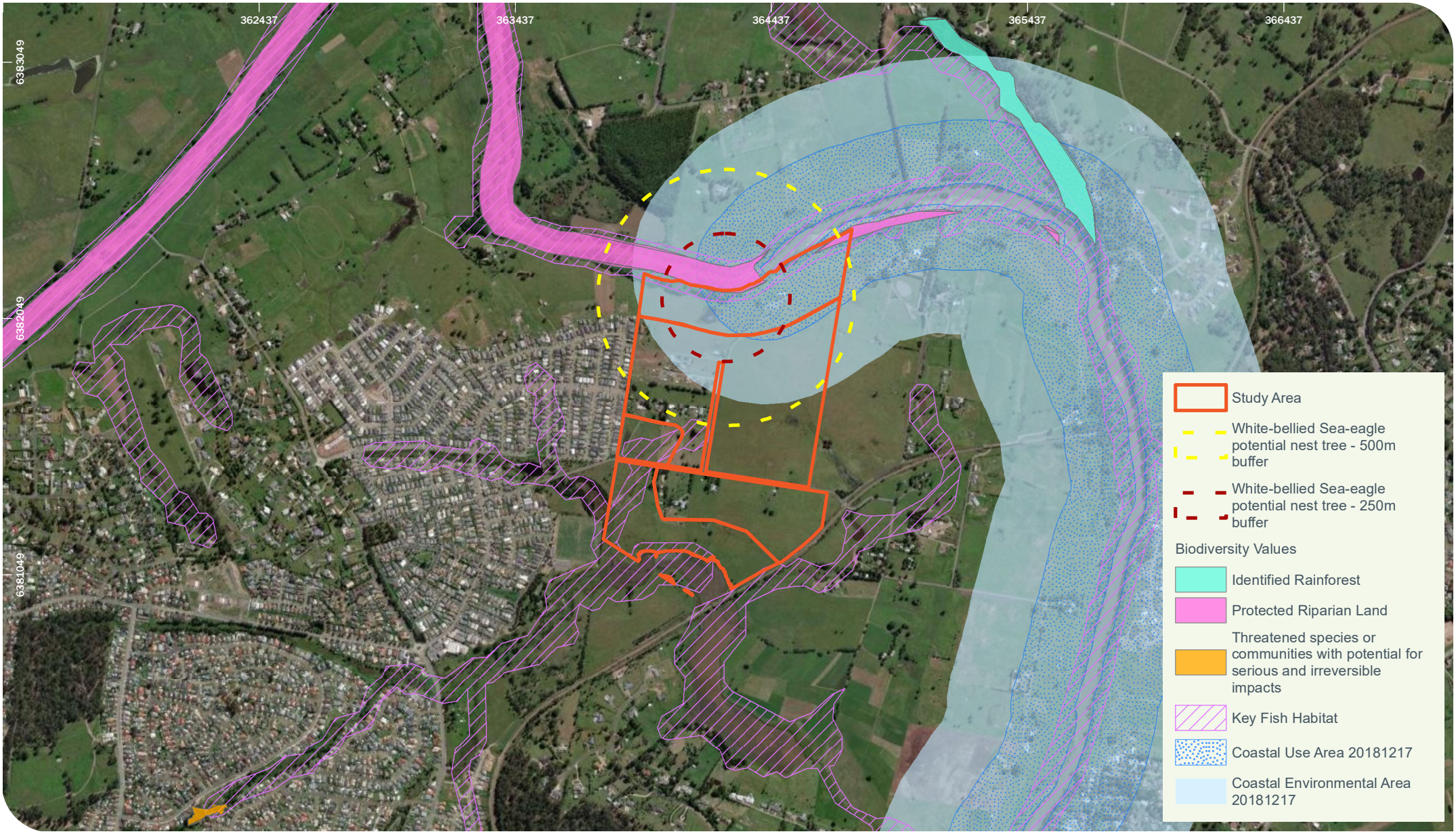
# Threatened Fauna within 10km of the Project Area

## Biodiversity Assessment for 42 Kezia Road, Oakhampton

Niche PM: Jai Green-Barber
Niche Proj. #: 7183
Client: Walkers Corporation

Figure 7

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Niche PM: Jai Green-Barber
Niche Proj. #: 7183
Client: Walker Corporation

# Ecological constraints in Study Area
## Biodiversity Assessment for 42 Kezia Road, Oakhampton

Figure 8

World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community


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GDA 1994 MGA Zone 56

# Important habitat in locality

## Biodiversity Assessment for 42 Kezia Road, Oakhampton

Niche PM: Jai Green-Barber
Niche Proj. #: 7183
Client: Walker Corporation

Figure 9

World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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# Appendix 1. RDP data

| RDP # | Overstorey | | Midstorey | | Understorey | | Groundcover | | Age | Condition |
|---|---|---|---|---|---|---|---|---|---|---|
| | Height (m) | Cover (%) | Height (m) | Cover (%) | Height (m) | Cover (%) | Height (m) | Cover (%) | | |
| 1 | 20 | 40 | 10 -19 | 15 | 1 - 3 | 90 | 0 - 1 | 90 | Mature remnant | Low |
| 2 | 25 | 45 | 10 -15 | 25 | 1 - 3 | 90 | 0 - 1 | 90 | Mixed age (mostly mature growth) | Low |
| 3 | 20 | 20 | 0 | 0 | 1 - 3 | 90 | 0 - 1 | 90 | Advanced regen | Low |
| 4 | 20 | 15 | 10 | 45 | 1 - 3 | 80 | 0 - 1 | 70 | Advanced regen | Low |
| 5 | 20 | 10 | 6 | 5 | 1 - 5 | 75 | 0 - 1 | 90 | Mixed age (mostly young) | Low |
| 6 | 25 | 50 | 10 -15 | 10 | 1 - 5 | 85 | 0 - 1 | 40 | Mixed age (mostly mature growth) | Low |

# Appendix 2. Plant community type description

| **PCT 1714 *River Oak - White Cedar Grassy Riparian Forest of the Dungog Area and Liverpool Ranges*** | |
|---|---|
| Vegetation formation | Forested Wetlands |
| Vegetation class | Eastern Riverine Forests |
| Vegetation structure | Riparian Open Forest |
| Conservation status | This vegetation does not form part of any TEC listed under the BC Act or EPBC Act. |
| Description | This vegetation occurred along the Hunter River, in the north of the Study Area. It is characterised by the presence of species characteristic of PCT 1714 such as River Oak (*Casuarina cunninghamiana*), Forest Red Gum (*Eucalyptus tereticornis*) and Common Couch (Cynodon dactylon), and a number of exotic flora species such as Lantana (*Lantana camara*), Paspalum (*Paspalum dilatatum*). A notable additional species present is Mugga Ironbark (*Eucalyptus sideroxylon*). The understorey and groundcover layers are dominated by exotic species. The canopy layer contained predominantly younger trees and occasional large mature trees. |
| Photo |  <br>**Plate 1. PCT 1714 vegetation at RDP 3.** |
| Diagnostic canopy species | River Oak (*Casuarina cunninghamiana*) and Forest Red Gum (*Eucalyptus tereticornis*). |
| Diagnostic midstorey species | N/A |
| Diagnostic groundcover species | Common Couch (*Cynodon dactylon*) |
| Other diagnostic features | Lithology: Sandstone |

| PCT 1714 *River Oak - White Cedar Grassy Riparian Forest of the Dungog Area and Liverpool Ranges* | |
|---|---|
| Justification of PCT selection | The main floristic evidence for alignment with PCT 1714 is the presence of River Oak and Forest Red Gum. This vegetation also contained young Mugga Ironbark trees. It occurred on sandstone and contained many exotic small trees, shrubs, grasses and forbs. Other PCTs present in the subregion do not fit the floristic composition of this vegetation. |
| High Threat Weeds | Asparagus Fern (*Asparagus aethiopicus*), Cobbler's Pegs (*Bidens pilosa*), Balloon Vine (*Cardiospermum* sp.), Cockspur Coral Tree (*Erythrina crista-galli*), Lantana (*Lantana camara*), Paspalum (*Paspalum dilatatum*), Castor Oil Plant (*Ricinus communis*), Wandering Jew (*Tradescantia fluminensis*). |
| Number of RDPs sampled | 6 |

## Appendix 3. Aquatic habitat assessment

**Bold text** = will be directly impacted based on the draft concept layout plan, * = may be indirectly impacted based proximity to Project in the draft concept layout plan, ^ = potential Key Fish Habitat

| ID | Water Level | Water quality conditions | Fish habitat | Aquatic fauna | Disturbances present | Adjacent land use | Riparian veg <10m | Riparian veg >10m | Shade | Rushes cover | Ground cover on banks | Width (m) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dam 1 | Low Moderate | Stagnant /no flow | Aquatic vegetation | Unidentified Duck (Anatidae) | Clearing, Agricultural | Rural-residential | 90% | 0% | Low | 15% | 90% | 20-50 |
| Drainage line 1 | Low flow | Stagnant /no flow | None | Common Eastern Froglet (*Crinia signifera*) | Agricultural | Rural-residential | 90% | 10% | Moderate | 20% | 80% | 1 |
| Dam 2 | Low Moderate | Turbid, Stagnant /no flow | None | N/A | Clearing, Agricultural | Rural-residential | 90% | 0% | None | 0% | 90% | 5-7 |
| **Dam 3** | **Low Moderate** | **Stagnant /no flow** | **None** | **N/A** | **Clearing** | **Rural-residential** | **90%** | **0%** | **Low** | **0%** | **90%** | **5-8** |
| Dam 4* | Low Moderate | Stagnant /no flow | Aquatic vegetation | Pacific Black Duck (*Anas superciliosa*) and Common Eastern Froglet (*Crinia signifera*) | Clearing, Agricultural | Grazing | 100% | 0% | Low | 55% | 90% | 15-35 |
| **Dam 5** | **Low Moderate** | **Stagnant /no flow** | **Aquatic vegetation** | **Australian Wood Duck (*Chenonetta jubata*) and Purple Swamphen (*Porphyrio porphyrio*)** | **Clearing, water extraction** | **Rural-residential** | **100%** | **0%** | **Low** | **15%** | **90%** | **15-30** |
| Dam 6* | Not assessed due to no access, however viewed from road and is not considered Key Fish Habitat as it is a farm dam on an order 1 stream | | | | | | | | | | | |
| Dam 7 | Low Moderate | Clear/ good condition | Aquatic vegetation | Common Eastern Froglet (*Crinia signifera*) | Clearing, Road crossings | Rural-residential | 90% | 0% | None | 80% | 90% | 6-8 |
| Drainage line 2 | Low flow | Stagnant /no flow | None | N/A | Clearing, Road crossings | Rural-residential | 100% | 0% | None | 0% | 100% | 1-2 |
| Dam 8 | Not assessed, however viewed from road and is not considered Key Fish Habitat as it is a farm dam on an order 2 stream | | | | | | | | | | | |
| Dam 9^ | Not assessed due to no access, unknown if it meets the definition of Key Fish Habitat; it is on an order 2 stream however the quality of aquatic habitat was not confirmed | | | | | | | | | | | |
| Dam 10* | Not assessed, no connected streams mapped and therefore it is assumed this is a constructed farm dam | | | | | | | | | | | |

| | |
|---|---|
| Dam 11* | Not assessed, no connected streams mapped and therefore it is assumed this is a constructed farm dam |

**Photo 1. Dam 1**

**Photo 2. Drainage line 1**

**Photo 3. Dam 2**

**Photo 4. Dam 3**

**Photo 5. Dam 4**

**Photo 6. Dam 5**

**Photo 7. Dam 7**

**Photo 8. Drainage line 2**

## Appendix 4. Threatened species likelihood of occurrence

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| **Amphibians** | | | | | | | |
| *Litoria aurea* | Green and Golden Bell Frog | BioNet, PMST | E | V | - | Inhabits a very wide range of water bodies including marshes, dams and streams, particularly those containing emergent vegetation such as bullrushes or spikerushes. It also inhabits numerous types of man-made water bodies including quarries and sand extraction sites. Optimum habitat includes water-bodies that are un-shaded, free of predatory fish such as Plague Minnow, have a grassy area nearby and diurnal sheltering sites available. | **Moderate** – due to presence of aquatic features. |
| *Litoria littlejohni* | Littlejohn's Tree Frog | BioNet | V | V | - | Occurs in wet and dry sclerophyll forests and heathland associated with sandstone outcrops between 280 and 1000 m on the eastern slopes of the Great Dividing Range from the Central Coast down into Victoria. Individuals have been collected from a wide range of water bodies that includes semi-permanent dams, permanent ponds, temporary pools and permanent streams, with calling occurring from fringing vegetation or on the banks. Individuals have been observed sheltering under rocks on high exposed ridges during summer and within deep leaf litter adjacent to the breeding site. Calling occurs in all months of the year, often in association with heavy rains. The tadpoles are distinctive, being large and very dark in colouration. | Low – insufficient outcropping and leaf litter present in proximity to aquatic features. |
| *Mixophyes balbus* | Stuttering Frog | PMST | - | V | - | Associated with streams in dry sclerophyll and wet sclerophyll forests and rainforests of more upland areas of the Great Dividing Range of NSW and down into Victoria. Breeding occurs along forest streams with permanent water where eggs are deposited within nests excavated in riffle zones by the females and the tadpoles swim free into the stream when large enough to do so. Outside of breeding, individuals range widely across the forest floor and can be found hundreds of metres from water | Low – no records in locality, no forest streams observed |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| **Birds** | | | | | | | |
| *Anseranas semipalmata* | Magpie Goose | BioNet | V | - | - | Mainly found in shallow wetlands less than 1 m deep, with a dense growth of rushes or sedges. | **Moderate** – suitable aquatic habitat within Study Area |
| *Anthochaera phrygia* | Regent Honeyeater | BioNet, PMST | E | CE | - | The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. The distribution of the species has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests. | Low – if present likely transient visitor |
| *Artamus cyanopterus cyanopterus* | Dusky Woodswallow | BioNet | V | - | - | Dusky woodswallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. | Low – if present likely transient visitor |
| *Botaurus poiciloptilus* | Australasian Bittern | PMST | - | E | - | The Australasian Bitterns is widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes and spikerushes. | Low – limited aquatic vegetation present and is not tall, if present likely transient visitor |
| *Calidris ferruginea* | Curlew Sandpiper | PMST | - | CE | - | The Curlew Sandpiper is distributed around most of the coastline of Australia. It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray- | None |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | | Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes the inland | |
| *Charadrius leschenaultii* | Greater Sand Plover | PMST | - | V | - | Occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons. Non-breeding in Australia. | None |
| *Chthonicola sagittata* | Speckled Warbler | BioNet | V | - | - | The Speckled Warbler lives in a wide range of eucalypt dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. | Low – unlikely that suitable habitat is present |
| *Circus assimilis* | Spotted Harrier | BioNet | V | - | - | The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. | Low – unlikely that suitable habitat is present |
| *Daphoenositta chrysoptera* | Varied Sittella | BioNet | V | - | - | Inhabits wide variety of dry eucalypt forests and woodlands, usually with either shrubby under storey or grassy ground cover or both, in all climatic zones of Australia. Usually in areas with rough-barked trees, such as stringybarks or ironbarks, but also in paperbarks or mature Eucalypts with hollows. | Low – unlikely that suitable habitat is present |
| *Ephippiorhynchus asiaticus* | Black-necked Stork | BioNet | E | - | - | Mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation. | **Moderate** – suitable wetlands within Study Area |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| *Epthianura albifrons* | White-fronted Chat | BioNet | V | - | - | Low vegetation in salty coastal and inland areas and crops. Runs along ground and is found in local flocks in Winter. | Low – unlikely that suitable habitat is present |
| *Erythrotriorchis radiatus* | Red Goshawk | PMST | - | V | - | The Red Goshawk occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia. | Low – unlikely that suitable habitat is present |
| *Falco hypoleucos* | Grey Falcon | PMST | - | V | - | Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. | Low – unlikely that suitable habitat is present |
| *Glossopsitta pusilla* | Little Lorikeet | BioNet | V | - | - | Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes. | Low – unlikely that suitable habitat is present |
| *Grantiella picta* | Painted Honeyeater | PMST | - | V | - | Inhabits Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema. | Low – unlikely that suitable habitat is present |
| *Haliaeetus leucogaster* | White-bellied Sea-Eagle | BioNet | V | - | - | Inhabits coastal and near coastal areas, building large stick nests, and feeding mostly on marine and estuarine fish and aquatic fauna. | **Known** – two individuals observed foraging in Study Area, potential nesting habitat occurs within the Study Area but outside of the Impact Area |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| *Hirundapus caudacutus* | White-throated Needletail | BioNet, PMST | - | V | - | An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. | Low – if present likely transient visitor |
| *Lathamus discolor* | Swift Parrot | BioNet, PMST | E | CE | - | The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects . The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW . This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability. | Low – if present likely transient visitor |
| *Limosa lapponica baueri* | Nunivak Bar-tailed Godwit | PMST | - | V | - | Birds arrive in New South Wales between August and October and then leave between February and April, with a small number of individuals overwintering. The subspecies is most frequently recorded along major coastal river estuaries and sheltered embayments, particularly the Tweed, Richmond, Clarence, Macleay, Hastings, Hunter and Shoalhaven river estuaries, Port Stephens and Botany Bay. It is a rare visitor to wetlands away from the coast with scattered records as far west as along the Darling River and the Riverina. It is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Less frequently it occurs in salt lakes and brackish wetlands, sandy ocean beaches and rock platforms. It often occurs around beds of seagrass, and sometimes in nearby saltmarsh or the outer margins of mangrove areas. | Low – if present likely transient visitor |
| *Neophema pulchella* | Turquoise Parrot | BioNet | V | - | - | The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust. | Low – if present likely transient visitor |
| *Ninox connivens* | Barking Owl | BioNet | V | - | - | Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country. | **Moderate –** may utilise riparian habitat for foraging, |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | | | no suitable hollows observed |
| *Ninox strenua* | Powerful Owl | BioNet | V | - | - | Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. It is most commonly recorded within red turpentine in tall open forests and black she-oak within open forests. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm. | Low – if present likely transient visitor |
| *Numenius madagascariensis* | Eastern Curlew | PMST | - | CE | - | A primarily coastal distribution. Found in all states, particularly the north, east, and south-east regions including Tasmania. Rarely recorded inland. Mainly forages on soft sheltered intertidal sand flats or mudflats, open and without vegetation or cover. Breeds in the northern hemisphere. | None |
| *Oxyura australis* | Blue-billed Duck | BioNet | V | - | - | Widespread in NSW, but most common in the southern Murray-Darling Basin area. Birds disperse during the breeding season to deep swamps up to 300 km away. It is generally only during summer or in drier years that they are seen in coastal areas. The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. | Low –wetlands within Study Area are likely too small and/or insufficiently vegetated |
| *Pandion cristatus* | Eastern Osprey | BioNet | V | - | - | Found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. | Low – if present likely transient visitor |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| *Petroica boodang* | Scarlet Robin | BioNet | V | - | - | The Scarlet Robin is found from SE Queensland to SE South Australia and also in Tasmania and SW Western Australia. In NSW, it occurs from the coast to the inland slopes. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. | Low – unlikely that suitable habitat is present |
| *Pomatostomus temporalis temporalis* | Grey-crowned Babbler (eastern subspecies) | BioNet | V | - | - | In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions. | Low – suitable vegetation is absent |
| *Rostratula australis* | Australian Painted Snipe | BioNet, PMST | E | E | - | In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. | Low – sufficiently tall vegetation in proximity to dams is absent |
| *Sternula albifrons* | Little Tern | BioNet | E | - | - | In NSW, it arrives from September to November, occurring mainly north of Sydney, with smaller numbers found south to Victoria. Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers. | Low – unlikely that suitable habitat is present |
| *Stictonetta naevosa* | Freckled Duck | BioNet | V | - | - | The freckled duck breeds in permanent fresh swamps that are heavily vegetated. Found in fresh or salty permanent open lakes, especially during drought. Often seen in groups on fallen trees and sand spits. | Low –wetland vegetation is not sufficiently dense |
| *Tyto novaehollandiae* | Masked Owl | BioNet | V | - | - | Inhabits a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting. Mostly recorded in open forest and woodlands adjacent to cleared lands. Nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead. Nest hollows are usually located within dense forests or woodlands. Masked owls prey upon hollow-dependent | Low – unlikely that suitable nesting habitat is present, potential for common suitable foraging habitat to |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | | arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet. | occur. If species is present then it is likely a transient visitor |
| **Mammals** | | | | | | | |
| *Chalinolobus dwyeri* | Large-eared Pied Bat | BioNet, PMST | - | V | - | Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range. Can also be found on the edges of rainforests and in wet sclerophyll forests. This species roosts in caves and mines in groups of between 3 and 37 individuals. | Low – only one record in the locality which is not in close proximity to the Study Area, unlikely that suitable roosting habitat is present |
| *Dasyurus maculatus* | Spotted-tailed Quoll | BioNet, PMST | - | E | - | Spotted-tailed Quoll are found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. | Low – unlikely that suitable habitat is present |
| *Falsistrellus tasmaniensis* | Eastern False Pipistrelle | BioNet | V | V | - | Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high. Two observations have been made of roosts in stem holes of living eucalypts. There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary but enter torpor . This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites . | **Moderate** – records in close proximity to the Study Area, suitable foraging habitat occurs within the Study Area, no suitable roosting hollows were observed |
| *Micronomus norfolkensis* | Eastern Coastal Free-tailed Bat | BioNet | V | - | - | Most records are from dry eucalypt forests and woodlands to the east of the Great Dividing Range. Appears to roost in trees, but little is known of this species' habits | **Moderate** – records in close proximity to the Study Area, suitable foraging |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | | | habitat occurs within the Study Area, no suitable roosting hollows were observed |
| *Miniopterus australis* | Little Bent-winged Bat | BioNet | V | - | - | Coastal north-eastern NSW and eastern Queensland. Little Bent-wing Bat is an insectivorous bat that roost in caves, in old mines, in tunnels, under bridges, or in similar structures. They breed in large aggregations in a small number of known caves and may travel 100s km from feeding home ranges to breeding sites. Little Bent-wing Bat has a preference for moist eucalypt forest, rainforest or dense coastal banksia scrub where it forages below the canopy for insects. | **Moderate** – numerous records in close proximity to the Study Area, suitable foraging habitat occurs within the Study Area, no suitable roosting habitat present |
| *Miniopterus orianae oceanensis* | Large Bent-winged Bat | BioNet | V | - | - | Eastern Bent-wing Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. | **Moderate** – numerous records in close proximity to the Study Area, suitable foraging habitat occurs within the Study Area, no suitable roosting habitat present |
| *Myotis macropus* | Southern Myotis | BioNet | V | V | - | The Sothern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. | **Moderate** – records in close proximity to the Study Area, suitable foraging habitat occurs within the Study Area, no suitable roosting |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | | | hollows were observed |
| *Petauroides volans* | Greater Glider | BioNet, PMST | V | V | - | The Greater Glider occurs in eucalypt forests and woodlands. The Greater Glider occurs in eucalypt forests and woodlands. The species nests in hollows and are typically found in older forests. Generally the home range for the greater glider is between 0.7-3 hectares and tends to have a population density of 0.01-5 individuals per hectare. The home ranges of females can overlap with males and females however for the males the home ranges never overlap. | Low |
| *Petaurus norfolcensis* | Squirrel Glider | BioNet | V | - | - | Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range . Requires abundant hollow bearing trees and a mix of eucalypts, banksias and acacias. There is only limited information available on den tree use by Squirrel gliders, but it has been observed using both living and dead trees as well as hollow stumps. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked. Endangered population in the Wagga Wagga LGA. | Low – no suitable roosting habitat was observed |
| *Petrogale penicillata* | Brush-tailed Rock-wallaby | PMST | - | V | - | Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices. | None |
| *Phascogale tapoatafa* | Brush-tailed Phascogale | BioNet | V | - | - | The Brush-tailed Phascogale has a patchy distribution around the coast of Australia. In NSW it is mainly found east of the Great Dividing Range although there are occasional records west of the divide. Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. | Low – no suitable roosting habitat was observed |
| *Phascolarctos cinereus* | Koala | BioNet, PMST | V | E | - | Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall . | Low – while there are numerous records in the |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | | | locality, and a small number of Koala food trees occur within the Study Area, the majority of records occur to the north of the Hunter River which occurs on the northern boundary of the Study Area and is likely to act as a barrier to Koala movement. |
| *Potorous tridactylus tridactylus* | Long-nosed Potoroo | PMST | - | V | - | Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy. | Low |
| *Pseudomys novaehollandiae* | New Holland Mouse | PMST | - | V | - | The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. | Low |
| *Pteropus poliocephalus* | Grey-headed Flying-fox | BioNet, PMST | V | E | - | This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost although some individuals may travel up to 70 km. | **Moderate** – numerous records in the locality the closest of which is approximately 500 m from the Study Area, two camps are located approximately 2.8km to the south-east of |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | | | the Study Area (DAWE 2022c), limited suitable foraging habitat occurs within the Study Area |
| *Saccolaimus flaviventris* | Yellow-bellied Sheathtail-bat | BioNet | V | E | - | Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. | **Moderate** – records in close proximity to the Study Area, suitable foraging habitat occurs within the Study Area, no suitable roosting hollows were observed |
| *Scoteanax rueppellii* | Greater Broad-nosed Bat | BioNet | V | - | - | Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m. In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat. This species roosts in hollow tree trunks and branches. | Low – no moist gullies in mature coastal forests and rainforests are present |
| *Vespadelus troughtoni* | Eastern Cave Bat | BioNet | V | - | - | The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. | Low – no suitable roosting habitat is present |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| *Caretta caretta* | Loggerhead Turtle | BioNet | E | E | - | Loggerhead turtles have a worldwide tropical and subtropical distribution. In Australia, they occur in coral reefs, bays and estuaries in tropical and warm temperate waters off the coast of Queensland, Northern Territory, Western Australia and New South Wales. | None |
| *Delma impar* | Striped Legless Lizard | PMST | -- | V | - | Found mainly in natural temperate grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near natural temperate grassland and occasionally in open box-gum woodland. Sometimes found in grasslands with significant amounts of surface rocks, which are used for shelter. | Low – unlikely that suitable habitat is present |
| **Fish** | | | | | | | |
| *Mogurnda adspersa* | Southern Purple Spotted Gudgeon | FNSWS DPI | - | | E | Two populations of Purple Spotted Gudgeon historically occurred in NSW; an eastern population found in coastal catchments north of the Clarence River, and a western population found patchily distributed throughout Murray Darling Basin drainages. Both populations have experienced significant declines in distribution and abundance. The Purple Spotted Gudgeon is a benthic species, usually found in rivers, creeks and billabongs with slow-moving or still waters; often amongst weeds, rocks or snags. Most remnant populations occur in small to medium sized streams. The disconnected farm dams and degraded small streams within the Study Area are not included in indicative habitat distribution mapping published by DPI (2022) and are unlikely to support habitat for this species. | Low – unlikely that suitable habitat is present |
| **Plants** | | | | | | | |
| *Acacia bynoeana* | Bynoe's Wattle | BioNet, PMST | E | V | - | Grows mainly in heath and dry sclerophyll forest in sandy soils. Mainly south of Dora Creek-Morisset area to Berrima and the Illawarra region, west to the Blue Mountains, also recorded from near Kurri Kurri in the Hunter Valley and from Morton National Park. | Low – no suitable habitat is present |
| *Arthraxon hispidus* | Hairy-joint Grass | PMST | | V | - | Occurs over a wide area in south-east Queensland, the northern tablelands and north coast of NSW. Moisture and shade-loving grass, | **Moderate** –suitable habitat occurs within the Study Area |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | | found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps. | |
| *Caladenia tessellata* | Thick-lipped Spider-orchid | PMST | - | V | - | The Thick-lipped Spider-orchid is found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. | Low – Study Area is outside known distribution of this species |
| *Callistemon linearifolius* | Netted Bottle Brush | BioNet | V | - | - | Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges. | Low – no suitable habitat is present |
| *Cryptostylis hunteriana* | Leafless Tongue-orchid | PMST | - | V | - | Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*). | Low – no suitable habitat is present |
| *Cymbidium canaliculatum* | *Cymbidium canaliculatum* population in the Hunter Catchment | BioNet | E | - | - | Typically grows in the hollows, fissures, trunks and forks of trees in dry sclerophyll forest or woodland, where its host trees typically occur on Permian Sediments of the Hunter Valley floor. It usually occurs singly or as a single clump, which can form large colonies on trees, between two and six metres from the ground. | Low – no suitable habitat is present |
| *Cynanchum elegans* | White-flowered Wax Plant | PMST | - | E | - | Recorded from rainforest gullies scrub and scree slopes from the Gloucester district to the Wollongong area and inland to Mt Dangar. | Low – no suitable habitat is present |
| *Dichanthium setosum* | Bluegrass | PMST | - | V | - | Occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, as well as in Queensland and Western Australia. It occurs widely on private property, including in the | Low – Study Area is outside known |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | | Inverell, Guyra, Armidale and Glen Innes areas. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. | distribution of this species |
| *Eucalyptus camaldulensis* | *Eucalyptus camaldulensis* population in the Hunter catchment | BioNet | EP | - | - | The Hunter population occurs from the west at Bylong, south of Merriwa, to the east at Hinton, on the bank of the Hunter River. | **Known** – a small number of mature individuals recorded |
| *Eucalyptus glaucina* | Slaty Red Gum | BioNet, PMST | V | V | - | Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. Grows in grassy woodland and dry eucalypt forest. Grows on deep, moderately fertile and well-watered soils. | Low – no suitable habitat is present |
| *Eucalyptus parramattensis* subsp. *decadens* | | BioNet, PMST | V | V | - | Generally occupies deep, low-nutrient sands, often those subject to periodic inundation or where water tables are relatively high. It occurs in dry sclerophyll woodland with dry heath understorey. It also occurs as an emergent in dry or wet heathland. Often where this species occurs, it is a community dominant. | Low – no suitable habitat is present |
| *Euphrasia arguta* | | PMST | - | CE | - | Occur in eucalypt forest with a mixed grass and shrub understorey within Nundle State forest. Sites have either been logged in the last few decades, or appear to have regrown from past clearing. | Low – Study Area is outside known distribution of this species |
| *Grevillea parviflora* subsp. *parviflora* | Small-flower Grevillea | BioNet, PMST | V | V | - | Grows in sandy or light clay soils usually over thin shales. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. Found over a range of altitudes from flat, low-lying areas to upper slopes and ridge crests. Often occurs in open, slightly disturbed sites such as along tracks. | Low – no suitable habitat is present |
| *Persicaria elatior* | Knotweed | PMST | - | V | - | This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance. | Low – no suitable habitat is present |
| *Persoonia pauciflora* | North Rothbury Persoonia | BioNet | E | CE | - | Extremely restricted distribution; all but one of the plants which make up the only known population occur within a 2.5 km radius of the original specimen at North Rothbury in the Cessnock local government | Low – no suitable habitat is present |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | | area. Within this range, there are three main sub-populations which comprise approximately 90% of the total population. The other 10% of the population occurs as scattered individuals in what is a relatively disturbed landscape. It is found in dry open forest or woodland dominated by spotted gum, broad-leaved ironbark and-or narrow-leaved ironbark and supporting a moderate to sparse shrub layer and grassy groundcover. The majority of the population is known to occur on silty sandstone soils derived from the Farley Formation. | |
| *Pomaderris brunnea* | Rufous Pomaderris | PMST | - | V | - | The species is expected to live for 10 - 20 years, while the minimum time to produce seed is estimated to be 4 - 6 years. Found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area. It also occurs at Walcha on the New England Tableland and in far eastern Gippsland in Victoria. | Low – Study Area is outside known distribution of this species |
| *Prasophyllum* sp. Wybong | A leek-orchid | PMST | - | CE | - | Endemic to NSW. It is known from seven populations in eastern NSW near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell and Tenterfield. | Low – Study Area is near the limit of the predicted range of this species |
| *Pterostylis gibbosa* | Illawarra Greenhood | BioNet, PMST | E | E | - | Grows in open forest or woodland, on flat or gently sloping land with poor drainage. Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). | Low – no suitable habitat is present |
| *Rhizanthella slateri* | Eastern Underground Orchid | PMST | - | E | - | Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore usually located only when the soil is disturbed. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. | Low – Study Area is outside known distribution of this species |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| *Rhodamnia rubescens* | Scrub Turpentine | PMST | - | CE | - | Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of *R. rubescens* typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m above sea level in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. | Low – easily distinguished appearance and was not detected during field surveys |
| *Rhodomyrtus psidioides* | Native Guava | BioNet, PMST | E | CE | - | Occurs from Broken Bay, approximately 90 km north of Sydney, New South Wales, to Maryborough in Queensland. Populations are typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to c. 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges in NSW. Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts. | Low – easily distinguished appearance and was not detected during field surveys |
| *Rutidosis heterogama* | Heath Wrinklewort | BioNet, PMST | V | V | - | Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides. | Low – no suitable habitat occurs within the Study Area |
| *Syzygium paniculatum* | Magenta Lilly Pilly | BioNet, PMST | E | V | - | Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State forest. On the south coast the species occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest. On the central coast it occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities | Low – no suitable habitat is present |
| *Tetratheca juncea* | Black-eyed Susan | PMST | - | V | - | Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. It is usually found in low open forest-woodland with a mixed shrub understorey and grassy groundcover. The majority of | Low – no suitable habitat is present |

| Scientific Name | Common Name | Source | BC Act | EPBC Act | FM Act | Habitat | Likelihood of Occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | | populations occur on low nutrient soils associated with the Awaba Soil Landscape. Cryptic species that requires survey in September-October. | |
| *Thesium australe* | Austral Toadflax | PMST | - | V | - | Grows in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland or grassy woodland. Grows on kangaroo grass tussocks but has also been recorded within the exotic coolatai grass. | Low – no suitable habitat is present |

*legislative status key: V = Vulnerable, E = Endangered, CE = Critically Endangered

## Appendix 5. Flora species recorded during field surveys

*= exotic, ^= HTW

| Family | Scientific name | Common Name | RDP 1 | RDP 2 | RDP 3 | RDP 4 | RDP 5 | RDP 6 |
|---|---|---|---|---|---|---|---|---|
| Fabaceae (Mimosoideae) | *Acacia fimbriata* | Fringed Wattle | | | | X | | |
| Fabaceae (Mimosoideae) | *Acacia implexa* | Hickory Wattle | | | | X | | |
| Asparagaceae | *Asparagus aethiopicus*^* | Asparagus Fern | | X | | | X | |
| Asteraceae | *Bidens pilosa*^* | Cobbler's Pegs | | | | X | X | |
| Poaceae | *Briza maxima** | Quaking Grass | | | | | | X |
| Myrtaceae | *Callistemon sieberi* | River Bottlebrush | | X | | | | |
| Sapindaceae | *Cardiospermum sp.*^* | Balloon Vine | | X | | X | | X |
| Casuarinaceae | *Casuarina cunninghamiana subsp. cunninghamiana* | River Oak | X | | X | X | X | X |
| Fabaceae (Caesalpinioideae) | *Delonix regia** | Royal Poinciana | | | | | | X |
| Convolvulaceae | *Dichondra repens* | Kidney Weed | | X | | X | X | |
| Poaceae | *Cynodon dactylon* | Common Couch | | | | | X | X |
| Fabaceae (Faboideae) | *Erythrina crista-galli*^* | Cockspur Coral Tree | | | | | | X |
| Myrtaceae | *Eucalyptus camaldulensis* | River Red Gum | X | | | | | |
| Myrtaceae | *Eucalyptus sideroxylon* | Mugga Ironbark | | X | X | | | |
| Myrtaceae | *Eucalyptus tereticornis* | Forest Red Gum | X | X | X | X | | |
| Asteraceae | *Hypochaeris radicata** | Catsear | | | | X | | |
| Verbenaceae | *Lantana camara*^* | Lantana | X | X | X | X | X | |
| Poaceae | *Melinis repens** | Red Natal Grass | | | X | X | | |
| Oleaceae | *Notelaea longifolia* | Large Mock-olive | X | X | X | | X | |
| Asteraceae | *Onopordum acanthium** | Scotch Thistle | | | | | X | |
| Poaceae | *Panicum simile* | Two-colour Panic | | | | | X | |
| Poaceae | *Paspalum dilatatum*^* | Paspalum | X | X | X | X | X | X |
| Plantaginaceae | *Plantago lanceolata** | Lamb's Tongues | | X | X | | X | |
| Euphorbiaceae | *Ricinus communis*^* | Castor Oil Plant | | | | | X | |
| Poaceae | *Setaria parviflora** | - | | | | | X | |
| Commelinaceae | *Tradescantia fluminensis*^* | Wandering Jew | | | | X | | X |
| Fabaceae (Faboideae) | *Trifolium repens** | White Clover | | X | | | | |
| Verbenaceae | *Verbena bonariensis** | Purpletop | | | X | | X | |

# Appendix 6. Fauna species recorded during field surveys

Bold = threatened species, * = introduced species, ^ = some species in this genus are listed as Vulnerable under the BC Act

| Scientific name | Common Name | BC Act | EPBC Act |
|---|---|---|---|
| **Frogs** | | | |
| *Crinia signifera* | Common Eastern Froglet | - | - |
| **Birds** | | | |
| ***Haliaeetus leucogaster*** | **White-bellied Sea-eagle** | ***V*** | ***MA*** |
| *Anthochaera carunculata* | Red wattlebird | - | - |
| *Rhipidura leucophrys* | Willie wagtail | - | - |
| *Eopsaltria australis* | Eastern Yellow Robin | - | - |
| *Malurus cyaneus* | Superb Fairy-wren | - | - |
| *Meliphaga lewinii* | Lewin's Honeyeater | - | - |
| *Gymnorhina tibicen* | Australian Magpie | - | - |
| *Grallina cyanoleuca* | Magpie-lark | - | - |
| *Bubulcus ibis* | Cattle Egret | - | *MA* |
| *Coracina novaehollandiae* | Black-faced Cuckoo-shrike | - | - |
| *Platycercus eximius* | Eastern Rosella | - | - |
| *Cacatua sanguinea* | Little Corella | - | - |
| *Aquila audax* | Wedge-tailed eagle | - | - |
| **Mammals** | | | |
| *Macropus giganteus* | Eastern Grey Kangaroo | - | - |
| *Vulpes vulpes** | Fox | - | - |
| *Petaurus sp.* | Unidentified glider | ^ | - |