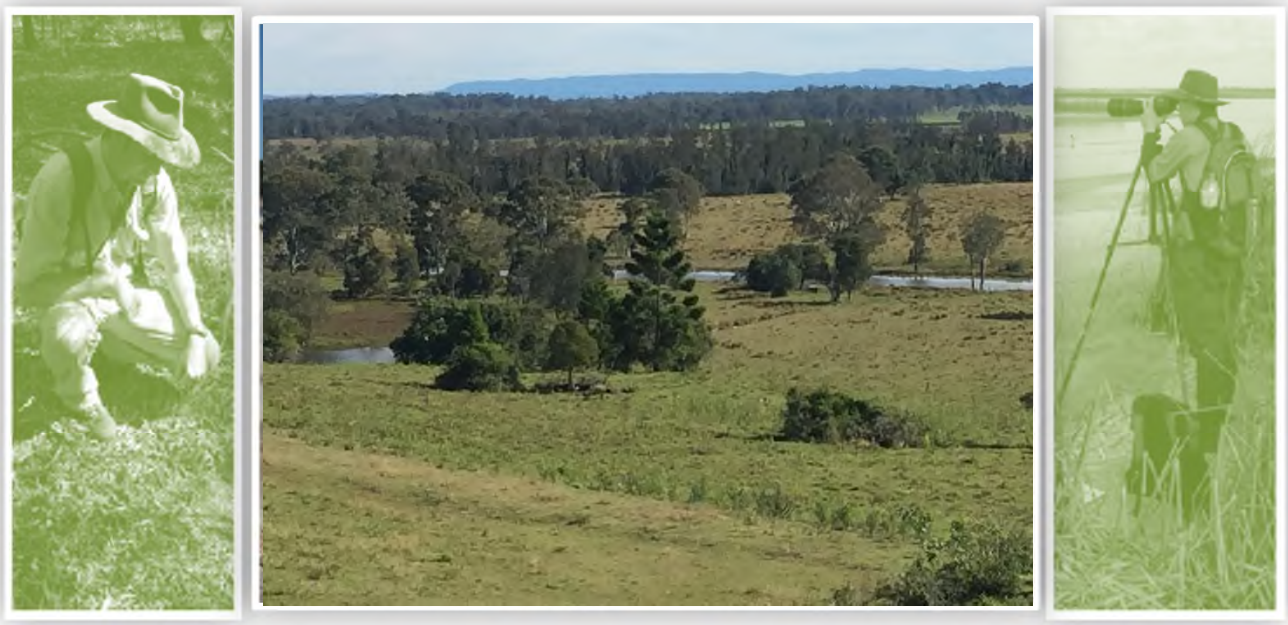
BIODIVERSITY ASSESSMENT REPORT

CORAKI QUARRY, CORAKI, NSW

Prepared for
Groundwork Plus on behalf of Quarry Solutions Pty Ltd



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Client: Groundwork Plus on behalf of Quarry Solutions Pty Ltd

Project Title: Biodiversity Assessment Report: Coraki Quarry, Seelems Road, Coraki, NSW

Project Author/s: Adrian Caneris, David Fell and Jedd Appleton

Project Summary: Assessment of terrestrial ecological values and potential impacts of a proposed extractive industry at Coraki in northern NSW in accordance with the Framework for Biodiversity Assessment, for informing a development application and EIS for the project.

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Biodiversity Assessment and Management Pty Ltd

Director

EXECUTIVE SUMMARY

Purpose of the report

This report has been prepared for Groundwork Plus on behalf of Quarry Solutions Pty Ltd to document an assessment of the biodiversity values in and around the proposed development footprint for an Extractive Industry at Seelems Road, Coraki. The purpose of the report is to inform decision making regarding the avoidance and mitigation of impacts on significant biodiversity values resulting from the project.

Study approach

A preliminary assessment of ecological values on the proposed development site concluded that the area of the proposed development footprint was unlikely to hold any notable value for flora or fauna species of significance and, therefore, the requirements for biodiversity offsets under the BioBanking process was also unlikely. Consequently, the NSW Office of Environment and Heritage confirmed that the Framework for Biodiversity Assessment would not need to be used to assess the biodiversity values and associated impacts, subject to the results of further investigations. DPI NSW also confirmed there are no fisheries issues and no aspects of the works trigger the need for any approvals under the NSW *Fisheries Management Act 1994*, provided the nearby wetland was not impacted.

The biodiversity values of the study area were assessed through a desktop review of available information together with a field survey conducted by two ecologists over one day. The survey primarily involved the assessment of all native vegetation, habitats and other landscape features on and adjacent to the proposed site development footprint for informing subsequent mapping and value assessments, and determining the need for any further assessment for threatened species. Given the small size of the site, all vegetation communities, habitats and flora species were able to be assessed and accounted for during the survey.

Landscape features

The study area occurs entirely within the Clarence Lowlands subregion of the South Eastern Queensland - Clarence Lowlands Bioregion, and includes the Lamington Volcanic Slopes, Grafton-Whiporie Basin and Clarence-Richmond Alluvial Plains Mitchell Landscapes.

Seelems Creek meanders across the western portion of the study area as a series of ox-bow wetlands, none of which are recognised as “important” wetlands. Wetlands also occur to the east and north-east of the study area, known locally as Kennedy’s Swamp. No state or regionally significant biodiversity links are recognised as occurring within the study area, although vegetation associated with Seelems Creek may act as a local biodiversity link.

Vegetation communities

Native vegetation recorded during the field survey was restricted to the western and central portions of the study area, as well as to the north-east. The ground-truthed extent was found to match that shown in aerial imagery for the site, which confirms that the proposed development footprint is largely devoid of native vegetation and has been used for grazing livestock and existing quarrying operations.

The field survey identified four native vegetation types within or in close proximity to the study area, all of which are recognised as Endangered Ecological Communities (EECs):

- Hoop Pine - Yellow Tulipwood dry rainforest of the North Coast – a component of the “Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions” EEC. Found to be in moderate condition.

- Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast – a component of the "Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion" EEC. Found to be in moderate condition.
- Paperbark swamp forest of the coastal lowlands of the North Coast – a component of the "Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions" EEC. Found to be in moderate condition.
- Coastal freshwater meadows and forblands of lagoons and wetlands – a component of the "Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions" EEC. Found to be in good condition.

These native vegetation communities all occur outside of the proposed development footprint. None of the vegetation on the study area is recognised as a Threatened Ecological Community under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Other native vegetation recorded onsite occurs as scattered paddock trees, planted amenity screens alongside access tracks, or as minor components within otherwise heavily disturbed and exotic-dominated patches of regrowth. Camphor Laurel (*Cinnamomum camphora*) and Lantana (*Lantana camara*) are dominant features of the latter.

Threatened species

Four specimens of *Macadamia tetraphylla* (Rough-shelled Bush Nut) were recorded during the field survey, a species currently listed as Vulnerable under both the New South Wales *Threatened Species Conservation Act 1995* (TSC Act) and EPBC Act. The specimens occur together, adjacent to a clump of other scattered, paddock trees and outside of any of the recognised native vegetation zones on the study area. These plants are either relicts of a dry rainforest or forested wetland community that once occupied that part of the site, or they have propagated from seeds dispersed from nearby communities.

No other threatened flora species were recorded during the field survey, despite targeted searching within all habitat types (including comprehensive searches within the proposed development footprint), and despite the majority of species being detectable throughout the year.

Forest Red Gums (*Eucalyptus tereticornis*) within the open forest habitat to the north-east of the study area showed scratches consistent with those of Koala (*Phascolarctos cinereus*) (Vulnerable: TSC Act and EPBC Act). No evidence of Koala occurrence was found within the study area, and although it is possible this species may also occasionally utilise food trees occurring within the open paddock and fringing the wetlands, these areas are considered to be of less value to the species than the habitats occurring off-site.

In addition to Koala, a number of threatened fauna species have the potential to occur within the habitats present within the study area, at least as transient visitors during foraging (particularly birds and bats). Black-necked Stork (*Ephippiorhynchus asiaticus*) (Endangered: TSC) and Comb-crested Jacana (*Irediparra gallinacea*) (Vulnerable: TSC Act) are also known to occur on the site from previous records, and the study area continues to provide suitable habitat for these species.

The degraded habitats present within the area of the proposed development footprint provide very limited habitat value for threatened fauna species.

Matters of local significance

The results of the field survey generally support the Richmond Valley Council's Local Environmental Plan mapping of relative biodiversity importance in that the far western and central parts of the study area and areas to the north-east contain native vegetation and associated habitat values for native fauna, including species of conservation significance. The results of the field survey also generally support the Koala Habitat Atlas mapping in that the vegetation in the north-east offers the highest value Koala habitat, with less valuable potential habitat occurring on the fringes of the wetlands.

Potential impacts

Clearing and grubbing activities during the construction and operational phases of the development primarily will reduce the overall amount of habitat and populations of flora and fauna, and has the potential to result in isolation of habitats and populations, changes to remaining vegetation that cause the loss of food and shelter resources for fauna, and exposure to introduced species that are either competitors or predators. Removal of vegetation will also result in direct loss of individual plants, including large trees that may provide nesting resources to fauna, and can result in the mortality of fauna present at the time of clearing. Secondary impacts can also affect peripheral vegetation through soil disturbance/exposure and altered water flow patterns, edge effects, and excessive dust.

The construction and operation phases have the potential to result in on-going disturbance to surrounding habitats due to noise, dust and vibration. An increase in heavy and light vehicle traffic could contribute to increased animal/vehicle collisions on local roads, and reptiles and small mammals may become trapped in any trenches or other excavations that remain open for any period of time. Vehicles also have the potential to introduce and/or spread weed species and plant pathogens in disturbed soil, while general waste and land disturbance has the potential to attract highly competitive and/or predatory exotic fauna species. Fuels and chemical spills from storage areas and oils from heavy machinery can enter the environment, affecting habitats where the spill occurs, and potentially causing more widespread impact if contaminants reach waterways.

Impact management

The proposed site development footprint has been positioned to avoid the clearing and fragmentation of the relatively large, well-connected tracts of vegetation and associated habitat within the study area, and avoids all patches of vegetation recognised as native vegetation communities that have greatest value to the majority of known or potentially occurring terrestrial flora and fauna species. No EECs, wetlands or important habitat for threatened flora and fauna species will be directly impacted. Buffers will be retained between the recognised vegetation communities (and associated EECs and wetlands) and the edge of the proposed site disturbance footprint to further prevent secondary impacts.

In response to the survey results, the original footprint was redesigned to avoid the clearing of four *Macadamia tetraphylla* specimens, with a 25 m buffer to be established and maintained around the plants. This development design, along with further management actions proposed to avoid and mitigate impacts to these plants, suggests any impacts are highly unlikely to be significant.

Implementation of a number of other mitigation measures is also recommended to reduce impacts on native flora and fauna to levels that will not cause significant or permanent harm. This includes the development and implementation of an Environmental Management Plan that includes components to reduce secondary impacts on terrestrial flora, fauna and ecosystems.

Overall, the Project is not expected to result in the direct loss of any significant biodiversity values and, once the proposed mitigation measures are implemented, the remaining impacts of the Project on terrestrial ecological values are predicted to be minor or negligible, particularly in the context of existing site conditions and current impacts from previous land clearing, weed invasion and the presence of livestock. Hence offsets to compensate for residual impacts are assessed to be unnecessary, and a referral to the Commonwealth in relation to impacts on species listed under the EPBC Act is not considered necessary at this time.

BIODIVERSITY ASSESSMENT REPORT

CORAKI QUARRY, SEELEMS ROAD, CORAKI, NSW

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Table of Terms and Abbreviations

AKF	Australian Koala Foundation
BAAM	Biodiversity Assessment and Management Pty Ltd
BAR	Biodiversity Assessment Report
DoE	Commonwealth Department of Environment
DPI	New South Wales Department of Primary Industries
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FBA	Framework for Biodiversity Assessment
LEP	Local Environmental Plan
MNES	Matter of National Environmental Significance
NSW	New South Wales
OEH	New South Wales Office of Environment and Heritage
SEARs	Secretary's Environmental Assessment Requirements
TEC	Threatened Ecological Community
TSC Act	New South Wales *Threatened Species Conservation Act 1995*

1.0 INTRODUCTION

1.1 BACKGROUND

Quarry Solutions Pty Ltd has commissioned the preparation of a development application for an Extractive Industry at Seelems Road (via Petersons Quarry Road), Coraki in New South Wales on land properly described as Lot 401 on DP633427, Lot 402 on DP802985, Lot 403 on DP802985, Lot 408 on DP1166287, Lot A on DP397946, Lot A on DP389418, Lot 3 on DP701197, Lot 2 on DP954593, Lot 1 on DP954592 and Lot 1 on DP310757. A Site Map and Location Map are provided as **Figures 1-1 and 1-2**, respectively.

As the project is considered a State Significant Development, the proponent must prepare an Environmental Impact Statement (EIS) as part of an application under the NSW *Environmental Planning and Assessment Act 1979*. Before preparing an EIS, proponents must also apply to the Secretary of the Department of Planning and Environment for the Secretary's Environmental Assessment Requirements (SEARs), which set out matters to be addressed in the EIS.

Under the NSW Biodiversity Offsets Policy for Major Projects, the SEARs typically require a proponent to apply the Framework for Biodiversity Assessment (FBA) to assess impacts on biodiversity. Stages 1 and 2 of the FBA require the preparation of a Biodiversity Assessment Report (BAR) describing the biodiversity values present on the development site and the impact of the project on these values. A Biodiversity Offset Strategy is then prepared that outlines how the proponent intends to offset the impacts of the project.

The SEARs received for the project identified biodiversity as one of the key issues to be addressed, having regard to the requirements of the NSW Office of Environment and Heritage (OEH) and Primary Industries NSW (DPI) specified in the SEARs. In particular, OEH's requirements included addressing and documenting biodiversity impacts in accordance with the FBA, unless otherwise agreed by OEH.

A preliminary assessment of ecological values on the site, including a brief desktop review and field investigation, was completed by BAAM on 22 April 2015, prior to the release of the SEARs (refer **Appendix 1**). The primary issues derived from the desktop review were the potential presence of Hairy-joint Grass (*Arthraxon hispidus*), currently listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), within the area of the proposed development footprint, including/particularly within cleared areas, and the Lowland Rainforests of Subtropical Australia Threatened Ecological Community (Critically Endangered – EPBC Act) in association with drainage lines on the study area. The preliminary site investigation revealed neither of these occurs within the area of the proposed development footprint, and the site is largely devoid of native vegetation and had been used for grazing livestock, particularly within the area nominated for the main quarry pit. However, it was considered prudent for quarry designs to establish sufficient buffers to nearby wetlands and native vegetation, pending the results of further investigations.

It was concluded the site of the area of the proposed development footprint was unlikely to hold any notable value for flora or fauna species of significance and, therefore, a requirement for biodiversity offsets under the BioBanking process was also unlikely. Consequently, following a review of the results of the preliminary assessment, correspondence received from OEH confirmed that, due to the degraded state of the site, OEH would not require the FBA to be used to assess the biodiversity values and associated impacts, subject to the results of further investigations (**Appendix 2**).

Correspondence received from DPI also confirmed that, given the location of the site in the landscape and the fact that no dredging, works within a waterway, impacts or damage to marine vegetation, placement of spoil in waterways, activities that block fish passage or impacts to fishing and aquaculture were anticipated, there are no fisheries issues and no aspects of the works trigger the need for any approvals under the NSW *Fisheries Management Act 1994*, provided the nearby wetland was not impacted by the proposal (**Appendix 2**).

The SEARs also state it should be established whether the project requires a separate approval under the EPBC Act, while Richmond Valley Council also identified biodiversity values of local significance requiring assessment as part of the SEARs.

153°15'E 153°15'30"E 153°16'E 153°16'30"E

28°58'30"S

28°59'S

153°15'E 153°15'30"E 153°16'E 153°16'30"E

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

0 50 100 200 300 400
Meters

LEGEND

- Site Boundary
- Inner assessment circle (200 Ha)
- Ground-truthed native vegetation communities
- Other ground-truthed vegetation
- Ground-truthed local wetlands
- 20m Buffer around wetlands
- Protected Macadamia trees and 25m buffer area
- Indigenous heritage non-disturbance zone
- Previously recorded Black-Necked Stork nest
- Wedge-tailed Eagle nest
- Mitchell Landscapes v3

Development site footprint

- Development site footprint
- Processing plant area
- Stormwater detention basin
- Traffic on road
- Traffic off road
- Stockpile area
- Extraction area
- Cadastre

1:8,075 at A3

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
False Easting: 500,000.0000
False Northing: 10,000,000.0000
Central Meridian: 153.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Drawn By: MG Reviewed by: AC Date: 31/08/2015

Figure: 1.1
Title: Site Map
Project: Biodiversity Assessment Report - Coraki Quarry, Seelems Road, Coraki
Client: Groundwork Plus on behalf of Quarry Solutions Pty Ltd

BAAM ECOLOGICAL CONSULTANTS

153°15'E 153°16'E 153°17'E

28°57'S 28°58'S 28°59'S 29°0'S

South East Queensland (Region)
Clarence Lowlands (sub region)
(IBRA7 subregions NSW)

Richmond River
Seelems Creek
Kennedys Swamp
Coraki

Wet Heath
Paperbark
Sub-Tropical & Warm Temperate Rainforest

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
False Easting: 500,000.0000
False Northing: 10,000,000.0000
Central Meridian: 153.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

1:22,000 at A3
0 0.1 0.2 0.4 0.6 0.8 Kilometers

LEGEND

- Site Boundary
- Outer assessment circle (2000 Ha)
- Inner assessment circle (200 Ha)
- Indigenous heritage non-disturbance zone
- Protected Macadamia trees and 25m buffer area

NSW Wetlands 2006

- Estuarine Wetland
- Floodplain Wetland

Northern Rivers CMA VISmap 524

- Paperbark
- River Oak
- Sub-Tropical & Warm Temperate Rainforest
- Wet Heath

- Ground-truthed native vegetation communities
- Ground-truthed local wetlands
- 20m Buffer around wetlands
- Previously recorded Black-Necked Stork nest
- Wedge-tailed Eagle nest

Development site footprint

- Development site footprint
- Processing plant area
- Stormwater detention basin
- Extraction area
- Stockpile area
- Traffic off road
- Traffic on road

Figure: 1-2
Title: Site and Surrounding Area
Project: Biodiversity Assessment Report - Coraki Quarry, Seelems Road, Coraki
Client: Groundwork Plus on behalf of Quarry Solutions Pty Ltd

BAAM ECOLOGICAL CONSULTANTS

Drawn By: MG Reviewed by: AC Date: 31/08/2015

Document Location: D:\GIS\Jobs\0049-074 Coraki Quarry\GIS\MXDs\ReportMaps\Figure 1-2 Site map smaller scaleA3 Portrait.mxdDate: 31/08/2015 11:59:48 AM

1.2 PURPOSE AND FORMAT OF THIS REPORT

Biodiversity Assessment and Management Pty Ltd (BAAM) has prepared this report for Groundwork Plus on behalf of Quarry Solutions Pty Ltd to document an assessment of the biodiversity values in and around the proposed development footprint (the "study area") to inform decision making regarding the avoidance and mitigation of impacts of the project on significant biodiversity values.

Although OEH has confirmed the FBA does not need to be used to assess the biodiversity values of the study area and impacts of the project (subject to the results of further investigations), this report follows the methods and reporting format outlined in the FBA where possible and appropriate to ensure sufficient information is available to regulating authorities. Accordingly, the following is provided:

- A description of the methodology used for the assessment, including desktop and field-based research.
- A description and mapping of existing biodiversity values present on the site and in the surrounding area, including landscape features, native vegetation and threatened species.
- A description of matters of national environmental significance (MNES) known or predicted to occur on the site.
- A description of biodiversity values recognised under local statutes.
- A discussion of potential impacts to the identified values and recommendations for their avoidance or mitigation, as required.
- Confirmation of whether any further assessment is required to meet the requirements for the EIS.

2.0 METHODOLOGY

The biodiversity values of the study area were assessed through a desktop review of available information together with a field survey conducted by two ecologists over one day.

2.1 DESKTOP REVIEW

The desktop review involved an inspection of publicly available databases and mapping, and other information, including:

- The Commonwealth Department of the Environment (DoE) EPBC Online Protected Matters Search Tool (10 km x 10 km search area centred on the site);
- The NSW BioNet Atlas of NSW Wildlife and associated species profiles (10 km x 10 km search area centred in the site);
- Publically available spatial data for the mapping of IBRA Bioregions, Mitchell Landscapes, wetlands and waterways, and native vegetation.
- Richmond Valley Council environmental planning layers and Koala (*Phascolarctos cinereus*) habitat mapping; and
- Aerial photography and background information on the project and the results of previous studies undertaken in support of proposed extensions to the adjacent Peterson's Quarry, as provided by the Proponent or otherwise publically available.

2.2 FIELD SURVEY

The field survey was conducted on 2 July 2015 by Adrian Caneris (Principal Wildlife Expert) and David Fell (Principal Botanist), following a preliminary site investigation undertaken by Dr Lindsay Popple (Senior Ecologist) on 22 April 2015 (**Appendix 1**). Data from the Bureau of Meteorology indicates conditions were mild (maximum of 24^0C) with minimal rainfall (2.2mm) during the preliminary site investigation, with moderate rainfall during the preceding month (138mm). Conditions during the survey on 2 July were cool-mild (maximum of 20^0C) and dry, with limited rainfall during the preceding month (37mm). All survey work was performed in accordance with BAAM's NSW Scientific Licence (SL100704) and Certificate of Accreditation as an Animal Research Establishment.

The survey primarily involved the assessment of all native vegetation, habitats and other landscape features on and adjacent to the proposed site development footprint (subject to access) for informing subsequent mapping and value assessments, and determining the need for any further assessment for threatened species. The field work focused on assessing vegetation and habitats within and directly adjacent to Lot 401 on DP633427, given proposed development within the other Lots included in the application are restricted to

previously disturbed areas associated with Petersons Quarry.

The flora survey generally followed the methods outlined in the FBA, and included plot and transect surveys for the assessment of native vegetation. Targeted searches for threatened flora species were also undertaken across the site throughout the survey period. The location of survey locations is shown on **Figure 3-1**.

Given the small size of the site, all vegetation communities, habitats and detectable flora species were able to be assessed and accounted for during the survey. As the time of year for the survey (winter) is outside the most suitable time for detecting many of the threatened fauna species potentially occurring in the vicinity of the site, the fauna survey component focused on the availability and quality of habitats present, combined with active searching for fauna signs (e.g. Koala scratches and scats) and opportunistic species records.

The locations of any significant values were recorded by GPS for subsequent mapping purposes.

While it is acknowledged that the time of year and conditions during which the primary survey was undertaken (i.e. winter, with limited rainfall) may fall outside the ideal time of the year to survey for one or more target species, the likelihood of their occurrence is able to be assessed through integration of the following sources of information:

- Review of the published literature pertaining to the known distributions, habitat requirements and detectability of the species; and
- Onsite habitat assessment results and professional experience.

The likelihood of occurrence assessment used the following four categories to determine the probability of conservation significant flora and fauna species occurring in the habitats available within the study area:

- **Known to occur**: the species was detected during field assessment, or is known from past surveys in the study area and is not now considered locally extinct.
- **Likely to occur**: a medium-high probability the species occurs in or regularly visits the study area because suitable habitat occurs, the study area is within the known distribution of the species, there are past records of the species in the vicinity of the study area, and the species is not considered locally extinct.
- **Potential to occur**: either: (a) there are no past records of the species in the vicinity of the study area but suitable habitat occurs and there is insufficient information on the distribution of the species (e.g. it is naturally rare and/or difficult to detect) to categorise the species as likely or unlikely to occur; or (b) there are past records of the species in the vicinity of the study area but habitat in the study area is marginal or spatially limited meaning that the species' presence on the study area would be transitory at best.
- **Unlikely to occur**: a very low probability that the species occurs in the study area because: (a) suitable habitat does not occur; or (b) the study area is outside the known distribution of the species; or (c) the species is considered locally extinct; or (d) there are no records of the species in the local region despite adequate survey effort; or (e) suitable habitat occurs, the study area is within the known distribution of the species and there are past records of the species in the vicinity of the study area but the species has not been observed despite sufficient spatial and temporal survey effort for detecting the species.Based on the above, where the likelihood of a species' occurrence is inconclusive, the species is typically assessed as having potential to occur and is subsequently considered in the assessment of potential impacts. This includes species for which the time of year the survey is undertaken is generally not suitable for detection.

2.3 DATA ANALYSIS AND REPORTING

Analysis of data obtained from the desktop review and field survey followed the methods outlined in the FBA, subject to the availability of associated resources. For example, as no member of the study team is currently an accredited BioBanking Assessor, access could not be gained to the BioBanking Credit Calculator for the purposes of the threatened species assessment. Instead, publically available information was used to supplement information gained from the field survey and the existing knowledge of the study team for

the purposes of assessing the occurrence of biodiversity values and potential impacts from the project.

3.0 EXISTING ENVIRONMENT

3.1 LANDSCAPE FEATURES

Landscape features of the site and surrounds are shown on **Figures 1-1 and 1-2**. Given the small size of the development site, the assessment has adopted an inner assessment circle of 100 ha and an outer assessment circle of 1,000 ha.

3.1.1 IBRA Bioregion and Subregion

The study area occurs entirely within the Clarence Lowlands subregion of the South Eastern Queensland - Clarence Lowlands Bioregion (DoE 2015).

3.1.2 NSW Landscape Regions

The study area includes the following Mitchell Landscapes, as shown on **Figures 1-1 and 1-2** (OEH 2015a):

- Lamington Volcanic Slopes.
- Grafton-Whiporie Basin.
- Clarence-Richmond Alluvial Plains.

3.1.3 Waterways and Wetlands

Seelems Creek meanders across the western portion of the study area as a series of ox-bow wetlands, none of which are recognised as "important" wetlands. Information provided by Groundwork Plus indicates the nearest SEPP 14 coastal wetland is approximately 9 km to the east of the study area.

The wetlands in the study area would be considered local wetlands, with an applicable riparian corridor width of 20 m (**Figure 1-1**). Wetlands known as Kennedy's Swamp occur to the east and north-east of the study area (**Figure 1-2**) (OEH 2015b).

3.1.4 Native Vegetation Extent

The extent of native vegetation recorded during the field survey is shown on **Figure 1-1**, while the extent of currently mapped native vegetation in the broader region (based on OEH [2015c]) is shown on **Figure 1-2**.

Native vegetation recorded during the field survey was generally restricted to the western portions of Lot 401 on DP633427 and Lot 403 on DP802985, and along the boundary of Lots 402 and Lot 403 on DP802985, as well as to the north-east of the study area (**Figure 1-1)**. Further details on this ground-truthed vegetation are provided in **Section 3.2**.

Native vegetation currently recognised in the broader area includes that described as "wet heath" in patches to the north-west, north-east, east and south-west of the study area, while a patch of "paperbark" is mapped to the south (**Figure 1-2**).

3.1.5 Biodiversity Links

No state or regionally significant biodiversity links are recognised as occurring within the study area.

Vegetation associated with Seelems Creek may act as a local biodiversity link.

3.1.6 Other Landscape Features

Information provided by Groundwork Plus indicates a Black-necked Stork (*Ephippiorhynchus asiaticus*) once nested in a Hoop Pine located within the centre of the vegetation community occurring along the boundary of Lots 402 and Lot 403 on DP802985 (refer **Figure 1-1**). The results of an assessment of this previously identified landscape feature based on the current field survey are discussed in **Section 3.5.3**.

The July 2015 survey recorded an active Wedge-tailed Eagle (*Aquila audax*) nest in the north-eastern part of the site (**Photo 1**, **Figure 1-1**).

3.1.7 Landscape Value

No recognised native vegetation types or associated biodiversity links are proposed to be directly impacted by the project (refer to **Section 4.0**). As such, an assessment of current and future landscape values for the purposes of determining a change in landscape value is not considered necessary.

Photo 1: Wedge-tailed Eagle nest recorded during the July 2015 survey

3.2 NATIVE VEGETATION

Native vegetation types confirmed on the site during the field investigation are shown on **Figure 3-1**, along with areas identified as being dominated by exotic vegetation and/or cleared paddocks. The ground-truthed extent was found to match that shown in aerial imagery for the site, which confirms that the proposed development footprint is largely devoid of native vegetation and has been used for grazing livestock (**Photos 2** and **8-9**) and existing quarrying operations.

Photo 2: General view of proposed development footprint within Lot 1 on DP633427

Native vegetation communities recorded during the survey are described in the following sections. Vegetation survey data are provided in **Appendix 3**.

3.2.1 Native Vegetation Types and Ecological Communities

The field survey identified four native vegetation types within or in close proximity to the study area, all of which are recognised as Endangered Ecological Communities (EECs):

- NR179: Hoop Pine - Yellow Tulipwood dry rainforest of the North Coast – a component of the "Dry Rainforests" vegetation class and "Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions" EEC (survey site CQ13 on **Figure 3-1**).
- NR161: Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast – a component of the "Coastal Valley Grassy Woodlands" vegetation class and "Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion" EEC (survey site CQ2).
- NR217: Paperbark swamp forest of the coastal lowlands of the North Coast – a component of the "Coastal Swamp Forests" vegetation class and "Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions" EEC (survey sites CQ9 and CQ11).
- NR150: Coastal freshwater meadows and forblands of lagoons and wetlands – a component of the "Coastal Freshwater Lagoons" vegetation class and "Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions" EEC (survey site CQ8).

As shown on **Figure 3-1**, these native vegetation communities all occur outside of the proposed development footprint.

153°16'E

28°58'S

South East Queensland (Region)
Clarence Lowlands (sub region)
(IBRA7 subregions NSW)

2 x Ficus obliqua,
1 x Hoop pine,
3 x Macadamia tetraphylla

Cupaniopsis parvifolia

Ficus obliqua

Hoop pine

Hoop pine

Silky oak

Brush box

CQ1

CQ2

CQ3

CQ4

CQ5

CQ6

CQ7

CQ8

CQ9

CQ10

CQ11

CQ12

CQ13

Eucalyptus teretecornis

Flindersia australis

Angophora floribunda

Camphor laurel

Flindersia australis

Seelems Creek

planted screen either side of road

28°59'S

153°16'E

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
False Easting: 500,000.0000
False Northing: 10,000,000.0000
Central Meridian: 153.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

1:6,700 at A3
0 0.035 0.07 0.14 0.21 0.28
Kilometers

LEGEND

- Site Boundary
- Survey Locations
- Inner assessment circle (200 Ha)
- Indigenous heritage non-disturbance zone
- Previously recorded Black-Necked Stork nest
- Protected Macadamia trees and 25m buffer area

Ground-truthed Vegetation:

- Coastal freshwater meadows and forblands of lagoons and wetlands (Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions EEC)
- Heavily disturbed vegetation dominated by exotics
- Hoop Pine - Yellow Tulipwood dry rainforest of the North Coast (Lowland Rainforest in the NSW North Coast and Sydney Basins Bioregions EEC)
- Paperbark swamp forest of the coastal lowlands of the North Coast (Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions EEC)
- Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast (Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion EEC)
- *Eucalyptus tereticornis* woodland on basalt slopes (not formally assessed)

Development site footprint

- Development site footprint
- Processing plant area
- Stormwater detention basin
- Extraction area
- Stockpile area
- Traffic off road
- Traffic on road

Drawn By: MG Reviewed by: AC Date: 31/08/2015

Document Location: D:\GIS\Jobs\0049-074 Coraki Quarry\GIS\MXDs\ReportMaps\Figure 3-1 Ground-truthed vegetation mapping v2.mxdDate: 31/08/2015 12:04:09 PM

Figure:	**3-1**
Title:	Ground-truthed Vegetation Mapping
Project:	Biodiversity Assessment Report - Coraki Quarry, Seelems Road, Coraki
Client:	Groundwork Plus on behalf of Quarry Solutions Pty Ltd

BAAM ECOLOGICAL CONSULTANTS

		
Photo 3. Lantana dominated regrowth on steep basalt slopes.	**Photo 4**. Heavy infestation of Climbing Asparagus Fern and Lantana dominating regrowth on steep basalt slopes.	**Photo 5**. Regrowth shrubland with Camphor Laurel, Climbing Asparagus Fern and Lantana on steep basalt slopes.
		
Photo 6. Site CQ2. Open forest of Forest Red Gum, *Melaleuca styphelioides,* with *Pentaceras australis, Araucaria cunninghamii, Alphitonia excelsa, Mallotus phillipensis* and *Casuarina glauca.* Alluvial plain and margins on adjoining property. Representative of Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion EEC.	**Photo 7.** View of Site CQ2 from western margin of alluvial plain and basalt foot slope. Swamp foxtail grasslands on margins represent potential habitat of Hairy-joint Grass. Targeted searches did not locate the species.	**Photo 8**. Site CQ3. Typical exotic dominated grassland of *Cynodon dactylon, Pennisetum clandestina, Senecio madagascarensis, Gomphocarpus physocarpus, Thesium vulgare,* and *Solanum mauritianum.*

		
Photo 9. Site CQ4. Grazed and disturbed spring seepage zone on basalt slope provides potential habitat for Hairy-joint Grass. Targeted searches did not record the species.	**Photo 10**. Dense thickets of Mysore Thorn (*Caesalpinea decapatala*).	**Photo 11**. Site CQ8. Degraded margins of freshwater wetland with *Persicaria strigosa, Leersia hexandra* and *Digitaria didactyla*. Margins provides potential habitat for Hairy-joint Grass, although targeted searches did not record the species. Representative of Freshwater Wetland on Coastal Floodplain EEC.
		
Photo 12. Degraded margins of freshwater wetland with senescent Melaleuca and infestation of Water Hyancinth. Representative of Freshwater Wetland on Coastal Floodplain EEC.	**Photo 13**. Degraded margins of freshwater wetland with scattered *Melaleuca quinquenervia.*	**Photo 14**. Open forest of Forest Red Gum, *Melaleuca quinquinervia, M. styphelioides, Callistemon salignus, Casuarina glauca* on alluvial floodplain adjoining to the east.

		
Photo 15. Eastern margin of open forest of Forest Red Gum*, Melaleuca quinquinervia, M. styphelioides, Callistemon salignus, Casuarina glauca* on alluvial floodplain.	**Photo 16**. Closed regrowth forest of Camphor Laurel* (dominant*),* with *Dysoxylum fraseranum, Mallotus phillipensis, Flindersia australis,* and *Cryptocarya triplinervis* on steep basalt slopes.	**Photo 17**. Site CQ13. Depauperate dry rainforest of Hoop Pine (*Araucaria cunninghamii*) with Camphor Laurel* on steep basalt slopes. Representative of Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions EEC.

3.2.2 Native Vegetation Condition

The native wetland community associated with Seelems Creek in the western portion of the study area was found to be heavily disturbed by cattle grazing and infested by Water Hyancinth (*Eichornia crassipes*) (**Photos 11-13**), with drainage impeded by a rocky stock crossing. Patches of the adjoining swamp forest were also found to be heavily disturbed by grazing, with numerous weed species in the mid-lower strata and ground layer.

The Hoop Pine dry rainforest community (**Photo 17**) is infested with exotic species on the margins, with Camphor Laurel (*Cinnamomum camphora*), privets (*Ligustrum* spp.), White Passion Flower (*Passiflora subpeltata*), Coral Berry (*Rivina humilis*) and Climbing Asparagus Fern (*Asparagus africanus*), and is relatively low in native species richness compared to other communities that are representative of the Lowland Rainforest EEC.

The paperbark swamp forest and Forest Red Gum open forest (**Photos 6-7** and **14-15**) to the north-east of the study area are subject to grazing, although retain a high proportion of native species and a number of valuable habitat trees.

Other native vegetation recorded onsite occurs as scattered paddock trees, planted amenity screens alongside access tracks, or as minor components within otherwise heavily disturbed and exotic-dominated patches of regrowth (**Figure 3-1, Appendix 3**). Camphor Laurel and Lantana (*Lantana camara*) are dominant features of the latter (**Photos 3-5** and **16**).

Appendix 4 provides the results of vegetation condition (site value) score calculations for each of the four identified native vegetation types, from applying the site attribute measurements recorded during the field survey (**Appendix 3**) and relevant benchmark data from the Vegetation Benchmarks Database to the site value formula specified in the FBA. The scores indicate that, despite current impacts from grazing and weed invasion, the Hoop Pine dry rainforest, paperbark swamp forest and Forest Red Gum open forest communities are currently in moderate condition (scoring between 50-65), while the wetland community is in relatively good condition (scoring 87.5).

3.3 THREATENED SPECIES

3.3.1 Threatened Flora

A search of the NSW BioNet Atlas of NSW Wildlife (10 km x 10 km search area centred in the site) returned a total of five flora species listed as threatened under the NSW *Threatened Species Conservation Act 1995* (TSC Act), including three species listed as Endangered and two species listed as Vulnerable (**Appendix 5**). Four of these species are also currently listed as threatened under the EPBC Act (two Endangered, two Vulnerable).

The Commonwealth EPBC Online Protected Matters Search Tool (10 km x 10 km search area centred on the site) returned an additional eight threatened flora species, including three listed as Endangered and five species listed as Vulnerable (**Appendix 5**). All of these species are also currently listed as threatened under the TSC Act (three Endangered, five Vulnerable).

Table 3.1 presents an assessment of potential occurrence of threatened flora species from the database searches, based on a review of species profiles and the habitat types present on the study area. Some of these species are assessed as having the potential to occur, including within disturbed habitats on basalt hills and on adjoining properties. However, none were detected despite targeted searching within all habitat types (including comprehensive searches within the proposed development footprint), and despite the majority of species being detectable throughout the year. Hence the potential for significant impacts on these species is considered low. The same applies to Hairy-joint Grass *Arthraxon hispidus*, which may not have been detectable during the 2 July (winter) survey, but was specifically targeted during the 22 April (autumn) survey during appropriate conditions.

Furthermore, the current extent of impacts from grazing and weed invasion throughout the native habitats within the study area is such that some species are considered unlikely to occur regardless of search effort. This includes all remaining target species that may not have been detectable during either survey.

Table 3.1. Potential occurrence within the study area of threatened flora species identified from database searches.

Species	Common Name	EPBC	TSC	Important Habitat Requirements[1]	Potential Occurrence within Habitat Types Present on the Study Area						Concluding Comments based on Field Survey
					Dry Rainforest	Forest Red Gum Open Forest on Floodplain	Melaleuca Swamp Forest	Freshwater Wetland	Disturbed Rainforest Patches	Paddock	
NSW BioNet Atlas records											
Desmodium acanthocladum	Thorny Pea	V	V,P	Rainforest or riparian areas.	Potential	n/a	n/a	n/a	Potential	n/a	Potential to occur, including within the disturbed habitat on basalt hills and on adjoining properties, although not detected despite targeted searching and the species being detectable all year. Information provided by Groundwork Plus indicates the closest known records are approximately 2 km to the east of the study area on the banks of the Richmond River.
Myrsine richmondensis	Ripple-leaf Muttonwood	E	E,P	Subtropical, dry rainforest and swamp forest.	Potential	n/a	Potential	n/a	Potential	n/a	Potential to occur, including within the disturbed habitat on basalt hills and on adjoining properties, although not detected despite targeted searching and the species being detectable all year.
Gossia fragrantissima	Sweet Myrtle	E	E,P	Rainforest or isolated remnants in cleared or regrowth areas.	Potential	n/a	n/a	n/a	Potential	n/a	Potential to occur, including within the disturbed habitat on basalt hills and on adjoining properties, although not detected despite targeted searching and the species being detectable all year.
Melaleuca irbyana	Weeping Paperbark		E,P	Open eucalypt forest on poorly drained soils.	n/a	Potential	n/a	n/a	n/a	n/a	Does not occur. Not detected despite targeted searching and the species being easily detectable all year.
Syzygium hodgkinsoniae	Red Lilly Pilly	V	V,P	Riverine and subtropical rainforest, or remnant and regrowth rainforest.	Potential	n/a	n/a	n/a	Potential	n/a	Potential to occur, although not detected despite targeted searching and the species being detectable all year.
Additional Protected Matters Search Tool results											
Allocasuarina defungens	Dwarf Heath Casuarina	E	E	Dry sclerophyll forests, wetlands and heathlands.	n/a	Potential	Potential	Potential	n/a	n/a	Unlikely to occur. No confirmed records in the vicinity and not detected despite targeted searching and the species being detectable all year.
Arthraxon hispidus	Hairy-joint Grass	V	V	Moist sites on edges of rainforest or in wet eucalypt forest.	Potential	n/a	n/a	n/a	Potential	Potential	Potential to occur. No confirmed records in the vicinity and not detected despite thorough, targeted searching of potential habitat on seepage zones on hillslopes and along wetland margins.
Bulbophyllum globuliforme	Hoop Pine Orchid	V	V	Epiphytic on Hoop Pines, usually on upper trunk and branches.	Potential	n/a	n/a	n/a	n/a	n/a	Unlikely to occur. No confirmed records in the vicinity and not detected despite targeted searching of potential habitat in Hoop Pine dry rainforest.
Clematis fawcettii	Stream Clematis	V	V	Dry or subtropical rainforest or regrowth rainforest.	Potential	n/a	n/a	n/a	Potential	n/a	Unlikely to occur. No confirmed records in the vicinity and not detected despite targeted searching and the species being detectable all year.
Cryptocarya foetida	Stinking Cryptocarya, Stinking Laurel	V	V	Littoral and subtropical rainforests and wet sclerophyll forests.	Potential	n/a	n/a	n/a	n/a	n/a	Potential to occur, although no confirmed records in the vicinity and not detected despite targeted searching and the species being detectable all year.
Ochrosia moorei	Southern Ochrosia	E	E	Riverine and subtropical rainforest.	Potential	n/a	n/a	n/a	n/a	n/a	Unlikely to occur. No confirmed records in the vicinity and not detected despite targeted searching and the species being detectable all year. Degraded nature of rainforest habitats present generally unsuitable.
Phaius australis	Lesser Swamp-orchid	E	E	Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas.	Potential	Potential	Potential	n/a	n/a	n/a	Unlikely to occur. No confirmed records in the vicinity and the degraded nature of habitats present being generally unsuitable.
Thesium australe	Austral Toadflax, Toadflax	V	V	Grassland, grassy open forest or woodland on fertile or moderately fertile soils and coastal headlands, often in association with Kangaroo Grass.	n/a	Potential	n/a	n/a	n/a	Potential	Unlikely to occur. No confirmed records in the vicinity and no Kangaroo grass habitat present.

Abbreviations: EPBC = status under the EPBC Act; **TSC** = status under the TSC Act; E = Endangered; P = Protected; V = Vulnerable.

Important habitat requirements sourced from OEH online threatened species profiles (OEH 2015d).

Four specimens of a threatened species not returned by the database searches were recorded during the field survey, namely *Macadamia tetraphylla* (Rough-shelled Bush Nut) (**Photos 18-20**), currently listed as Vulnerable under both the TSC Act and EPBC Act. The specimens occur together within the centre of Lot 401 on DP633427, adjacent to a clump of other scattered, paddock trees (**Photos 21-23**) and outside of any of the recognised native vegetation zones on the study area, as shown on **Figure 3-1**. The geographic coordinates and a description of each specimen are provided in **Table 3.2**. These plants are either relicts of a dry rainforest or forested wetland community that once occupied that part of the site, or they have propagated from seeds dispersed from nearby communities.

Recognised threats to *Macadamia tetraphylla* that are currently present on the site include invasion of habitat by weeds, and grazing and trampling (of seedlings) by domestic stock (OEH 2015d). Recognised activities to assist this species focus on the protection and expansion of rainforests and other native habitats (OEH 2015d).

A list of all other flora species recorded during the survey is provided in **Appendix 6**.

Table 3.2. Location and description of *Macadamia tetraphylla* specimens found on the site

Easting	Northing	Description
525230	6794990	Small tree (5 m) in good condition (**Photo 18**). Single trunk to 1.5m then branched. Coppice shoots below. On upper slope / crest of basalt hillslopes and plateau with 5 degrees slope. Occurs on margin of three large paddock trees (*Ficus obliqua* x 2 and *Araucaria cunninghamii* x1). Degraded habitat with grazed groundcover of Kikuyu (*Pennisetum clandestinum*), Tobacco Bush (*Solanum mauritianum*), Fireweed (*Senecio madagascarensis*), Balloon Cotton Bush (*Gomphocarpus physocarpus*) and Lantana.
525219	6794990	Small tree (1.5 m) in poor condition (**Photo 19**). Single stem with dry rot and damaged by stock. Coppice suckers from rootstock. Habitat as for specimen 1.
525222	6794989	Sapling (1 m) in poor condition (**Photo 20**). Single stem. Occurs within patch of lantana in close proximity to specimens 1, 2 and 4.
525222	6794989	Sapling (0.5 m) in poor condition. Multi stemmed. Occurs within patch of lantana in close proximity to specimens 1, 2 and 3.

3.3.2 Threatened Fauna

A search of the NSW BioNet Atlas of NSW Wildlife (10 km x 10 km search area centred in the site) returned a total of 11 fauna species listed as threatened under the TSC Act, including one species listed as Endangered and 10 species listed as Vulnerable (**Appendix 5**). Two of these species are also currently listed as Vulnerable under the EPBC Act.

The Commonwealth EPBC Online Protected Matters Search Tool (10 km x 10 km search area centred in the site) returned an additional 33 fauna species listed as threatened under the EPBC Act, including 14 species listed as Endangered and 19 species listed as Vulnerable (**Appendix 5**). This includes a number of marine species for which the site and proposed activities should not be viewed as relevant, including 11 species of albatross, two species of giant-petrel, one species of marine fish and five species of marine turtle. These 19 species are not considered further in this report.

Forest Red Gums (*Eucalyptus tereticornis*) within the open forest habitat to the north-east of the study area showed scratches consistent with those of Koala (Vulnerable: TSC Act and EPBC Act) (**Photo 24**) (**Figure 3-1**). No evidence of Koala occurrence was found within the study area, despite targeted searches. Although it is possible Koalas may occasionally utilise food trees occurring within the open paddock and fringing the wetlands, these areas are of less value to the species than the habitats occurring off-site.

Photo 18. *Macadamia tetraphylla* at 525230 6794990.

Photo 19. *Macadamia tetraphylla* at 525219 6794990.

Photo 20. *Macadamia tetraphylla* at 525222 6794989.

Photo 21. Looking east to localtion of Macadamia plants (top left) and depauperate dry rainforest of Hoop Pine (far right)

Photo 22. Degraded habitat of *Macadamia tetraphylla* occurrence.

Photo 23. Cluster of *Ficus obliqua* and Hoop Pine trees. *Macadamia tetraphylla* plants occur in Lantana on the left hand margin.

Photo 24: Tree-trunk scratches consistent with Koala found within the open forest habitat to the north-east of the site.

An assessment of Koala habitat in the context of Commonwealth and local statutes is provided in **Sections 3.4.2 and 3.5.2**, respectively.

No other threatened fauna species identified in the database searches were recorded during the field survey, although it is acknowledged that the time of year during which the survey was undertaken (winter) is outside the suitable time for detecting some of these species. Nonetheless, coverage of the site during the survey was such that all potential habitats were able to be assessed in sufficient detail to enable an informed assessment of potential occupancy for all species.

Table 3.3 presents the assessment of potential occurrence of threatened fauna species identified in the database searches. This assessment is based on a review of species profiles and the assessment of habitats during the field survey. Several threatened fauna species have the potential to occur within the habitats present within the study area, at least as transient visitors during foraging, particularly birds and bats (**Table 3.3**). Information provided by Groundwork Plus indicates Black-necked Stork (Endangered: TSC) and Comb-crested Jacana (*Irediparra gallinacea*) (Vulnerable: TSC Act) are known to occur on the site from previous records, and the study area continues to provide suitable habitat for these species. In particular, the dry rainforest community on the boundary of Lots 402 and Lot 403 on DP802985 provides known breeding habitat for Black-necked Stork while the wetlands associated with Seelems Creek provide known habitat for both Black-necked Stork and Comb-crested Jacana, as well as potential habitat for a number of other species.

As noted in **Section 2.2**, species known, considered likely or considered to have the potential to occur are subsequently considered in the assessment of potential impacts. This includes species for which the time of year the survey is undertaken is generally not suitable for detection.

Even so, the degraded habitats present within the area of the proposed development footprint provide very limited habitat value for threatened fauna species. Hence the potential for significant impacts on these known, likely or potentially occurring species is considered low, and many species are considered unlikely to occur regardless of search effort. This includes all remaining target species that may not have been detectable during the survey.

A list of all other fauna species recorded during the survey is provided in **Appendix 7**.

Table 3.3. Potential occurrence within the study area of threatened fauna species identified in database searches.

Species	Common Name	EPBC	TSC	Important Habitat Requirements[1]	Potential Occurrence within Habitats Present on the Study Area							Comments
					Dry Rainforest	Forest Red Gum Open Forest on Floodplain	Melaleuca Swamp Forest	Freshwater Wetland	Disturbed Rainforest Patches	Scattered Paddock Trees	Grassed Paddock	
NSW BioNet Atlas records												
Anseranas semipalmata	Magpie Goose		V,P	**Foraging:** Open grasslands, pastures, shallow wetlands or crops, vegetated dams, mangroves or flood plains. **Breeding:** Emergent vegetation above water 60-100 cm deep.	n/a	Low potential as foraging habitat.	Low potential as foraging habitat.	Potential foraging habitat.	n/a	Low potential as foraging habitat.	Low potential as foraging habitat.	The freshwater wetlands in the study area provide suitable habitat for this species, while adjacent floodplains could also be used for foraging.
Ephippiorhynchus asiaticus	Black-necked Stork		E,P	**Foraging:** Shallow open freshwater or saline wetlands and watercourses, occasionally mud- and sand-flats, farm dams and drains. **Breeding:** Live or dead tree within or near foraging habitat. Usually isolated, live, paddock trees in NSW, but also in paperbarks and occasionally low shrubs within wetlands.	Former, known breeding habitat.	Potential breeding habitat.	Potential breeding habitat.	Potential foraging habitat.	Potential breeding habitat.	Potential breeding habitat.	n/a	This species was known to utilise the dry rainforest habitat in the study area for breeding in the past, and this habitat continues to provide potential breeding resources. However, no current or recent breeding activity was recorded during the field assessment.
Ixobrychus flavicollis	Black Bittern		V,P	**Foraging and breeding:** Wetland vegetation bordering water bodies or watercourses.	n/a	Low potential.	Low potential.	Potential to occur.	n/a	n/a	n/a	Potential to occur in wetland areas abutted by forested habitats or holding dense grasses. Domestic stock access would reduce any likelihood of the species occurring.
Pandion cristatus	Eastern Osprey		V,P	**Foraging:** Protected open water. **Breeding:** Emergent living or dead trees or artificial towers within 3 km of foraging habitat.	n/a	Low potential as breeding habitat.	n/a	Little to no value as foraging habitat.	n/a	Low potential as breeding habitat.	n/a	The habitats within the study area are of relatively low value for this species.
Irediparra gallinacea	Comb-crested Jacana		V,P	**Foraging and breeding:** Floating aquatic vegetation, or fringing vegetation, of permanent, slow-moving or still freshwater wetlands.	n/a	n/a	n/a	Known to occur.	n/a	n/a	n/a	Information provided by Groundwork Plus indicates this species is known to occur in wetland areas on the study area from previous records.
Turnix maculosus	Red-backed Button-quail		V,P	**Foraging and breeding:** Grassland, grassy understorey, crops or sedgeland.	n/a	Low potential.	n/a	Low potential.	n/a	n/a	Low potential.	The habitats within the study area are of relatively low value for this species. There is potential for the species to utilise the grassed paddocks once suitable cover was established.
Phascolarctos cinereus	Koala	V	V,P	**Foraging and breeding:** Wet and dry sclerophyll forests, woodlands and forested wetlands.	n/a	Known to occur.	Potential to occur.	n/a	n/a	Low potential.	n/a	Characteristic scratches were found within open forest habitat to the north-east of the site during the current survey. Suitable feed trees my also occur on the fringes of the wetlands and as scattered paddock trees.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V,P	**Foraging:** Most vegetation types. **Breeding:** Canopy trees associated with rainforest, or coastal scrub or riparian or estuarine communities and with sufficient forage resources available within 40km.	Low potential as foraging habitat.	Potential foraging habitat.	Potential foraging habitat.	n/a	Low potential as foraging habitat.	Potential foraging habitat.	n/a	This species may visit the forested habitats in response to seasonal flowering events.
Miniopterus australis	Little Bentwing-bat		V,P	**Foraging:** Most vegetation types. **Breeding:** Caves, often limestone.	Potential foraging habitat.	Potential foraging and roosting habitat.	Potential foraging habitat.	n/a	Potential foraging habitat.	Potential foraging and roosting habitat.	n/a	This species forages within most forested habitats, and the study area has the occasional large tree that may provide hollows for roosting.
Myotis macropus	Southern Myotis		V,P	**Foraging:** Waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20m. **Breeding:** Likely to be as per roosting habitat – i.e. close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	Low potential.	Potential foraging and roosting habitat.	Potential foraging and roosting habitat.	Potential foraging habitat.	Low potential.	Low potential.	n/a	Potential to occur in wetland areas abutted by forested habitats.
Scoteanax rueppellii	Greater Broad-nosed Bat		V,P	**Foraging:** Most forested vegetation types. **Breeding:** Likely to be as per roosting habitat – i.e. tree hollows.	Potential foraging habitat.	Potential foraging and roosting habitat.	Potential foraging habitat.	n/a	Potential foraging habitat.	Potential foraging and roosting habitat.	n/a	This species forages within most forested habitats, and the study area has the occasional large tree that may provide hollows for roosting.
Additional Protected Matters Search Tool results												
Anthochaera phrygia	Regent Honeyeater	E	CE	**Foraging and breeding:** Dry sclerophyll forests, woodlands and forested wetlands.	n/a	Low potential.	Low potential.	n/a	n/a	n/a	n/a	No confirmed records in the vicinity and the habitats within the study area are of relatively low value for this species. There is low potential for the species to visit during localised flowering.

Species	Common Name	EPBC	TSC	Important Habitat Requirements[1]	Potential Occurrence within Habitats Present on the Study Area							Comments
					Dry Rainforest	Forest Red Gum Open Forest on Floodplain	Melaleuca Swamp Forest	Freshwater Wetland	Disturbed Rainforest Patches	Scattered Paddock Trees	Grassed Paddock	
Botaurus poiciloptilus	Australasian Bittern	E	E	**Foraging:** Freshwater or brackish wetlands, tussocky wet paddocks or drains. **Breeding:** Emergent vegetation (e.g. Phragmites, Typha) in freshwater or brackish wetlands.	n/a	n/a	n/a	Potential to occur.	n/a	n/a	n/a	No confirmed records in the vicinity although some potential to occur within the thicker vegetated areas within the wetlands.
Cyclopsitta diophthalma coxeni	Coxen's Fig-Parrot	E	CE	**Foraging:** Figs or other fleshy-fruited trees in rainforest or wet sclerophyll forest or remnants. **Breeding:** Live or dead eucalypts close to rainforest or trees within rainforest close to foraging habitat.	Low potential.	Low potential.	n/a	n/a	Low potential.	Low potential.	n/a	No confirmed records in the vicinity although occasional food trees present.
Dasyornis brachypterus	Eastern Bristlebird	E	E	**Foraging:** Dense native tussock grasses >80% projected groundcover and >40cm tall; with sparse midstory in ecotone of open forest/rainforest or within open forest up to 1 km of rainforest. **Breeding:** Dense native tussock grasses in open grassy patches within open forest with dense native tussock grasses >80% projected groundcover and >40 cm tall, with sparse midstory, in ecotone of open forest/rainforest or within open forest up to 1 km of rainforest.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No confirmed records in the vicinity and the study area provides no suitable habitat for this species.
Erythrotriorchis radiatus	Red Goshawk	V	CE	**Foraging:** Open woodland and sclerophyll forest, subtropical rainforest, Melaleuca swamp forest, Araucaria vine forests and riparian habitats along or near watercourses or wetlands, preferring a mosaic of vegetation types. **Breeding:** Tall stand of trees within 1km of permanent water, often adjacent to rivers or clearings. Usually one of the tallest trees is selected for the nest location.	Low potential.	Low potential.	Low potential.	n/a	Low potential.	Low potential.	n/a	No confirmed records in the vicinity and the habitats within the study area are of relatively low value for this species. There is low potential for the species to visit and roost during hunting.
Lathamus discolor	Swift Parrot	E	E	**Foraging:** Dry sclerophyll forests, woodlands and forested wetlands. Breeds in Tasmania.	n/a	Low potential.	Low potential.	n/a	n/a	n/a	n/a	No confirmed records in the vicinity and the habitats within the study area are of relatively low value for this species. There is low potential for the species to visit during localised flowering.
Rostratula australis	Australian Painted Snipe	E	E	**Foraging and breeding:** Areas of tussock grass, lignum, reeds, sedges or rushes within 500 m of, and including, shallow wetlands or ephemeral or permanent waterbodies, or inundated grasslands/paddocks.	n/a	n/a	n/a	Potential to occur.	n/a	n/a	n/a	No confirmed records in the vicinity although some potential to occur within the thicker vegetated areas within the wetlands.
Turnix melanogaster	Black-breasted Button-quail	V	CE	**Foraging and breeding:** Predominantly drier low closed forests. In NSW, also wetter subtropical rainforest sometimes in association with moist eucalypt forest or dry rainforest associated with eucalypt forest.	Very low potential.	n/a	n/a	n/a	n/a	n/a	n/a	No confirmed records in the vicinity and the study area provides virtually no suitable habitat for this species.
Phyllodes imperialis smithersi	Pink Underwing Moth	E	E	**Foraging and breeding:** Rainforest where fruiting plants and the food plant *Carronia multisepalea* is present.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No confirmed records in the vicinity and no suitable habitat present within the study area.
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	V	V	**Foraging:** Dry sclerophyll forests and woodlands. **Breeding:** Roof domes in sandstone caves and overhangs (maternity and nursery roosts).	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No confirmed records in the vicinity and no suitable habitat present within the study area.
Dasyurus maculatus maculatus	Spot-tailed Quoll	E	V	**Foraging:** Most forested vegetation types. **Breeding:** Hollow-bearing trees, fallen logs, small caves, rock crevices, boulder piles, rocky-cliff faces or animal burrows.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No confirmed records in the vicinity and no suitable habitat present within the study area.
Potorous tridactylus tridactylus	Long-nosed Potoroo	V	V	**Foraging and breeding:** Rainforest or vegetation with dense understorey.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No confirmed records in the vicinity and the study area provides no suitable habitat for this species.
Pseudomys novaehollandiae	New Holland Mouse	V		**Foraging and breeding:** Dry sclerophyll forests, heathlands and forested wetlands.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No confirmed records in the vicinity and the study area provides no suitable habitat for this species.
Coeranoscincus reticulatus	Three-toed Snake-tooth Skink	V	V	**Foraging:** Earthworms and other soft-bodied invertebrates in loose soil, leaf litter, rotting logs, clumps of fallen epiphytes. **Breeding:** Littoral and subtropical rainforest, wet sclerophyll forest with well-developed rainforest understorey; many rotting logs and well developed leaf litter.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No confirmed records in the vicinity and the study area provides no suitable habitat for this species.

Abbreviations: EPBC = status under the EPBC Act; **TSC** = status under the TSC Act; CE = Critically Endangered; E = Endangered; P = Protected; V = Vulnerable.

Important habitat requirements sourced from OEH online threatened species profiles (OEH 2015d).

3.4 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

3.4.1 Threatened Ecological Communities

The Commonwealth EPBC Online Protected Matters Search Tool (10 km x 10 km search area centred in the site) identified one threatened ecological community (TEC) that may occur within the study area: 'Lowland Rainforest of Subtropical Australia' (Critically Endangered) (**Appendix 5**). The field survey found that one vegetation community potentially corresponding to this TEC occurs within the study area, that being the Hoop Pine - Yellow Tulipwood dry rainforest of the North Coast vegetation type occurring on the boundary of Lots 402 and Lot 403 on DP802985.

As noted in the listing advice for the Lowland Rainforest of Subtropical Australia TEC, the listing focuses on protecting patches of this community that are "most functional, relatively natural…", "…and in relatively good condition" (TSSC, 2011). Accordingly, condition thresholds have been developed to establish whether a patch of vegetation retains sufficient conservation values to be considered a TEC.

An assessment of vegetation data obtained for the patch of Hoop Pine dominated dry rainforest community recorded during the field survey (**Appendix 3**) against these condition thresholds confirms the community present onsite fails one of the mandatory criteria relating to the high species richness that characterises good examples of the TEC – that is, patches need to contain at least 30 of the native woody species listed in an appendix to the listing advice, whereas the patch present on the study area contains less than 30 of these species.

Accordingly, none of the vegetation on the study area is recognised as a TEC and a referral to the Commonwealth in relation to impacts on TECs is not considered necessary at this time.

3.4.2 Threatened species

The Commonwealth EPBC Online Protected Matters Search Tool and a search of the NSW BioNet Atlas of NSW Wildlife (10 km x 10 km search area centred in the site) (**Appendix 5**) indicate the potential presence of a number of EPBC Act listed threatened flora and fauna species for the study area.

Flora

None of the threatened flora species returned by the database searches were recorded during the field survey, despite targeted searching within all habitat types (including comprehensive searches within the proposed development footprint), and despite the majority of species being detectable throughout the year. Current impacts from grazing and weed invasion throughout the native habitats within the study area is also such that some of these species are considered unlikely to occur regardless of search effort or detectability. However, four specimens of a threatened species not returned by the database searches were recorded during the field survey: *Macadamia tetraphylla* (Rough-shelled Bush Nut). This species is currently listed as Vulnerable under both the TSC Act and EPBC Act.

The four recorded specimens occur together within the centre of Lot 401 on DP633427, adjacent to a clump of other scattered, paddock trees and outside of any of the recognised native vegetation zones on the study area, as shown on **Figure 3-1**. These specimens are either relicts of a dry rainforest or forested wetland community that once occupied that part of the site, or they have propagated from seeds dispersed from nearby communities.

Recognised threats to *Macadamia tetraphylla* that are currently present on the site include invasion of habitat by weeds and grazing and trampling (of seedlings) by domestic stock (OEH 2015d). Recognised activities to assist this species focus on the protection and expansion of rainforests and other native habitats (OEH 2015d).

An assessment of potential impacts on this species is provided in **Section 4.0**.

Fauna

None of the threatened fauna species returned by the database searches were recorded during the field survey, although it is acknowledged that the time of year during which the survey was undertaken (winter) is outside the suitable time for detecting many of these species. Nonetheless, coverage of the site during the survey was such that all potential habitats were able to be assessed in

sufficient detail to enable an informed assessment of potential occupancy for all species returned by the database searches.

Table 3.3 presents the assessment of potential occurrence of threatened fauna species returned by the database searches, based on a review of species profiles and the assessment of habitats undertaken during the field survey. This excludes a number of marine species for which the site and proposed activities should not be viewed as relevant (refer **Section 3.3.2**).

Forest Red Gums within the open forest habitat to the north-east of the site showed scratches consistent with those of Koala (Vulnerable: TSC Act and EPBC Act) and it is possible this species may also occasionally utilise food trees occurring within the open paddock and fringing the wetlands. The assessment of potential occurrence also indicates the study area provides potential habitat for Grey-headed Flying-fox (Vulnerable), Australasian Bittern (Vulnerable) and Painted Snipe (Vulnerable).

Koala

Known Koala habitat occurs in close proximity to the study area in the form of Forest Red Gum woodland, and Koalas may also visit eucalypts occurring as scattered paddock trees and on the wetland fringes. The results of a habitat assessment performed in accordance with the EPBC Act referral guidelines for Koala (DoE 2014) are summarised in **Table 3.4**. The total habitat score from this assessment is 4; as this total score is <5, the habitats onsite are not considered to represent critical habitat and the referral guidelines indicate a referral to the Commonwealth in relation to impacts on this species is not considered necessary at this time.

Grey-headed Flying-fox

Grey-headed Flying-fox may visit the forested habitats on site in response to seasonal flowering events. However, such foraging habitat is widespread in the local region, and this species travels widely to exploit seasonal flowering trees, so any loss of habitat within the study area will not have an adverse effect on the long-term survival of the species in the locality. Furthermore, no roosting camp occurs in the study area, so the proposed action is unlikely to have an adverse effect on the life cycle of the species. Accordingly, a referral to the Commonwealth in relation to impacts on this species is not considered necessary.

Australasian Bittern and Painted Snipe

It is possible that these species may occasionally utilise the thicker vegetated areas within the wetland habitats on the study area and adjacent properties. However, there are no confirmed records of either species in the vicinity and similar foraging habitat is widespread in the local region. Accordingly, a referral to the Commonwealth in relation to impacts on these species is not considered necessary at this time.

Other Threatened Species

There is also a low potential for Regent Honeyeater, Coxen's Fig-Parrot, Red Goshawk and Swift Parrot to visit the study area during foraging/hunting. However, there are no confirmed records of any of these species in the vicinity and the habitats present within the study area are not particularly valuable for these species, given their degraded condition, small patch size and isolation. Accordingly, a referral to the Commonwealth in relation to impacts on these species is not considered necessary at this time.

3.4.3 Non-threatened Migratory species

The Commonwealth EPBC Online Protected Matters Search Tool and the search of the NSW BioNet Atlas of NSW Wildlife (**Appendix 5**) indicate the potential for a number of species listed as migratory under the EPBC Act to occur in the study area.

Table 3.5 presents the assessment of potential occurrence of non-threatened migratory species returned by the database searches, based on a review of species profiles and the assessment of habitats undertaken during the field survey. This excludes a number of marine species for which the site and proposed activities should not be viewed as relevant, including species of albatross, giant-petrel, marine fish, marine turtle and marine mammals.

Table 3.4. Koala habitat assessment tool results summary.

Attribute	Score	Coastal area criteria	Score	Assessment details
Koala occurrence	+2 (high)	Evidence of one or more Koalas within the last 2 years	**2**	**Desktop:** • The Atlas of NSW Wildlife database search identified 90 Koala records within a 10 x 10 km search area centred on the study area; • The AKF Koala Map (AKF 2015) did not identify any Koala records within the local area (i.e. nearest record approximately 7 km away, north of Tuckurimba). **On-ground:** Forest Red Gums within the open forest habitat to the north-east of the site showed scratches consistent with those of Koala, and it is possible this species may also occasionally utilise food trees occurring within the open paddock and fringing the wetlands.
	+1 (medium)	Evidence of one or more Koalas within 2 km of the edge of the impact area within the last 5 years		
	0 (low)	None of the above		
Vegetation Composition*	+2 (high)	Has forest or woodland with 2 or more known Koala feed tree species in the canopy, OR 1 feed tree species that alone accounts for >50% of the vegetation in the relevant strata.	**1**	**On-ground:** On-ground surveys revealed the only recognised Koala food tree occurring on and near the site is Forest Red Gum (*Eucalyptus tereticornis*), occurring in swamp forest fringing the wetlands in the western portion of the site, and as the dominant canopy tree in open forest occurring to the north-east of the site.
	+1 (medium)	Has forest or woodland with only 1 known Koala feed tree species in the canopy.		
	0 (low)	None of the above		
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 500 ha, a contiguous landscape being an area that encompasses no barriers but is bounded by barriers, where a barrier is a feature (natural or artificial) that is likely to prevent the movement of koalas; natural barriers may include steep mountain ranges (cliffs), unsuitable habitats, major rivers / water bodies or treeless areas more than 2 km wide; artificial barriers may include infrastructure (such as roads, rail, mines, large fences etc.) without effective koala passage measures, or developments that create treeless areas more than 2 km wide.	**0**	Habitat on the study area occurs as small, isolated pockets within a landscape otherwise dominated by open pasture and agricultural land.
	+1 (medium)	Area is part of a contiguous landscape < 500 ha but ≥300 ha.		
	0 (low)	None of the above		
Key existing threats	+2 (high)	Little or no evidence of Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence. Areas which score 0 for Koala occurrence have no dog or vehicle threat present.	**1**	**Desktop:** No relevant information was located. **On-ground:** The study area incorporates the existing Petersons Quarry and another industrial activity (pre-cast concrete facility), and occurs within a largely rural landscape. There is likely to be some degree of dog and/or vehicle threat present.
	+1 (medium)	Evidence of infrequent or irregular Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence, OR Areas which score 0 for Koala occurrence and are		

Attribute	Score	Coastal area criteria	Score	Assessment details
		likely to have some degree of dog or vehicle threat present.		
	0 (low)	Evidence of frequent or regular Koala mortality from vehicle strike or dog attack in the study area at present, OR Areas with score 0 for Koala occurrence and have a significant dog or vehicle threat present.		
Recovery value **	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the referral guidelines (DoE 2014).	**0**	Habitat in the study area occurs as small, isolated pockets within a landscape otherwise dominated by open pasture and agricultural land, and no evidence of Koala occurrence on the study area has been obtained despite targeted survey of the limited habitat present.
	+1 (medium)	Uncertainty exists as to whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the referral guidelines (DoE 2014).		
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the referral guidelines (DoE 2014).		
Total Score			**4**	As this total score is <5, the habitats onsite are not considered to represent critical habitat.

* Koala feed tree species are those listed for the North Coast of NSW by OEH (http://www.environment.nsw.gov.au/animals/koalahabitat.htm#north).

** Interim recovery objectives in coastal areas are to (a) protect and conserve large, connected areas of Koala habitat, particularly large, connected areas that support Koalas that are: genetically diverse/distinct; or free of disease or have a very low incidence of disease; or breeding (i.e. presence of back young or juveniles); and (b) maintain corridors and connective habitat that allow movement of koalas between large areas of habitat.

Table 3.5. Potential occurrence within the study area of non-threatened migratory fauna species obtained from database searches.

Species	Common Name	Potential Occurrence within Habitats Present on the Study Area							Comments
		Dry Rainforest	Forest Red Gum Open Forest	Melaleuca Swamp Forest	Freshwater Wetland	Disturbed Rainforest Patches	Scattered Paddock Trees	Grassed Paddock	
Ardea ibis	Cattle Egret	n/a	Potential habitat.	Some potential.	Known habitat.	n/a	Potential habitat.	Known habitat.	Known to utilise open habitats in the study area for foraging, particularly in association with domestic stock. The swamp forest fringing the wetlands may provide suitable breeding resources, although there is no confirmed nesting on the site.
Plegadis falcinellus	Glossy Ibis	n/a	n/a	Potential habitat.	Potential habitat.	n/a	n/a	Potential habitat.	The wetland habitats in the study area provide suitable foraging resources for this species, along with fringing habitats during high rainfall and flood events.
Haliaeetus leucogaster	White-bellied Sea-Eagle	n/a	Some potential.	Some potential.	Some potential.	n/a	Some potential.	n/a	The wetland habitats in the study area provide potential foraging opportunities, although the narrow pondage areas have low value only. The larger trees on site may also provide suitable breeding resources, although there is no confirmed nesting on the study area.
Calidris melanotos	Pectoral Sandpiper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No suitable habitat present within the study area.
Apus pacificus	Fork-tailed Swift	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No suitable habitat present within the study area.
Hirundapus caudacutus	White-throated Needletail	n/a	n/a	n/a	n/a	n/a	n/a	n/a	This aerial species may occur over any habitat type but the site has no direct relevance to the species.
Merops ornatus	Rainbow Bee-eater	Little to low value.	Known habitat.	Known habitat.	Known habitat.	Little to low value.	Known habitat.	Known habitat.	Observed foraging throughout the more open habitats on the site during the current survey.
Monarcha melanopsis	Black-faced Monarch	Potential habitat.	Low potential.	Potential habitat.	n/a	Potential habitat.	n/a	n/a	Suitable habitat for this species occurs on site within the denser patches of vegetation.
Monarcha trivirgatus	Spectacled Monarch	Potential habitat.	Low potential.	Potential habitat.	n/a	Potential habitat.	n/a	n/a	Suitable habitat for this species occurs on site within the denser patches of vegetation.
Myiagra cyanoleuca	Satin Flycatcher	Potential habitat.	Low potential.	Potential habitat.	n/a	Potential habitat.	n/a	n/a	Suitable habitat for this species occurs on site within the denser patches of vegetation.
Rhipidura rufifrons	Rufous Fantail	Potential habitat.	Low potential.	Potential habitat.	n/a	Potential habitat.	n/a	n/a	Suitable habitat for this species occurs on site within the denser patches of vegetation.
Ardea alba	Great Egret	n/a	n/a	Low potential.	Known habitat.	n/a	n/a	n/a	Known to utilise wetland habitats in the study area for foraging. The melaleuca swamp forest fringing the wetlands may also provide suitable resources during high rainfall and flood events.
Gallinago hardwickii	Latham's Snipe	n/a	n/a	n/a	Low potential.	n/a	n/a	n/a	Some potential to occur within sections of the wetlands containing dense reeds and grasses, although habitat values are limited.

Cattle Egrets (*Ardea ibis*) were observed foraging around the wetlands and within the open paddock habitats within the study area in association with domestic stock, while a Great Egret (*Ardea alba*) was also observed within the wetlands (**Photo 25**). Rainbow Bee-eaters (*Merops ornatus*) were also regularly observed foraging throughout the more open habitats on the site. The assessment of potential occurrence also indicates the study area provides potential habitat for most of the other non-threatened migratory species returned by the database searches.

Photo 25: Great Egret observed within the wetland.

However, the local region has not been identified as supporting an ecologically significant proportion of habitat for any of the species known or considered to have the potential to occur. Furthermore, these species are all common, widely distributed species that are neither known to be declining nor at the limit of their range within the study area. Therefore any future development of the site is unlikely to have a significant impact on any non-threatened migratory species, particularly as the majority of the study area has previously been cleared, and the majority of potential habitat present will be retained as part of future development plans (refer **Section 4.0**). As such, a referral to the Commonwealth in relation to impacts on these species is not considered necessary at this time.

3.5 MATTERS OF LOCAL ENVIRONMENTAL SIGNIFICANCE

3.5.1 Local Environmental Plan Mapping

Richmond Valley Council's Local Environmental Plan (LEP) mapping (RVC 2015a,b) indicates a recognised wetland occurs in the western portion of the study area, consistent with the freshwater wetland community identified during the field survey (refer **Figure 1-1 and Section 3.2.1**). The LEP mapping also identifies the western part of the study area as an important area for biodiversity, which appears to be associated with the wetland.

The LEP mapping identifies important areas for biodiversity in the centre and to the north-east of the study area. These areas were identified as comprising native vegetation communities during the field survey, other than the smallest patch mapped in the centre of the study area that was found to be dominated by exotics (refer **Figure 3-1 and Section 3.2**). These areas are also identified on the LEP mapping as wetlands. No wetland vegetation was recorded within these areas during the field survey, although they could become seasonally inundated, thereby providing potential habitat for frogs and water birds.

The results of the field survey generally support the LEP mapping of relative biodiversity importance in that the far western and central parts of the study area and areas to the north-east contain native vegetation and associated habitat values for native fauna, including species of conservation significance.

3.5.2 Koala Habitat Mapping

Richmond Valley Council's Koala Habitat Atlas mapping (RVC 2015c) indicates Class B and C secondary Koala habitat occurs to the north-east and in the far west of the study area, respectively.

The Richmond Valley Koala Habitat Atlas (AKF 2008) defines Class B secondary Koala habitat as areas of forest or woodland where primary Koala food tree species comprise less than 30% of the overstorey trees, or together with secondary food tree species comprise at least 30% (but less than 50%) of the overstorey trees, or where secondary food tree species alone comprise at least 30% (but less than 50%) of the overstorey trees (primary Koala food tree

species absent). This habitat class is capable of supporting medium to low-density Koala populations.

Class C secondary Koala habitat is defined as areas of forest or woodland where Koala habitat is comprised of secondary and supplementary food tree species (primary Koala food tree species absent), where secondary food tree species comprise less than 30% of the overstorey trees. This habitat class is capable of supporting low-density Koala populations.

The results of the field survey generally support the Koala Habitat Atlas mapping in that the vegetation in the north-east offers the highest value Koala habitat, with less valuable potential habitat occurring on the fringes of the wetlands.

3.5.3 Black-Necked Stork Nesting Tree

Information provided by Groundwork Plus indicates a Black-necked Stork once nested in a Hoop Pine located within the centre of the dry rainforest community occurring within the centre of the study area (refer **Figure 3-1**).

The current field survey found no active nests in any of the trees within this community, nor was any evidence of recent nesting activity found. Therefore Black-necked Stork is unlikely to currently utilise these trees for nesting. However, this vegetation continues to provide potential breeding resources.

4.0 IMPACT ASSESSMENT

4.1 IMPACT MECHANISMS

4.1.1 Clearing

During the construction phase, clearing and/or grubbing activities will be required for the establishment of all key infrastructure components outside of the previously disturbed areas associated with Petersons Quarry. Clearing will also occur progressively during quarry operation for the extension of the pit and stockpile areas.

Clearing of vegetation reduces the total amount of habitat and populations of flora and fauna, and has the potential to result in isolation of habitats and populations, changes to remaining vegetation that cause the loss of food, breeding and shelter resources for fauna, and exposure to introduced species that are either competitors or predators (Bennett *et al*. 2000).

Removal of vegetation will also result in direct loss of individual plants, including large trees that may provide nesting resources to fauna, and can result in the mortality of fauna present at the time of clearing.

Secondary impacts can affect peripheral vegetation through:

- soil disturbance/exposure and altered water flow patterns, and subsequent erosion and sedimentation, which may expose tree roots, smother vegetation, and potentially alter the physical form, chemical processes and ecological health of downstream aquatic and riparian habitats;
- increased desiccation, light penetration, wind-throw, herbivory, weed invasion, nest predation, and parasitism for adjacent flora and fauna (Murcia 1995). In particular, introduced weeds can change vegetation community composition and in some cases increase the intensity of fire, leading to further community degradation;
- salinisation of areas downslope, depending on the clearing extent and nature of the associated landform and geology/soils; and
- clearing, earthworks, vehicle movements, wind and blasting within the project area causing increased dust which will potentially impact on nearby vegetation. Excessive dust has been known to reduce photosynthesis rates and inhibit plant growth (Thompson *et al.* 1984, Sharifi, *et al.* 1997), and pollutants in dust can impede plant growth (Farmer 1993).

Clearing can also create barriers to fauna movement through habitat fragmentation, affecting reproductive cycles and facilitating the incursion of pest species and aggressive, native “edge” species deeper into woodlands and open forests.

4.1.2 Construction and Operational Activities

In addition to clearing and the associated secondary (or indirect) impacts, the construction and operation phases have the potential to result in on-going disturbance to surrounding habitats. Noise, dust and vibration affect habitat adjacent to active areas due to ground disturbance, the operation and movement of machinery traffic along haul roads, exposed stockpiles and blasting.

Noise, including background noise, generated by human activities can potentially affect behaviour and persistence of species and communities by, for example, masking of alarm and mating calls, location and motion of resources, obstructions or potential harms; in short, noise pollution affects the sending and reception of behavioural and social signals in faunal communities (e.g. see Brumm and Slabbekoorn 2005).

Another potential impact associated with fauna, particularly reptiles and small mammals, is becoming trapped in any trenches or other excavations that remain open for any period of time. This may lead to mortality either by exposure, starvation, thirst or predation by other species. Open pipes may also attract fauna, particularly micro-bats and reptiles, which may then be injured or killed when the pipes are transported and utilised.

An increase in heavy and light vehicle traffic during both the construction and operation phases could contribute to increased animal/vehicle collisions on local roads. Species particularly susceptible to traffic collisions include larger and slow-moving snakes, monitors and other large lizards, macropods and frogs (during wet periods).

Vehicles also have the potential to introduce and/or spread weed species and plant

pathogens in disturbed soil, while general waste and land disturbance has the potential to attract highly competitive and/or predatory exotic fauna species. Increased human presence has the potential to increase the frequency of accidental fires within vegetated areas, adversely affecting habitat structure and therefore habitat value for a range of significant species.

Fuels and chemical spills from storage areas and oils from heavy machinery can enter the environment, affecting habitats where the spill occurs, and potentially causing more widespread impact if contaminants reach waterways.

The operation of the quarry also has the potential to disrupt natural ecological processes within the local area through:

- limiting the natural movement and dispersal of ground-dwelling and flightless fauna (i.e. for breeding and foraging purposes), which are unable to traverse the quarried landscape;
- altering the local surface water environment[1] due to large-scale landform modification, and subsequent potential impacts on downstream terrestrial ecosystems, particularly wetlands and riparian vegetation, and other sensitive vegetation communities and dependent fauna. This includes alterations to base flows, as well as to the frequency and extent of flooding; and
- creating long-term edge effects along the borders of the active area and adjacent habitat.

It is understood the hours of operation will be restricted to 6am to 7pm Monday to Saturday, with no night works proposed. As such, there will be no impacts as a result of artificial lighting, which could otherwise affect behaviour of both nocturnal and diurnal fauna.

[1] Information provided by Groundwork Plus indicates the resource is a basalt flow over clay, and that extraction will be restricted to within the resource and will retain a floor separating the quarry from the underlying clay resource. Accordingly, no impacts to groundwater residing within the clay layer are anticipated.

4.2 IMPACT MANAGEMENT

The overarching principle of relevant State and Commonwealth environmental protection policies in terms of impact management is to avoid impacts as much as possible in the first instance, following which mitigation measures should be used to reduce unavoidable impacts to acceptable/insignificant levels. Where impacts remain at unacceptable/significant levels post-mitigation, only then should compensatory measures (e.g. offsets) be employed as a last resort.

The following sections outline the proposed measures for avoidance, mitigation and compensation to address potential impacts on terrestrial ecological values as a result of the proposed development.

4.2.1 Impact Avoidance

The most effective means of impact avoidance is through appropriate development footprint design. As shown on **Figures 1-1 and 3-1**, the proposed site development footprint has been positioned to avoid the clearing and fragmentation of the relatively large, well-connected tracts of vegetation and associated habitat within the study area, and avoids all patches of vegetation recognised as native vegetation communities that have greatest value to the majority of known or potentially occurring terrestrial flora and fauna species. No EECs, wetlands or important habitat for threatened flora and fauna species (as identified during the site survey and recognised on local government mapping) will be directly impacted. Buffers will be retained between the recognised vegetation communities (and associated EECs and wetlands) and the edge of the proposed site disturbance footprint to further prevent secondary impacts.

It is imperative that the positive ecological outcomes of this design are respected through strict controls on the clearing of vegetation, access and storage of site personnel, vehicles, machinery, materials and excavated soil, and other construction and activities throughout the life of the Project. Of particular importance will be the identification and enforcement of no-go areas and regular monitoring of the condition of retained vegetation and habitat for unauthorised clearing and secondary impacts.

Original development plans involved the clearing of patches of isolated vegetation within the centre of Lot 401 on DP633427 area as part of a designated stockpiling area. The field survey undertaken as part of the current assessment recorded four specimens of *Macadamia tetraphylla* (currently listed as Vulnerable under the TSC Act and EPBC Act) within one of these patches. In response to the survey results, the original footprint was redesigned to avoid the clearing of these specimens. Taking into account site constraints and the necessary size of the stockpiling area to meet operational requirements, the current, revised footprint incorporates the retention of these specimens and a 25 m buffer (**Figures 1-1 and 3-1**).

Additional management measures to mitigate residual impacts on these plants are discussed in the following section.

4.2.2 Impact Mitigation

General Management

In general, the area proposed to be disturbed for the project is of relatively low habitat value in the context of the surrounding area and particularly in comparison with the adjacent patches of native vegetation. The overall value of the proposed disturbance area (as habitat) has been reduced because of historical clearing and grazing practices, which have significantly reduced areas of cover and facilitated the dominance of exotic vegetation.

Nonetheless, the area within the proposed site development footprint (outside of currently disturbed areas associated with Petersons Quarry) still retains some limited habitat value and provides resources for some terrestrial fauna species. Furthermore, the mosaic of pasture, remnant vegetation and regrowth across the entire site provides resources for species that are adapted to respond to a range of conditions. For example, mobile species adapted to foraging in open areas, but with specific or preferred requirements, will use such areas (e.g. Cattle Egrets). Habitat mosaics also increase the resources available to other fauna species (Law and Dickman 1998). For example, microbats may roost in woodland and forage in open areas, as do larger marsupials (e.g. kangaroos and wallabies).

As noted in **Section 4.1**, there is also the potential for direct and indirect impacts on adjacent habitats and associated flora and fauna species, without adequate controls.

Consequently, implementation of the following mitigation measures is recommended to reduce impacts on native flora and fauna to levels that will not cause significant or permanent harm:

- Restrict disturbance and access to areas absolutely necessary for the construction and the operation of the Project. Clearly cordon off all adjacent vegetation and buffer extents that are not to be disturbed from clearing activities, creating 'no go zones' for vehicles, materials, machinery, workers, excavated soil or fallen timber.
- Implement strict controls on construction and operational/maintenance activities that encroach into buffer areas around EECs, wetlands and known populations/habitats of significant species.
- Implement measures to avoid the spill of earth and rock downslope of the quarry footprint into areas of retained vegetation.
- Design and install temporary erosion control measures to avoid impacts on retained vegetation downslope of the quarry footprint.
- Leave ground layer vegetation (grasses and herbs) in situ wherever possible to assist soil stability. Mulching of heavily disturbed areas can assist in reducing soil erosion. Where necessary, temporary interception devices such as hay bales or geotextile fabric fencing can be employed to slow stormwater and intercept sediment.
- Non-millable vegetation can be mulched and used in rehabilitation or soil stabilisation works, provided no weeds are incorporated into the mulch.
- Consider the installation of nest boxes in areas where hollow-bearing trees must be removed and relocate large fallen logs and boulder piles to adjacent habitat to increase sheltering opportunities for displaced animals where it is not feasible to avoid such features during clearing.
- Ensure a fauna spotter/catcher is present during clearing and site preparation works to:

  - Check habitat (vegetation, logs, rock outcrops) for fauna and breeding sites,
  - Check any stored materials, including stockpiled timber, prior to removal,
  - Check temporary excavations for trapped fauna, and
  - Ensure appropriate treatment of injured/orphaned animals through liaison with local Wildlife Carers.

- Establish 'go slow zones' (40km/hr) for vehicles and machinery where non-gazetted roads or tracks are located adjacent to patches of native vegetation communities.
- Limit construction and operational work to daylight hours as far as practicable, and any lighting within outdoor areas should comply with relevant Australian Standards and be of low spillage, with no or limited upward spillage.
- Minimise vehicle and machinery access and subsequent soil compaction and weed transfer risk within and adjacent to retained vegetation.
- Undertake regular monitoring of the health and condition of retained vegetation and habitat, and the health of significant plant specimens.
- Undertake regular monitoring of road kills.
- Educate the workforce on the location of significant/sensitive communities and species and potential impacts from unauthorised activities.
- Develop and implement an Environmental Management Plan (EMP) that includes the following components to reduce secondary impacts on terrestrial flora, fauna and ecosystems:
  - Threatened species management,
  - Noise and dust suppression,
  - Weed management,
  - Management of environmental flows, runoff quality, erosion and sediment,
  - Fuel, chemical spill and waste management, and
  - Waste management.

Mitigation strategies relevant to the components of the EMP are outlined below in more detail for inclusion in the EMP. Management of erosion and sedimentation, soil and water contamination, environmental flows, noise, dust, vibration and chemical and oil spill management are standard components of Environmental Management Plans and are addressed within other specialist reports for the Project.

The EMP will also address rehabilitation of the site post-operation. It is understood such rehabilitation will be limited to that necessary to return the site to a safe, stable, non-polluting state, suitable for reinstatement of previous land use (i.e. rural – cattle grazing).

Threatened Species Management

Macadamia tetraphylla

As noted in **Section 4.2.1**, original development plans have been modified to allow the retention of four specimens of *Macadamia tetraphylla* together with a 25 m buffer to be established and maintained around the plants. This far exceeds the minimum tree protection zone recommended within AS 4970-2009 "Protection of trees on development sites", which specifies a buffer radius equivalent to 12 times the stem diameter at breast height to minimise direct impacts to tree canopies and root zones (Standards Australia 2009). A larger (25 m) buffer is appropriate for this site, given the threatened status of the plants and the scale of the adjacent development and associated, potential impacts from dust and soil compaction.

The locations of the plants and the 25 m buffer will be clearly marked to facilitate onsite recognition, and will be recorded in all relevant quarry documentation for future reference. The 25 m buffer will also be managed, such that existing weed infestations will be removed from within the buffer area. In-fill planting and edge-seal planting of native species will also be undertaken to minimise the effect of further weed intrusion. The retention of a 25 metre buffer enhanced and maintained in this way is expected to improve existing habitat condition such that the plants' chances of survival are at least equivalent to their chances of survival if the development was not to occur.

Collection and storage of seeds from the existing plants is also recommended as insurance against potential mortality due to quarrying operations.

Regular monitoring of the existing plants and habitat within the surrounding buffer is also recommended, intended at detecting major changes to plant health and habitat conditions for informing adaptive management strategies. The monitoring is also intended to record detectable alterations to hydrology and water quality caused by the proposed stockpile area. It is anticipated that these factors will be managed by installing a physical barrier to minimise build-up of sedimentation, nutrients and weed propagules into the buffer.

A more detailed account of the proposed management actions for this species is provided in **Table 4.1**.

Black-necked Stork

Although previous studies indicate a Black-necked Stork once nested in a Hoop Pine located within the centre of the dry rainforest community occurring in the centre of the study area (refer **Figure 3-1**), targeted searches undertaken as part of the current field survey found no active nests in any of the trees within this community, nor was any evidence of recent nesting activity found. Therefore, Black-necked Stork does not currently utilise these trees for nesting. However, this vegetation continues to provide potential breeding resources, and there is a small possibility this species may utilise this habitat for nesting in the future.

Accordingly, it is recommended a fauna spotter/catcher is engaged to regularly (i.e. fortnightly) inspect the Hoop Pine dry rainforest community for signs of nesting throughout the construction phase of the project where this coincides with the breeding season for Black-necked Stork (May to January, inclusive). If any nesting activity is identified, a species management plan is to be developed and implemented that ensures any impacts to this species are not significant.

Weed Management

The proliferation of weed species in the landscape can have a serious effect on biodiversity values and ecosystem function. Pest plants may be controlled by:

- Limiting the introduction of weeds and weed propagules into the area of interest,
- Rapidly controlling any weeds that become established on the site,
- Regular monitoring of the area of interest, and
- Preparing a control/eradication plan with follow up action when and where needed.

The following actions should be taken during the life of the Project to reduce the possibility of weeds (or their propagules) entering the site:

- Regularly survey disturbance areas and haul/access roads, and identify and remove any new infestations of invasive weeds encountered. Treatment needs to take place in accordance with local and regional Pest Management Plans and State government recommendations.
- Ensure onsite personnel undertake appropriate training in vehicle hygiene and weed awareness and identification.
- Prepare a car park (preferably gravelled) to house all vehicles entering the site offices. The car park would be regularly checked for any weeds and treated.
- Prepare wash down areas and/or utilise Council approved wash down facilities for any machinery or vehicles entering the Project area that have been working outside of the local area.
- Obtain pest free certification for any soil, fill, mulch, etc entering the site.
- Appoint a person responsible for regularly monitoring for potential pest occurrences (and treatment if required) of equipment, vehicles, machinery and materials (including soil, mulch, fill) entering the site.
- Maximise the diversity and cover of native species when revegetating disturbed areas.

4.2.3 Residual Impacts

The Project is not expected to result in the direct loss of any significant biodiversity values and, once the proposed mitigation measures are implemented, the remaining impacts of the Project on terrestrial ecological values are predicted to be minor or negligible, particularly in the context of existing site conditions and current impacts from previous land clearing, weed invasion and the presence of livestock. Hence offsets to compensate for residual impacts are not considered necessary.

Table 4.1. Management Actions to avoid and mitigate impacts to *Macadamia tetraphylla*

Performance Objective	Implementation Strategy	Performance Indicators	Responsibilities, Reporting	Timing and Frequency
On-site establishment of procedures and responsibilities	A pre-start meeting is to be arranged by the Principal to clearly define roles and the approach to *Macadamia tetraphylla* management.	Pre-start meeting is undertaken and all site workers are informed of their obligations with regard to *Macadamia tetraphylla* protection.	The Principal to liaise with the Project Manager and EO throughout construction and operation	Prior to commencing works.
Backup propagation material is collected for *Macadamia tetraphylla*	Seeds are collected for use as backup propagation source if mortality of existing *Macadamia tetraphylla* individuals occurs following clearing.	Seeds are stored and viable	Nursery / ecology contractor	Prior to commencing works and every 12 months following clearing.
Edge-seal planting of the 25 metre buffer perimeter	The perimeter of the 25 m buffer is planted with locally native species to prevent weed intrusion.	The tubestock seedlings are well established and in healthy condition.	Nursery / ecology contractor	Post Clearing
Macadamia tetraphylla and vegetation monitoring	Undertake regular monitoring of the health of the retained *Macadamia tetraphylla* specimens and surrounding vegetation. Ensure monitoring is conducted by personnel experienced in flora surveying. Ensure onsite personnel do not disturb (i.e. trample) retained or regenerated vegetation.	A monitoring program has been implemented and monitoring is occurring at the specified times. Observer/s are experienced in flora monitoring. Undue trampling of vegetation is not evident.	Ecologist undertakes monitoring and a summary report detailing the results of the monitoring is compiled and presented to the Site Manager	After two weeks, six weeks and three months, then on a bi-annual basis for two years following completion of works
Removal of major weed infestation* within the buffer	Any major weed infestation within the 25 metre buffer will be removed appropriately.	Weeds are controlled** to a manageable state.	Nursery / ecology contractor	Targeted weed removal is to be undertaken immediately after the clearing and if adaptive management is triggered during monitoring thereafter.

* Major weed infestations would include any occurrence of Weeds of National Significance, and/or an infestation of any other recognised environmental weed that could threaten the survival of the retained *Macadamia tetraphylla* specimens or surrounding native vegetation, as determined by routine monitoring.

** Species-specific control methods are to be used in accordance with State government guidelines.

4.3 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Under the EPBC Act an action would require approval from the Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance (MNES).

MNES relevant to terrestrial ecology have been addressed throughout this report as part of the existing environment and impact assessment process, and it is concluded that there are no such MNES for which proposed measures of avoidance and mitigation are unable to reduce impacts to insignificant levels. In particular:

- Original development plans have been modified to allow the retention of the four specimens of *Macadamia tetraphylla* recorded within the study area, with a 25 m buffer established and maintained around the plants. This development design, along with further management actions proposed to avoid and mitigate impacts to these plants, suggests any impacts are highly unlikely to be significant.
- Although Koala habitat occurs in close proximity to the study area, and Koalas may also occur occasionally within the study area, consideration of the results of a habitat assessment performed in accordance with the EPBC Act referral guidelines for Koala (DoE 2014) indicates a referral to the Commonwealth in relation to impacts on this species is not necessary at this time.
- A number of listed Migratory species are known or considered likely to utilise the study area for foraging and, potentially, breeding. However, the local region has not been identified as supporting an ecologically significant proportion of habitat for any of these species, which are all common and widely distributed, and are neither known to be declining nor at the limit of their range within the study area.
- The proposed site development footprint has been positioned to avoid the clearing and fragmentation of the relatively large, well-connected tracts of vegetation and associated habitat within the study area, and avoids all patches of vegetation that have greatest value to the majority of known or potentially occurring terrestrial flora and fauna species. No wetlands or other important habitat for threatened flora and fauna species as identified during the site survey and recognised on local government mapping will be directly impacted. Buffers will also be retained between the recognised vegetation communities (and wetlands) and the edge of the proposed site disturbance footprint, to further prevent secondary impacts.

Overall, the findings of this assessment indicate that, provided the impact mitigation measures outlined in this report are successfully implemented, there are no predicted significant impacts on any species listed as threatened or migratory under the EPBC Act. Accordingly, a referral to the Commonwealth in relation to impacts on species listed under the EPBC Act is not considered necessary at this time.

4.4 MATTERS OF LOCAL ENVIRONMENTAL SIGNIFICANCE

Matters of local ecological significance have been addressed throughout this report as part of the existing environment and impact assessment process, and it is concluded that there are no such matters for which proposed measures of avoidance and mitigation are unable to reduce impacts to insignificant levels. In particular:

- The proposed site development footprint has been positioned such that no wetlands or other important habitat for threatened flora and fauna species as identified during the site survey and recognised on local government mapping will be directly impacted. Buffers will also be retained between the recognised vegetation communities (and wetlands) and the edge of the proposed site disturbance footprint, to further prevent secondary impacts.
- The current field survey found no active nests of Black-necked Stork in any of the trees within this community, nor was any evidence of recent nesting activity found. Therefore Black-necked Stork is unlikely to currently utilise these trees for nesting.

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APPENDIX 1

Results of preliminary ecological investigation

28/05/2015

Jim Lawler
Team Leader - Planning
Groundwork Plus

Dear Jim,

RE: PRELIMINARY ECOLOGICAL INVESTIGATION – CORAKI QUARRY

BACKGROUND

Quarry Solutions Pty Ltd is seeking to develop an extractive industry operation (quarry) on Lot 401 on DP633427, located on Seelems Road at Coraki in NSW. As part of the preparations for a development application, BAAM were engaged by Ground Plus on behalf of Quarry Solutions Pty Ltd to undertake a preliminary assessment of ecological values on the site, including a brief desktop review and site investigation. In particular, advice was sought on matters of national environmental significance (MNES) that may trigger a referral under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), as well as any noteworthy State or local matters.

The field investigation was undertaken by Dr Lindsay Popple (Senior Ecologist ay BAAM) on 22 April 2015. Initial onsite observations confirmed the site was largely devoid of native vegetation and had been used for grazing livestock, particularly within the area nominated for the main quarry pit (**Photo 1**).

Photo 1: typical site view

In terms of MNES, the primary issues derived from the desktop review were the potential presence of Hairy-joint Grass *Arthraxon hispidus* (Vulnerable – EPBC Act), including/particularly within cleared areas, and the Lowland Rainforests of Subtropical Australia Threatened Ecological Community (Critically Endangered – EPBC Act) in association with drainage lines on the property. The site investigation revealed that neither of these occurs within the subject area. In particular, targeted searches for *Arthraxon hispidus* revealed no specimens, while the only vegetation that could have represented the Rainforest TEC (based on aerial photography) was found to be dominated by Camphor Laurel and Lantana. No other TECs, threatened plants or important habitat for threatened fauna (listed under the EPBC Act) were found to occur within the subject area. However, it is considered that it would be prudent for quarry designs to establish a sufficient buffer to nearby wetlands (**Photo 2**), which may provide habitat for migratory species (some of which are also threatened).

Photo 2: nearby wetland

It was also noted that vegetation on the neighbouring properties may contain the Rainforest TEC, such that sufficient buffers to neighbouring vegetation should be established.

In terms of other potential constraints, it was confirmed by the client representatives present during the site investigations that they intend to remove a number of native trees, including some large Hoop Pines and Figs (**Photo 3**). These do not occur as part of any remnant vegetation communities on site, and a review of the Richmond Valley Planning documentation (Local Environmental Plan and Development Control Plan) suggests there are no restrictions on the removal of these species on private property. However, it would be advisable to confirm this with Council.

There was also mention of a Black-necked Stork (listed as Endangered in NSW) nesting in one of the Hoop Pines near the site in the recent past. The tree shown to Dr Popple showed no signs of nesting, although this may not have been the correct tree and it is not currently breeding season for this species. It would therefore be advisable to check the requirements with Council, assuming they are aware of the past record.

Photo 3: hoop pine to be removed

Otherwise, we don't believe the subject area holds any notable value for flora or fauna species of significance. The site is also not constrained by Richmond Valley Council's Koala habitat or terrestrial biodiversity mapping, which we consider an accurate representation of the limited values present.

We trust this information is suitable for your purposes. Please do not hesitate to contact us on 3286 7788 if you have any queries.

Yours sincerely

Jedd Appleton
Director / Project Delivery Manager
Biodiversity Assessment and Management Pty Ltd

APPENDIX 2

Correspondence from EOH and Primary Industries NSW confirming required level of assessment

NSW GOVERNMENT | Office of Environment & Heritage

RECEIVED
29 JUN 2015
BY: KB

Your reference SSD15_7036
Our reference: DOC15/215377
Contact Krister Waern (02) 6640 2503

Mr Jim Lawler
Team Leader - Planning
Groundwork Plus
PO Box 1779
Milton QLD 4064

Dear Mr Lawler

Re: OEH Environmental Assessment Requirements – Proposed Coraki Quarry, Richmond Valley local government area (SSD15_7036)

Thank you for your email dated 28 May 2015 seeking clarification from the Office of Environment and Heritage (OEH) in relation to the proposed State Significant Development (SSD) application above, particularly in relation to the use of the Framework for Biodiversity Assessment (FBA).

I understand that your environmental consultant Biodiversity Assessment and Management (BAAM) has advised you that due to the lack of biodiversity on the site, they anticipate that no offsets would be required under the BioBanking process. To support this advice, BAAM has undertaken a preliminary ecological investigation, which you have forwarded to OEH.

The BAAM preliminary ecological report states:

a) The site is largely devoid of native vegetation and has been used for grazing;
b) Targeted searches for Hairy Jointgrass (*Arthraxon hispidus*) revealed no specimens;
c) No threatened ecological communities, threatened plants or important habitat for threatened fauna were found to occur within the subject area, and;
d) The report recommended that sufficient buffers are established between the proposed quarry and the nearby wetland and to vegetation occurring on neighbouring properties.

Due to the degraded state of the subject site, OEH will not require that the FBA be used to assess the biodiversity values of the site and the impacts of the proposal on this occasion. However, the Environmental Impact Statement for the quarry will still need to address biodiversity values of the site in enough detail to ensure OEH can assess the proposal.

Please note, that, contrary to the BAAM preliminary ecological report, if biodiversity values are found on the site or the proposed quarry expansion will have indirect impacts on nearby biodiversity values, the applicant will need to address these biodiversity impacts through the FBA.

If you require any further information or clarification regarding this matter please contact Mr Krister Waern, Senior Operations Officer, on (02) 6640 2503.

Yours sincerely

Dimitri Young 22 June 2015

DIMITRI YOUNG
Senior Team Leader Planning, North East Region
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Jedd Appleton

From: Cressida Gilmore <cressida.gilmore@trade.nsw.gov.au>
Sent: Thursday, 28 May 2015 2:36 PM
To: Jim Lawler
Subject: EMI_150528_Cressida Gilmore_SSD 15 7036 Coraki Quarry - clarification of aquatic habitat protection requirements

Hi Jim,
I've looked into this issue. Our response (OUT15/10606) included Attachment B which is a bit of a legacy from when we were all in the same department a few years back and coordinated advice. We have been asked to continue doing this by Fisheries to cover any potential gaps in the correspondence chain following restructures within the Department. When I went and checked the DPI response however - OUT15/11867 (have you seen this?) it says that Fisheries have no issues. So that's some cause for confusion really isn't it! I got in touch with Pat Dwyer who is the Fisheries contact for this proposal and he has responded as per below. Hopefully this clarifies things for you?
Regards,
Cressida

"On behalf of Fisheries NSW I have indicated that there are no fisheries issues. Specifically no aspects of the works trigger the need for any approvals under the Fisheries Management Act. I do note however that the works are on the Richmond floodplain and are just a bit more than 50m from a very near a floodplain lagoon which is within the site boundary but not the works footprint (based on the concept site layout plan which remains attached). I suspect the works will trigger NSW Office of Water approvals. Cognisant of this I am happy for the proponent to be advised that the present proposal does not raise Fisheries issues. Because of the floodplain lagoon on the property it is possible that redesign or modification of the proposal might result in a need to consult Fisheries.
I would be the contact."
PAT

Patrick Dwyer | A/Regional Manager Aquatic Ecosystems (North)|
Aquaculture & Aquatic Environment **|** Primary Industries NSW
T 02 6626 1397 | F 02 6626 1377 | M 0407 264 391 | E patrick.dwyer@dpi.nsw.gov.au
W: www.industry.nsw.gov.au | www.dpi.nsw.gov.au
Postal Address: | 1243 Bruxner Hwy | Wollongbar NSW 2477 |

From: Jim Lawler [mailto:jlawler@groundwork.com.au]
Sent: Thursday, 28 May 2015 11:06 AM
To: cressida.gilmore@trade.nsw.gov.au
Subject: SSD 15 7036 Coraki Quarry - clarification of aquatic habitat protection requirements

Hi Cressida,

Firstly, thanks for your time on the phone earlier today. As discussed I am looking to connect with the relevant officer to clarify the matters raised in Attachment B 'Primary Industries Division – Aquatic Habitat Protection Requirements', of the departments letter dated 6 May 2015 (your ref OUT15/10606). I am looking to clarify a number of items all of which are associated with the requirement to conduct a 'survey of fish species' and other points such as the comments about 'dredging and reclamation activities'.

As shown on the attached drawings which were included in the request for the Secretary's Environmental Assessment Requirements (SEARs), the project area is outside of mapped waterways and aquatic habitat areas, on the top of a hill, adjacent to the existing Peterson Quarry run by the Richmond Valley Council. Specifically, no dredging is proposed. Importantly, it is intended to maintain at least a 40m buffer to the water way on the site, and of course surface water within the quarry area will be managed to achieve the relevant water quality objectives and release criteria that will be set by the EPA.

Accordingly, in our assessments and consideration of the project impacts we **do not** anticipate:

- Dredging
- Works within a water way
- Impacts or damage to marine vegetation
- Placement of spoil in waterways
- Activities that block fish passage
- Impacts to fishing and aquaculture.

I would like to clarify with the relevant officer the matters raised as I believe some of the requirements are not relevant in this instance, such as a fish survey and detailed assessment of the bed morphology and characteristics of the waterway. If you could let me know the best point of contact that would be greatly appreciated.

I note that we have no items of clarification regarding the Attachment A – Resource Assessment matters, as those were entirely anticipated given the nature of the project.

Kind regards,

Jim Lawler
Team Leader - Planning

GROUNDWORK plus

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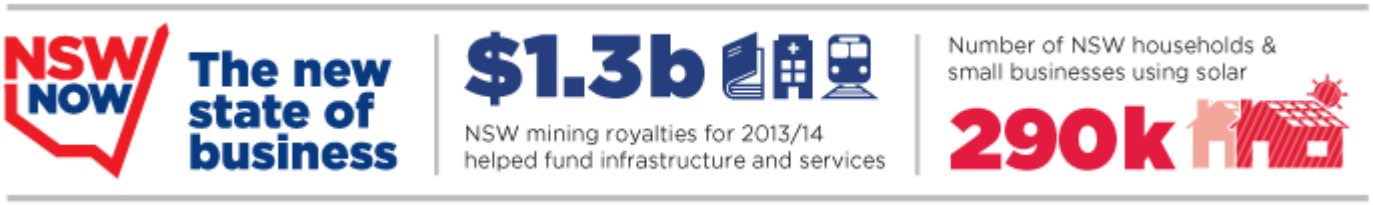

APPENDIX 3

Vegetation survey data

Site #	Easting	Northing	Landform/ Geology	Vegetation Structure	Structure_Floristics_ Upper (Ht m_% Crown Cover)	Floristics Mid (Ht m_% Crown Cover)	Floristics Lower (Ht m_% Crown Cover)	Floristics Ground (Ht m_% Cover)	Biometric Number	Biometric Type	EEC	Notes
CQ2	525934	6795101	Margin of alluvial floodplain	Open forest.	Upper Ht 12-16m. Crown Cover 70%. *Eucalyptus tereticornis (15%), Melaleuca styphelioides (55%), Pentaceras australe (5%), Araucaria cunninghamii (<5%), Alphitonia excelsa (5%), Mallotus phillipensis (5%), Casuarina glauca (<5%)*	Mid 3-8m, 20%. *Glochidion ferdinandi (10%), Cupaniopsis parviflora (5%), Streblus brunonianus (5%), Alectryon tomentosus (5%), M. styphelioides (5%), Callistemon salignus (5%)*	Lower 1-4m, 10%. *Lantana camara*, Scolopia braunii, Cupaniopsis parviflora, Alectryon tomentosus, Maclura cochinchinensis, Carissa ovata, Flindersia australis, Araucaria cunninghamii, Breynia oblongifolia, Mallotus phillipensis, Alogyne ilicifolia, Callistemon salignus, Ligustrum sinense*, Ligustrum lucidum**	Ground 0-1m, 90%. *Asparagus lumosus*, Commelina ensifolia, Aeferatum conyzioides*, Juncus usitatus, Doodia aspera, Eustrephus latifolius, Oplismenus aemulus, Plectranthus scutelllaroides, Carex sp., Senecio madagascarensis**	NR161	Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast	Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion	Located on adjoining property to NE of site. Represents remnant vegetation on alluvial floodplain at margin with basalt footslopes. Grazing. Habitat trees.
CQ3	525677	6794861	Gently sloping basalt hills.	Grassland exotic	0	0	0	Ground 0-0.25m 100%. *Cynodon dactylon*, Pennisetum clandestina*, Senecio madagascarensis*, Gomphocarpus physocarpus*, Thesium vulgare*, Solanum mauritianum**	NA	NA	NA	Grazed
CQ4	525509	6794859	Gently sloping basalt hills.	Grassland exotic	0	0	0	Ground 0-0.25m 100%. *Cynodon dactylon*, Pennisetum clandestina*, Senecio madagascarensis*, Gomphocarpus physocarpus*, Thesium vulgare*, Solanum mauritianum**	NA	NA	NA	Grazed
CQ5	525450	6794983	Steep basalt hills	Thicket/ shrubland exotic dominated	Upper 2-6m, 30%. *Cinnamomum camphora*, Hibiscus heterophyllus, Mallotus phillipensis, Maclura cochinchinensis, Ligustrum lucidum*, Ligustrum sinense*, Alectryon tomentosum, Abutilon sp., Wickstroemia indica*	0	0	Ground 0-1m, 60%. *Cymbopogon refractus, Senecio madagascarensis*, Stephania japonica var. discolor, Tagetes minima*, Asparagus plumosus*, Thesium vulgare**	NA	NA	NA	Heavily disturbed exotic dominated regrowth. Grazed
CQ6	525423	6795032	Steep basalt hills	Sedgeland/ grassland	0	0	0	Ground 0-0.25m, 95%. *Azolla pinnata, Juncus usitatus, Ludwigia peploides subsp. montevidensis, Paspalum sp.*, Senecio madagascarensis*, Cynodon dactylon*, Persicaria sp., Ranunculus inundatus*	NA	NA	NA	Heavily disturbed by cattle and exotic dominated. Micro community occuring as a result of a seepage spring upslope on the basalt hillsope. Not on a floodplain.
CQ7	525339	6794933	Steep basalt hills	Thicket/ shrubland exotic dominated	Upper 2-6m, 90%. *Caesalpinia decapetala*, Lantana camara* and Maclura cochinchinensis**	0	0	0	NA	NA	NA	Heavily disturbed by cattle and exotic dominated. Grazed on margins.
CQ8	525022	6794879	Alluvial floodplain	Sedgeland/ grassland	Upper 4-6m, <5%. *Melaleuca alternifolia*	0	0	Ground 0-0.25m, 100%. *Carex appressa, Persicaria strigosa, Juncus usitatus, udwigia peploides subsp. montevidensis, Paspalum sp.*, Senecio*	NR105	Coastal freshwater meadows and forblands of lagoons and wetlands	Freshwater wetlands on coastal floodplains of the NSW North Coast,	Heavily disturbed by cattle grazing. Infested by water hyancinth. Drainage of oxbow impedd by rocky stock crossing. Adjoining

Site #	Easting	Northing	Landform/ Geology	Vegetation Structure	Structure_Floristics_ Upper (Ht m_% Crown Cover)	Floristics Mid (Ht m_% Crown Cover)	Floristics Lower (Ht m_% Crown Cover)	Floristics Ground (Ht m_% Cover)	Biometric Number	Biometric Type	EEC	Notes
								madagascarensis, Cynodon dactylon*, Ranunculus inundatus, Eichhornia crassipes*, Setaria sp., Digitaria didactyla, Leersia hexandra.*			Sydney Basin and South East Corner bioregions	open water is 15-20m wide with Azolla and water hyancinth. Persicaria strigosa creeps over edges and forms the dominant cover in places. Native grasses and sedges form 34% of cover with native herbs forming 66%. Linkages to Richmond River.
CQ9	524895	6795052	Alluvial floodplain	Woodland	Upper 10-15m, 13%. *Melaleuca quinquenervia, Casuarina glauca*	Mid 3-8m, 8%. *Maclura cochinchinensis, Acacia excelsa, Cupaniopsis parviflora, Lantana camara*, Asparagus plumosus**	0	Ground 0-0.25m 100%. Cynodon dactylon*, Pennisetum clandestinum*, Senecio madagascarensis*, Gomphocarpus physocarpus*, Thesium vulgare*, Solanum mauritianum*, Lantana camara*, Carex appessa, Dichondra repens, Centella asiatica*, Digitaria didactyla, Conyza sumatrensis*, Asclepias curvassica*, Oxalis cornicualta*, Sigsbeckia orientalis, Sida retusa*, Asparagus plumosus*, Axonopus compressus*, Oplismenus aemulus.	NR217	Paperbark swamp forest of the coastal lowlands of the North Coast	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Heavily disturbed by cattle grazing. Adjoins degraded areas of freshwater wetland.
CQ10	524908	6794941	Alluvial floodplain	Grassland exotic	0	0	0	Ground 0-0.25m 100%. *Axonopus compressus*, Cynodon dactylon*, Senecio madagascarensis*, Gomphocarpus physocarpus*, Thesium vulgare*.*	NA	NA	NA	Heavily disturbed by cattle and exotic dominated. Grazed paddock.
CQ11	524873	6794949	Alluvial floodplain	Open forest	Upper 10-18m, 60%. *Eucalyptus tereticornis, Melaleuca quinquenervia, M. styphelioides, Callistemon salignus, Casuarina glauca.*	Mid 4-8m, 30%. *Maclura cochinchinensis, Alphitonia excelsa, Cupaniopsis parviflora, Lantana camara*, Asparagus plumosus*, Elaeocarpus obovatus, Streblus brunonianus.*	Lower 1-3m, 30%. *Lantana camara*, Maclura cochinchinensis, Breynia oblongifolia, Parsonsia straminea, Eustrephus latifolius, Alphitonia excelsa, Cupaniopsis parviflora, Asparagus plumosus*, Elaeocarpus obovatus, Streblus brunonianus. Epiphytes of Dendrobium liguliforme.*	Ground 0-0.25m 100%. *Asparagus plumosus*, Carex appressa, Axonopus compressus*, Cynodon dactylon*, Senecio madagascarensis*, Gomphocarpus physocarpus*, Rivina humilis*, Thesium vulgare*, Ipomoea cairica*.*	NR217	Paperbark swamp forest of the coastal lowlands of the North Coast	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Disturbed by cattle grazing and weed infestation in ground and understorey. Adjoins degraded areas of freshwater wetland.

Site #	Easting	Northing	Landform/ Geology	Vegetation Structure	Structure_Floristics_ Upper (Ht m_% Crown Cover)	Floristics Mid (Ht m_% Crown Cover)	Floristics Lower (Ht m_% Crown Cover)	Floristics Ground (Ht m_% Cover)	Biometric Number	Biometric Type	EEC	Notes
CQ12	525328	6794784	Steep basalt hills	Closed forest (exotic)	Upper 10-15m, 70%. *Cinnamomum camphora* (dominant), Dysoxylum fraseranum, Mallotus phillipensis, Flindersia australis, Cryptocarya triplinervis*	Mid 4-8m, 30%. *Ligustrum lucidum*, Archidendron pruinosum, Mallotus phillipensis, C. triplinervis, Alectryon tomentosum, Breynia oblongifolia, Maclura cochinchinensis, Alphitonia excelsa, Cupaniopsis parviflora, Lantana camara*, Asparagus plumosus*, Elaeocarpus obovatus, Streblus brunonianus,*	Lower 1-4m, 10%. *Ligustrum lucidum*, Mallotus phillipensis, Breynia oblongifolia, Maclura cochinchinensis, Lantana camara*, Asparagus plumosus*.*	Ground 0-0.25m 10%. *Pandora baileyana, Ipomoea cairica*, Rivina humilis*, Stephania japonica var. dicolor, Dioscorea transversa, Passiflora subpetala*, Asparagus plumosus*.*	NA	NA	NA	Heavily disturbed exotic dominated regrowth. Potential to rehabilitate toward dry rainforest type through control of camphor, privet and asparagus fern.
CQ13	525304	6794628	Basalt hills	Closed forest	Upper 15-25m, 80%. *Araucaria cunninghamii (dominant), Cinnamomum camphora**	Mid 8-12m, 20%. *Araucaria cunninghamii (dominant), Cinnamomum camphora*, Alphitonia excelsa, Archidendron pruinosum, Mallotus phillipensis, Jagera psuedorhus, Callistemon salignus (margins).*	Lower 1-5m, 5%. *Maclura cochinchinensis, Mallotus phillipensis, Breynia oblongifolia, Lantana camara*, Asparagus plumosus*, Araucaria cunninghamii, Alphitonia excelsa, C. camphora*, Pandorea baileyana, Pittosporum revolutum, Smilax australis, Eustrephus latifolius, Abutilon sp., Alectryon tomentosum, Archidendron pruinosum, Streblus brunonianus, Alogyne ilicifolius, Cupaniopsis parvifolia, Notelaea longifolia, Ligustrum sinense*, L. lucidum*.*	Ground 0-0.25m <5%. *Rivina humilis*, Stephania japonica var. dicolor, Eustrephus latifolius*	NR179	Hoop Pine - Yellow Tulipwood dry rainforest of the North Coast	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	A simple forest dominated by Araucaria cunninghamii. Weed infested on margins with Camphor laurel, Privets, Passiflora subpeltata, Rivina humilis and Asparagus fern. Potential to rehabilitate toward dry rainforest type through control of camphor, privet and asparagus fern.
CQ14			Basalt hills	Plantings	Upper 4-6m, 50%. *Acacia melanoxylon, Melaleuca alternifolia, Eucalyptus microcorys, Commersonia bartramia, Melia azederach, Acacia disparrima, Casuarina glauca, Banksia integrifolia, Callistemon viminalis, Ficus macrophylla.*	0	0	0	NA	NA	NA	Amenity planting along either side of acces track.

APPENDIX 4

Vegetation condition (site value) scores

NR179: Hoop Pine - Yellow Tulipwood dry rainforest of the North Coast

Site attribute		Site attribute score				Weighting for site attribute score	Benchmark Measure	Measure for Community Onsite	Score
		0	1	2	3				
a	Native plant species richness	0–10%	>10 – <50% of benchmark	50 – <100% of benchmark	≥ benchmark	25	20	19	2
b	Native overstorey cover	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	10	20-100	80	3
c	Native midstorey cover	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	10	10-60	20	3
d	Native ground cover (grasses)	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	2.5	0-25	0	3
e	Native ground cover (shrubs)	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	2.5	5-25	5	3
f	Native ground cover (other)	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	2.5	5-40	<5	2
g	Exotic plant cover (calculated as percentage of total ground and midstorey cover)	>66%	>33 – 66%	>5 – 33%	0 – 5%	5		>5 – 33%	2
h	Number of trees with hollows	0 (unless benchmark includes zero)	>0 – <50% of benchmark (or if zero included)	50 – <100% of benchmark	≥ benchmark	20	0	0	3
i	Proportion of over-storey species occurring as regeneration	0	>0 – <50%	50 – <100%	100%	12.5		66%	2
j	Total length of fallen logs	0 – 10% of benchmark	>10 – <50% of benchmark	50 – <100% of benchmark	≥ benchmark	10	0.5	0	0

NR161: Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast

Site attribute		Site attribute score				Weighting for site attribute score	Benchmark Measure	Measure for Community Onsite	Score
		0	1	2	3				
a	Native plant species richness	0–10%	>10 – <50% of benchmark	50 – <100% of benchmark	≥ benchmark	25	35	25	2
b	Native overstorey cover	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	10	10-35	70	1
c	Native midstorey cover	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	10	5-18	20	2
d	Native ground cover (grasses)	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	2.5	10-60	5	1
e	Native ground cover (shrubs)	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	2.5	0-40	5	3
f	Native ground cover (other)	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	2.5	5-60	90	2
g	Exotic plant cover (calculated as percentage of total ground and midstorey cover)	>66%	>33 – 66%	>5 – 33%	0 – 5%	5		>5 – 33%	2
h	Number of trees with hollows	0 (unless benchmark includes zero)	>0 – <50% of benchmark (or if zero included)	50 – <100% of benchmark	≥ benchmark	20	1	1	3
i	Proportion of over-storey species occurring as regeneration	0	>0 – <50%	50 – <100%	100%	12.5		40%	1
j	Total length of fallen logs	0 – 10% of benchmark	>10 – <50% of benchmark	50 – <100% of benchmark	≥ benchmark	10	5	2	1

NR217: Paperbark swamp forest of the coastal lowlands of the North Coast

Site attribute		Site attribute score				Weighting for site attribute score	Benchmark Measure	Measure for Community Onsite	Score
		0	1	2	3				
a	Native plant species richness	0–10%	>10 – <50% of benchmark	50 – <100% of benchmark	≥ benchmark	25	6	10	3
b	Native overstorey cover	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	10	10-70	14	3
c	Native midstorey cover	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	10	0-80	11	3
d	Native ground cover (grasses)	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	2.5	0-50	24	3
e	Native ground cover (shrubs)	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	2.5	0-60	0	3
f	Native ground cover (other)	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	2.5	5-60	>5	3
g	Exotic plant cover (calculated as percentage of total ground and midstorey cover)	>66%	>33 – 66%	>5 – 33%	0 – 5%	5		64	1
h	Number of trees with hollows	0 (unless benchmark includes zero)	>0 – <50% of benchmark (or if zero included)	50 – <100% of benchmark	≥ benchmark	20	0.1	0	0
i	Proportion of over-storey species occurring as regeneration	0	>0 – <50%	50 – <100%	100%	12.5		20%	1
j	Total length of fallen logs	0 – 10% of benchmark	>10 – <50% of benchmark	50 – <100% of benchmark	≥ benchmark	10	5	0	0

NR150: Coastal freshwater meadows and forblands of lagoons and wetlands

Site attribute		Site attribute score				Weighting for site attribute score	Benchmark Measure	Measure for Community Onsite	Score
		0	1	2	3				
a	Native plant species richness	0–10%	>10 – <50% of benchmark	50 – <100% of benchmark	≥ benchmark	25	5	9	3
b	Native overstorey cover	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	10	0-5	<5	3
c	Native midstorey cover	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	10	0-5	0	3
d	Native ground cover (grasses)	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	2.5	0-80	34	3
e	Native ground cover (shrubs)	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	2.5	0-10	0	3
f	Native ground cover (other)	0 – 10% or >200% of benchmark	> 10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	Within benchmark	2.5	2-70	64	3
g	Exotic plant cover (calculated as percentage of total ground and midstorey cover)	>66%	>33 – 66%	>5 – 33%	0 – 5%	5		<5%	3
h	Number of trees with hollows	0 (unless benchmark includes zero)	>0 – <50% of benchmark (or if zero included)	50 – <100% of benchmark	≥ benchmark	20	0	0	3
i	Proportion of over-storey species occurring as regeneration	0	>0 – <50%	50 – <100%	100%	12.5		0	0
j	Total length of fallen logs	0 – 10% of benchmark	>10 – <50% of benchmark	50 – <100% of benchmark	≥ benchmark	10	0	0	3

APPENDIX 5

Database searches

Data from the BioNet Atlas of NSW Wildlife website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1Â°; ^^ rounded to 0.01Â°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria : Public Report of all Valid Records of Entities in selected area [North: -28.92 West: 153.2 East: 153.31 South: -29.02] returned a total of 612 records of 222 species.
Report generated on 3/07/2015 1:50 PM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Amphibia	Bufonidae	3269	*Rhinella marina*	*	Cane Toad			8	
Animalia	Reptilia	Typhlopidae	2599	*Ramphotyphlops nigrescens*		Blackish Blind Snake	P		2	
Animalia	Reptilia	Typhlopidae	2603	*Ramphotyphlops proximus*		Proximus Blind Snake	P		1	
Animalia	Reptilia	Boidae	2625	*Morelia spilota*		Carpet & Diamond Pythons	P		1	
Animalia	Aves	Phasianidae	0012	*Excalfactoria chinensis*		King Quail	P		1	
Animalia	Aves	Anseranatidae	0199	*Anseranas semipalmata*		Magpie Goose	V,P		2	
Animalia	Aves	Anatidae	0211	*Anas gracilis*		Grey Teal	P		2	
Animalia	Aves	Anatidae	0208	*Anas superciliosa*		Pacific Black Duck	P		26	
Animalia	Aves	Columbidae	0028	*Columba leucomela*		White-headed Pigeon	P		1	
Animalia	Aves	Columbidae	0032	*Geopelia humeralis*		Bar-shouldered Dove	P		1	
Animalia	Aves	Columbidae	9931	*Geopelia striata*		Peaceful Dove	P		1	
Animalia	Aves	Anhingidae	8731	*Anhinga novaehollandiae*		Australasian Darter	P		1	
Animalia	Aves	Ciconiidae	0183	*Ephippiorhynchus asiaticus*		Black-necked Stork	E1,P		78	
Animalia	Aves	Ardeidae	0977	*Ardea ibis*		Cattle Egret	P	C,J	1	
Animalia	Aves	Ardeidae	0186	*Ardea intermedia*		Intermediate Egret	P		2	
Animalia	Aves	Ardeidae	8703	*Ixobrychus dubius*		Australian Little Bittern	P		1	

Animalia	Aves	Ardeidae	0196	*Ixobrychus flavicollis*	Black Bittern	V,P		1	
Animalia	Aves	Threskiornithidae	0178	*Plegadis falcinellus*	Glossy Ibis	P	C	2	
Animalia	Aves	Threskiornithidae	0180	*Threskiornis spinicollis*	Straw-necked Ibis	P		1	
Animalia	Aves	Accipitridae	0226	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	P	C	1	
Animalia	Aves	Accipitridae	8739	*^^Pandion cristatus*	Eastern Osprey	V,P,3		2	
Animalia	Aves	Rallidae	0056	*Gallinula tenebrosa*	Dusky Moorhen	P		1	
Animalia	Aves	Charadriidae	0135	*Vanellus tricolor*	Banded Lapwing	P		1	
Animalia	Aves	Jacanidae	0171	*Irediparra gallinacea*	Comb-crested Jacana	V,P		1	
Animalia	Aves	Scolopacidae	0978	*Calidris melanotos*	Pectoral Sandpiper	P	J,K	1	
Animalia	Aves	Turnicidae	0013	*Turnix maculosus*	Red-backed Button-quail	V,P		1	
Animalia	Aves	Turnicidae	0019	*Turnix pyrrhothorax*	Red-chested Button-quail	P		1	
Animalia	Aves	Laridae	0110	*Chlidonias hybrida*	Whiskered Tern	P		1	
Animalia	Aves	Cacatuidae	0273	*Eolophus roseicapillus*	Galah	P		1	
Animalia	Aves	Psittacidae	0288	*Platycercus eximius*	Eastern Rosella	P		1	
Animalia	Aves	Psittacidae	0256	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet	P		1	
Animalia	Aves	Psittacidae	9947	*Trichoglossus haematodus*	Rainbow Lorikeet	P		1	
Animalia	Aves	Cuculidae	0337	*Cacomantis pallidus*	Pallid Cuckoo	P		1	
Animalia	Aves	Cuculidae	0347	*Eudynamys orientalis*	Eastern Koel	P		1	
Animalia	Aves	Cuculidae	0348	*Scythrops novaehollandiae*	Channel-billed Cuckoo	P		1	
Animalia	Aves	Alcedinidae	0322	*Dacelo novaeguineae*	Laughing Kookaburra	P		1	
Animalia	Aves	Alcedinidae	0324	*Todiramphus macleayii*	Forest Kingfisher	P		1	
Animalia	Aves	Alcedinidae	0326	*Todiramphus sanctus*	Sacred Kingfisher	P		1	
Animalia	Aves	Coraciidae	0318	*Eurystomus orientalis*	Dollarbird	P		1	
Animalia	Aves	Maluridae	0529	*Malurus cyaneus*	Superb Fairy-wren	P		1	
Animalia	Aves	Acanthizidae	0475	*Acanthiza pusilla*	Brown Thornbill	P		1	

Animalia	Aves	Acanthizidae	0454	*Gerygone mouki*	Brown Gerygone	P	1
Animalia	Aves	Acanthizidae	0488	*Sericornis frontalis*	White-browed Scrubwren	P	1
Animalia	Aves	Meliphagidae	0634	*Manorina melanocephala*	Noisy Miner	P	1
Animalia	Aves	Meliphagidae	0605	*Meliphaga lewinii*	Lewin's Honeyeater	P	2
Animalia	Aves	Meliphagidae	0586	*Myzomela sanguinolenta*	Scarlet Honeyeater	P	1
Animalia	Aves	Meliphagidae	0645	*Philemon corniculatus*	Noisy Friarbird	P	1
Animalia	Aves	Psophodidae	0421	*Psophodes olivaceus*	Eastern Whipbird	P	1
Animalia	Aves	Pachycephalidae	0408	*Colluricincla harmonica*	Grey Shrike-thrush	P	1
Animalia	Aves	Pachycephalidae	0401	*Pachycephala rufiventris*	Rufous Whistler	P	1
Animalia	Aves	Oriolidae	0671	*Oriolus sagittatus*	Olive-backed Oriole	P	1
Animalia	Aves	Oriolidae	0432	*Sphecotheres vieilloti*	Australasian Figbird	P	1
Animalia	Aves	Artamidae	0705	*Cracticus tibicen*	Australian Magpie	P	1
Animalia	Aves	Artamidae	0694	*Strepera graculina*	Pied Currawong	P	1
Animalia	Aves	Rhipiduridae	0361	*Rhipidura albiscapa*	Grey Fantail	P	2
Animalia	Aves	Rhipiduridae	0364	*Rhipidura leucophrys*	Willie Wagtail	P	1
Animalia	Aves	Corvidae	9902	*Corvus orru*	Torresian Crow	P	1
Animalia	Aves	Monarchidae	0373	*Monarcha melanopsis*	Black-faced Monarch	P	1
Animalia	Aves	Monarchidae	0365	*Myiagra rubecula*	Leaden Flycatcher	P	1
Animalia	Aves	Petroicidae	0392	*Eopsaltria australis*	Eastern Yellow Robin	P	2
Animalia	Aves	Hirundinidae	0357	*Hirundo neoxena*	Welcome Swallow	P	1
Animalia	Aves	Sturnidae	0999	*Sturnus vulgaris* *	Common Starling		1
Animalia	Aves	Nectariniidae	0564	*Dicaeum hirundinaceum*	Mistletoebird	P	1
Animalia	Aves	Estrildidae	0662	*Neochmia temporalis*	Red-browed Finch	P	1
Animalia	Mammalia	Tachyglossidae	1003	*Tachyglossus aculeatus*	Short-beaked Echidna	P	4

Animalia	Mammalia	Phascolarctidae	1162	*Phascolarctos cinereus*		Koala	V,P	V	90
Animalia	Mammalia	Vombatidae	1165	*Vombatus ursinus*		Common Wombat	P		1
Animalia	Mammalia	Phalangeridae	1735	*Trichosurus caninus*		Short-eared Possum	P		1
Animalia	Mammalia	Phalangeridae	T082	*Trichosurus sp.*		brushtail possum	P		4
Animalia	Mammalia	Pteropodidae	1280	*Pteropus poliocephalus*		Grey-headed Flying-fox	V,P	V	2
Animalia	Mammalia	Molossidae	1938	*Mormopterus ridei*		Eastern Free-tailed Bat			1
Animalia	Mammalia	Molossidae	T091	*Mormopterus sp.*		mastiff-bat	P		1
Animalia	Mammalia	Vespertilionidae	1349	*Chalinolobus gouldii*		Gould's Wattled Bat	P		1
Animalia	Mammalia	Vespertilionidae	1346	*Miniopterus australis*		Little Bentwing-bat	V,P		1
Animalia	Mammalia	Vespertilionidae	1357	*Myotis macropus*		Southern Myotis	V,P		3
Animalia	Mammalia	Vespertilionidae	1361	*Scoteanax rueppellii*		Greater Broad-nosed Bat	V,P		1
Animalia	Mammalia	Vespertilionidae	1022	*Vespadelus darlingtoni*		Large Forest Bat	P		1
Animalia	Mammalia	Muridae	1395	*Rattus fuscipes*		Bush Rat	P		1
Animalia	Mammalia	Muridae	1408	*Rattus rattus*	*	Black Rat			1
Animalia	Mammalia	Canidae	1531	*Canis lupus*	*	Dingo, domestic dog			2
Animalia	Mammalia	Canidae	1532	*Vulpes vulpes*	*	Fox			12
Animalia	Mammalia	Felidae	1536	*Felis catus*	*	Cat			1
Animalia	Mammalia	Bovidae	1518	*Bos taurus*	*	European cattle			1
Plantae	Flora	Acanthaceae	1010	*Pseuderanthemum variabile*		Pastel Flower			2
Plantae	Flora	Acanthaceae	7044	*Rostellularia obtusa*					2
Plantae	Flora	Adiantaceae	8000	*Adiantum hispidulum*		Rough Maidenhair	P		1

Plantae	Flora	Aizoaceae	7175	*Glinus oppositifolius*				1
Plantae	Flora	Amaranthaceae	7056	*Gomphrena celosioides*	*	Gomphrena Weed		1
Plantae	Flora	Apiaceae	1113	*Eryngium expansum*				2
Plantae	Flora	Apocynaceae	6380	*Carissa ovata*		Currant Bush		1
Plantae	Flora	Apocynaceae	1185	*Parsonsia straminea*		Common Silkpod		4
Plantae	Flora	Arecaceae	1220	*Linospadix monostachyos*		Walking-stick Palm	P	1
Plantae	Flora	Asparagaceae	11785	*Asparagus plumosus*	*	Climbing Asparagus Fern		2
Plantae	Flora	Asteraceae	1255	*Ageratina adenophora*	*	Crofton Weed		1
Plantae	Flora	Asteraceae	1256	*Ageratina riparia*	*	Mistflower		1
Plantae	Flora	Asteraceae	13957	*Centratherum australianum*				1
Plantae	Flora	Asteraceae	12047	*Emilia sonchifolia var. javanica*				1
Plantae	Flora	Asteraceae	1447	*Ethulia conyzoides*	*			1
Plantae	Flora	Asteraceae	7163	*Hemisteptia lyrata*				1
Plantae	Flora	Bignoniaceae	1737	*Macfadyena unguis-cati*	*	Cat's Claw Creeper		1
Plantae	Flora	Capparaceae	1943	*Capparis arborea*		Native Pomegranate		2
Plantae	Flora	Casuarinaceae	2022	*Casuarina glauca*		Swamp Oak		11
Plantae	Flora	Celastraceae	2029	*Elaeodendron australe*				2
Plantae	Flora	Commelinaceae	2209	*Commelina cyanea*		Native Wandering Jew		2
Plantae	Flora	Convolvulaceae	2222	*Dichondra repens*		Kidney Weed		1
Plantae	Flora	Convolvulaceae	2225	*Ipomoea cairica*	*			4
Plantae	Flora	Cyperaceae	2389	*Cyperus procerus*				1

Plantae	Flora	Cyperaceae	2429	*Fimbristylis velata*		1
Plantae	Flora	Cyperaceae	2448	*Isolepis cernua*	Nodding Club-rush	1
Plantae	Flora	Dennstaedtiaceae	7749	*Hypolepis muelleri*	Harsh Ground Fern	3
Plantae	Flora	Dennstaedtiaceae	6403	*Pteridium esculentum*	Bracken	1
Plantae	Flora	Dilleniaceae	2532	*Hibbertia dentata*	Twining Guinea Flower	1
Plantae	Flora	Ebenaceae	2562	*Diospyros australis*	Black Plum	2
Plantae	Flora	Ebenaceae	2566	*Diospyros pentamera*	Myrtle Ebony	1
Plantae	Flora	Elaeocarpaceae	2573	*Elaeocarpus obovatus*	Hard Quandong	2
Plantae	Flora	Elaeocarpaceae	2574	*Elaeocarpus reticulatus*	Blueberry Ash	1
Plantae	Flora	Ericaceae	2649	*Monotoca scoparia*		1
Plantae	Flora	Escalloniaceae	3229	*Quintinia verdonii*	Grey Possumwood	1
Plantae	Flora	Euphorbiaceae	8669	*Alchornea ilicifolia*	Native Holly	2
Plantae	Flora	Euphorbiaceae	2706	*Croton verreauxii*	Green Native Cascarilla	4
Plantae	Flora	Euphorbiaceae	2735	*Mallotus philippensis*	Red Kamala	1
Plantae	Flora	Fabaceae (Caesalpinioideae)	1881	*Caesalpinia subtropica*	Corky Prickly-vine	2
Plantae	Flora	Fabaceae (Caesalpinioideae)	7377	*Senna pendula var. glabrata* *		1
Plantae	Flora	Fabaceae (Faboideae)	6807	*Austrosteenisia glabristyla*	Giant Blood Vine	2

Plantae	Flora	Fabaceae (Faboideae)	2832	*Derris involuta*				1	
Plantae	Flora	Fabaceae (Faboideae)	2833	*Desmodium acanthocladum*		Thorny Pea	V,P	V	29
Plantae	Flora	Fabaceae (Faboideae)	2990	*Pultenaea euchila*					1
Plantae	Flora	Fabaceae (Faboideae)	11188	*Vigna racemosa*	*				1
Plantae	Flora	Fabaceae (Faboideae)	10065	*Vigna vexillata var. angustifolia*		Wild Cow Pea			1
Plantae	Flora	Fabaceae (Mimosoideae)	3824	*Acacia melanoxylon*		Blackwood			1
Plantae	Flora	Haloragaceae	7456	*Myriophyllum gracile var. lineare*					1
Plantae	Flora	Haloragaceae	7059	*Myriophyllum striatum*					1
Plantae	Flora	Juncaceae	3348	*Juncus subsecundus*		Finger Rush			1
Plantae	Flora	Lamiaceae	3397	*Plectranthus parviflorus*					1
Plantae	Flora	Lamiaceae	3444	*Salvia plebeia*		Austral Sage			1
Plantae	Flora	Lauraceae	3471	*Cinnamomum camphora*	*	Camphor Laurel			3
Plantae	Flora	Lauraceae	3479	*Cryptocarya glaucescens*		Jackwood			1
Plantae	Flora	Lauraceae	3486	*Cryptocarya triplinervis*		Three-veined Cryptocarya			1
Plantae	Flora	Lauraceae	9275	*Cryptocarya triplinervis var. triplinervis*					2
Plantae	Flora	Lauraceae	3495	*Endiandra sieberi*		Hard Corkwood			3

Plantae	Flora	Lomandraceae	6308	*Lomandra longifolia*		Spiny-headed Mat-rush			1	
Plantae	Flora	Luzuriagaceae	6016	*Geitonoplesium cymosum*		Scrambling Lily			5	
Plantae	Flora	Malvaceae	6129	*Commersonia bartramia*		Brown Kurrajong			1	
Plantae	Flora	Malvaceae	3673	*Sida rhombifolia*	*	Paddy's Lucerne			1	
Plantae	Flora	Moraceae	8841	*Ficus macrophylla subsp. macrophylla*		Moreton Bay Fig			1	
Plantae	Flora	Moraceae	8407	*Ficus superba var. henneana*		Deciduous Fig			1	
Plantae	Flora	Moraceae	3928	*Maclura cochinchinensis*		Cockspur Thorn			7	
Plantae	Flora	Moraceae	3931	*Streblus brunonianus*		Whalebone Tree			6	
Plantae	Flora	Myrsinaceae	3959	*Embelia australiana*					1	
Plantae	Flora	Myrsinaceae	11951	*Myrsine richmondensis*		Ripple-leaf Muttonwood	E1,P	E	1	
Plantae	Flora	Myrsinaceae	11953	*Myrsine variabilis*					1	
Plantae	Flora	Myrtaceae	4010	*Callistemon pachyphyllus*		Wallum Bottlebrush			3	
Plantae	Flora	Myrtaceae	4015	*Callistemon salignus*		Willow Bottlebrush			2	
Plantae	Flora	Myrtaceae	4019	*Callistemon viminalis*		Weeping Bottlebrush			2	
Plantae	Flora	Myrtaceae	9601	*Corymbia intermedia*		Pink Bloodwood			1	
Plantae	Flora	Myrtaceae	4101	*Eucalyptus grandis*		Flooded Gum			1	
Plantae	Flora	Myrtaceae	4191	*Eucalyptus tereticornis*		Forest Red Gum			9	
Plantae	Flora	Myrtaceae	11397	*Gossia acmenoides*		Scrub Ironwood			2	
Plantae	Flora	Myrtaceae	11398	*Gossia bidwillii*		Python Tree			2	
Plantae	Flora	Myrtaceae	11894	*Gossia fragrantissima*		Sweet Myrtle	E1,P	E	30	
Plantae	Flora	Myrtaceae	4215	*Leptospermum brachyandrum*					1	

Plantae	Flora	Myrtaceae	4221	*Leptospermum juniperinum*		Prickly Tea-tree			2	
Plantae	Flora	Myrtaceae	4224	*Leptospermum liversidgei*		Olive Tea-tree			1	
Plantae	Flora	Myrtaceae	8199	*Leptospermum polygalifolium subsp. cismontanum*					3	
Plantae	Flora	Myrtaceae	4241	*Leptospermum whitei*					1	
Plantae	Flora	Myrtaceae	4242	*Lophostemon confertus*		Brush Box			1	
Plantae	Flora	Myrtaceae	4243	*Lophostemon suaveolens*		Swamp Mahogany, Swamp Turpentine			2	
Plantae	Flora	Myrtaceae	4245	*Melaleuca alternifolia*					3	
Plantae	Flora	Myrtaceae	6390	*Melaleuca bracteata*		Black Tea-tree			3	
Plantae	Flora	Myrtaceae	4255	*Melaleuca irbyana*		Weeping Paperbark	E1,P		2	
Plantae	Flora	Myrtaceae	4258	*Melaleuca nodosa*					2	
Plantae	Flora	Myrtaceae	4260	*Melaleuca quinquenervia*		Broad-leaved Paperbark			3	
Plantae	Flora	Myrtaceae	4261	*Melaleuca sieberi*					1	
Plantae	Flora	Myrtaceae	4262	*Melaleuca squamea*		Swamp Honey-myrtle			1	
Plantae	Flora	Myrtaceae	4264	*Melaleuca styphelioides*		Prickly-leaved Tea Tree			3	
Plantae	Flora	Myrtaceae	4266	*Melaleuca thymifolia*		Thyme Honey-myrtle			2	
Plantae	Flora	Myrtaceae	4290	*Syzygium hodgkinsoniae*		Red Lilly Pilly	V,P	V	1	
Plantae	Flora	Ochnaceae	4306	*Ochna serrulata*	*	Mickey Mouse Plant			2	
Plantae	Flora	Oleaceae	4311	*Jasminum volubile*					3	
Plantae	Flora	Oleaceae	4313	*Ligustrum sinense*	*	Small-leaved Privet			2	
Plantae	Flora	Oleaceae	4318	*Notelaea longifolia*		Large Mock-olive			1	
Plantae	Flora	Onagraceae	7375	*Ludwigia peploides subsp. montevidensis*		Water Primrose			1	

Plantae	Flora	Phyllanthaceae	2695	*Breynia oblongifolia*		Coffee Bush	1
Plantae	Flora	Pittosporaceae	11204	*Pittosporum multiflorum*		Orange Thorn	3
Plantae	Flora	Pittosporaceae	4683	*Pittosporum revolutum*		Rough Fruit Pittosporum	1
Plantae	Flora	Pittosporaceae	4685	*Pittosporum undulatum*		Sweet Pittosporum	1
Plantae	Flora	Poaceae	4831	*Chloris gayana*	*	Rhodes Grass	1
Plantae	Flora	Poaceae	6540	*Cynodon dactylon*		Common Couch	1
Plantae	Flora	Poaceae	4946	*Entolasia marginata*		Bordered Panic	1
Plantae	Flora	Poaceae	5024	*Leersia hexandra*		Swamp Ricegrass	1
Plantae	Flora	Poaceae	7707	*Microlaena stipoides var. stipoides*		Weeping Grass	1
Plantae	Flora	Poaceae	5044	*Oplismenus aemulus*			2
Plantae	Flora	Poaceae	5045	*Oplismenus imbecillis*			3
Plantae	Flora	Poaceae	6395	*Panicum decompositum*		Native Millet	1
Plantae	Flora	Poaceae	9327	*Paspalum ciliatifolium*	*	One-spiked Paspalum	1
Plantae	Flora	Poaceae	5113	*Phragmites australis*		Common Reed	1
Plantae	Flora	Polygonaceae	7568	*Persicaria decipiens*		Slender Knotweed	1
Plantae	Flora	Polygonaceae	5281	*Persicaria hydropiper*		Water Pepper	1
Plantae	Flora	Polygonaceae	8887	*Persicaria praetermissa*			2
Plantae	Flora	Proteaceae	5396	*Grevillea robusta*		Silky Oak	1
Plantae	Flora	Proteaceae	5482	*Stenocarpus sinuatus*		Firewheel Tree	1
Plantae	Flora	Rhamnaceae	7686	*Alphitonia excelsa*		Red Ash	2
Plantae	Flora	Rubiaceae	10868	*Atractocarpus chartaceus*			2
Plantae	Flora	Rubiaceae	11599	*Cyclophyllum longipetalum*		Coast Canthium	1

Plantae	Flora	Rubiaceae	5691	*Hodgkinsonia ovatiflora*			1
Plantae	Flora	Rubiaceae	11942	*Psydrax odorata*		Shiny-leaved Canthium	1
Plantae	Flora	Rutaceae	5722	*Acronychia oblongifolia*		White Aspen	1
Plantae	Flora	Sapindaceae	5878	*Arytera distylis*		Twin-leaved Coogera	1
Plantae	Flora	Sapindaceae	5884	*Cupaniopsis anacardioides*		Tuckeroo	1
Plantae	Flora	Sapindaceae	5886	*Cupaniopsis parvifolia*		Small-leaved Tuckeroo	3
Plantae	Flora	Sapindaceae	5917	*Guioa semiglauca*		Guioa	1
Plantae	Flora	Sapindaceae	12514	*Jagera pseudorhus var. pseudorhus*		Foambark Tree	3
Plantae	Flora	Solanaceae	7043	*Solanum americanum*		Glossy Nightshade	2
Plantae	Flora	Solanaceae	7325	*Solanum capsicoides*	*	Devil's Apple	1
Plantae	Flora	Solanaceae	6080	*Solanum erianthum*	*	Potato Tree	1
Plantae	Flora	Solanaceae	6087	*Solanum laciniatum*		Large-flowered Kangaroo Apple	1
Plantae	Flora	Solanaceae	6090	*Solanum mauritianum*	*	Wild Tobacco Bush	1
Plantae	Flora	Ulmaceae	6218	*Aphananthe philippinensis*		Rough-leaved Elm	4
Plantae	Flora	Urticaceae	6228	*Dendrocnide photinophylla*		Shiny-leaved Stinging Tree	1
Plantae	Flora	Verbenaceae	6248	*Lantana camara*	*	Lantana	3
Plantae	Flora	Violaceae	6272	*Viola hederacea*		Ivy-leaved Violet	2
Plantae	Flora	Viscaceae	6278	*Notothixos incanus*			1

Australian Government

Department of the Environment

EPBC Act Protected Matters Report

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

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

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

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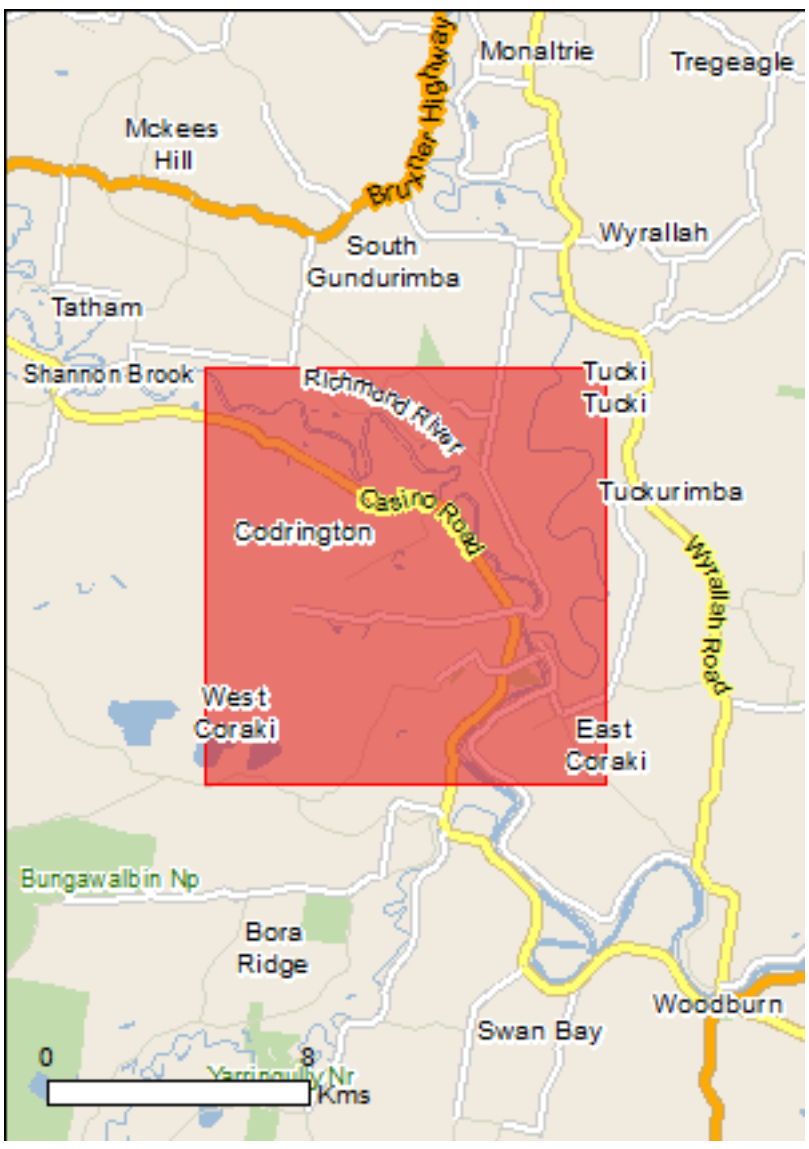

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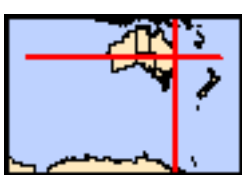
Coordinates

Buffer: 0.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	47
Listed Migratory Species:	34

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	34
Whales and Other Cetaceans:	1
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	1
Invasive Species:	43
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Endangered	Species or species habitat may occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora epomophora Southern Royal Albatross [25996]	Vulnerable	Species or species habitat may occur within area
Diomedea epomophora sanfordi Northern Royal Albatross [82331]	Endangered	Species or species habitat may occur within area
Diomedea exulans antipodensis Antipodean Albatross [82269]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans exulans Tristan Albatross [82337]	Endangered	Species or species habitat may occur within area
Diomedea exulans gibsoni Gibson's Albatross [82271]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta salvini Salvin's Albatross [82343]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Insects		
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
[Pteropus poliocephalus](#) Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
[Allocasuarina defungens](#) Dwarf Heath Casuarina [21924]	Endangered	Species or species habitat may occur within area
[Arthraxon hispidus](#) Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area
[Bulbophyllum globuliforme](#) Miniature Moss-orchid, Hoop Pine Orchid [6649]	Vulnerable	Species or species habitat may occur within area
[Clematis fawcettii](#) Stream Clematis [4311]	Vulnerable	Species or species habitat likely to occur within area
[Cryptocarya foetida](#) Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat likely to occur within area
[Desmodium acanthocladum](#) Thorny Pea [17972]	Vulnerable	Species or species habitat likely to occur within area
[Gossia fragrantissima](#) Sweet Myrtle, Small-leaved Myrtle [78867]	Endangered	Species or species habitat likely to occur within area
[Myrsine richmondensis](#) Purple-leaf Muttonwood, Lismore Muttonwood [83888]	Endangered	Species or species habitat likely to occur within area
[Ochrosia moorei](#) Southern Ochrosia [11350]	Endangered	Species or species habitat likely to occur within area
[Phaius australis](#) Lesser Swamp-orchid [5872]	Endangered	Species or species habitat likely to occur within area
[Syzygium hodgkinsoniae](#) Smooth-bark Rose Apple, Red Lilly Pilly [3539]	Vulnerable	Species or species habitat may occur within area
[Thesium australe](#) Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
[Coeranoscincus reticulatus](#) Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
[Natator depressus](#)		
Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
[Apus pacificus](#)		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Diomedea antipodensis](#)		
Antipodean Albatross [64458]	Vulnerable*	Species or species habitat may occur within area
[Diomedea dabbenena](#)		
Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
[Diomedea epomophora (sensu stricto)](#)		
Southern Royal Albatross [1072]	Vulnerable*	Species or species habitat may occur within area
[Diomedea exulans (sensu lato)](#)		
Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
[Diomedea gibsoni](#)		
Gibson's Albatross [64466]	Vulnerable*	Species or species habitat may occur within area
[Diomedea sanfordi](#)		
Northern Royal Albatross [64456]	Endangered*	Species or species habitat may occur within area
[Macronectes giganteus](#)		
Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
[Macronectes halli](#)		
Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
[Thalassarche cauta (sensu stricto)](#)		
Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat may occur within area
[Thalassarche eremita](#)		
Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
[Thalassarche impavida](#)		
Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
[Thalassarche melanophris](#)		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
[Thalassarche salvini](#)		
Salvin's Albatross [64463]	Vulnerable*	Species or species habitat likely to occur within area
[Thalassarche steadi](#)		
White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Migratory Marine Species		
[Caretta caretta](#)		
Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to

Name	Threatened	Type of Presence
		occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Breeding likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Pandion cristatus Eastern Osprey [82411]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Telecommunications Commission

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Breeding likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable*	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable*	Species or species habitat may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat may occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered*	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Macronectes halli Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable*	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Sousa chinensis		
Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area

Extra Information

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata		
Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus		
Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis		
Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus africanus Climbing Asparagus, Climbing Asparagus Fern [66907]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish		Species or species

Name	Status	Type of Presence
Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur

Name	Status	Type of Presence within area

Caveat

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

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

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

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

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-28.92 153.2,-29.02 153.2,-29.02 153.31,-28.92 153.31,-28.92 153.2

Acknowledgements

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

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

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

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

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APPENDIX 6

Flora species list from field survey

Abbreviations:
Status: V: Vulnerable; **EPBC Act**: Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999; **TSC Act**: New South Wales *Threatened Species Conservation Act 1995*.

Group	Family	Scientific Name	Common Name	Weeds	Threatened
Angiosperms	Apiaceae	*Centella asiatica*	Gotu Kola	X	
Angiosperms	Apocynaceae	*Carissa ovata*	Conkleberry		
Angiosperms	Apocynaceae	*Parsonsia straminea*	Monkey Rope Vine		
Angiosperms	Araliaceae	*Schefflera actinophylla*	Umbrella Tree	X	
Angiosperms	Araucariaceae	*Araucaria cunninghamii*	Hoop Pine		
Angiosperms	Ascleopiadaceae	*Asclepias curvassica*	Redhead Cotton Bush	X	
Angiosperms	Asclepiadaceae	*Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush	X	
Angiosperms	Asclepiadaceae	*Gomphocarpus physocarpus*	Balloon Cotton Bush	X	
Angiosperms	Asparagaceae	*Asparagus plumosus*	Climbing Asparagus	X	
Angiosperms	Asteraceae	*Ageratina riparia*	Mistflower	X	
Angiosperms	Asteraceae	*Ageratum houstonianum*	Blue Top	X	
Angiosperms	Asteraceae	*Bidens pilosa*	Cobblers Peg	X	
Angiosperms	Asteraceae	*Cirsium vulgare*	Spear Thistle	X	
Angiosperms	Asteraceae	*Conyza sumatrensis*	Fleabane	X	
Angiosperms	Asteraceae	*Eclipta prostrata*			
Angiosperms	Asteraceae	*Senecio madagascarensis**	Fire Weed	X	
Angiosperms	Bignoniaceae	*Pandora baileyana*	Wonga Vine		
Angiosperms	Bignoniaceae	*Pandorea pandorana*	Wonga Vine		
Angiosperms	Caesalpiniaceae	*Caesalpinea decapetala*	Thorny Poinciana	X	
Angiosperms	Caesalpiniaceae	*Senna pendula var. glabrata*	Winter Senna	X	
Angiosperms	Campanulaceae	*Lobelia purpurescens*	Lobelia		
Angiosperms	Capparaceae	*Capparis arborea*	Brush Caperberry		
Angiosperms	Casuarinaceae	*Casuarina glauca*	Swamp Oak		
Angiosperms	Commelinaceae	*Commelina cyanea*	Scurvy Weed		
Angiosperms	Convolvulaceae	*Dichondra repens*	Kidney Weed		
Angiosperms	Cyperaceae	*Carex appressa*	Carex		

Group	Family	Scientific Name	Common Name	Weeds	Threatened
Angiosperms	Cyperaceae	*Cyperus exaltatus*	Tall Flat Sedge		
Angiosperms	Dioscoreaceae	*Dioscorea transversa*	Native Yam		
Angiosperms	Elaeocarpaceae	*Elaeocarpus obovatus*	Hard Quandong		
Angiosperms	Euphorbbiaceae	*Allogyne ilicifolia*	Native Holly		
Angiosperms	Euphorbiaceae	*Breynia oblongifolia*	Breynia		
Angiosperms	Euphorbiaceae	*Drypetes deplanchei*	Yellow Tulip Wood		
Angiosperms	Euphorbiaceae	*Glochidion ferdinandi*	Cheese Tree		
Angiosperms	Euphorbiaceae	*Mallotus philippensis*	Red Kamala		
Angiosperms	Fabaceae	*Austrosteenisia blackii*	Blood Vine		
Angiosperms	Flacourtiaceae	*Scolopia braunii*	Flintwood		
Angiosperms	Juncaceae	*Juncus uncitatus*			
Angiosperms	Lamiaceae	*Plectranthus parviflorus*	Cockspur Flower		
Angiosperms	Lauraceae	*Cinnamomum camphora*	Camphor Laurel	X	
Angiosperms	Lauraceae	*Cryptocarya triplinervis var. pubens*	Thre-veined Laurel		
Angiosperms	Malvaceae	*Abutilon sp.*			
Angiosperms	Malvaceae	*Hibiscus heterophyllus*	Rosella		
Angiosperms	Malvaceae	*Sida acuta*	Spink-headed Sida	X	
Angiosperms	Meliaceae	*Melia azederach*	White Cedar		
Angiosperms	Menispermaceae	*Stephania japonica var. discolor*	Snake Vine		
Angiosperms	Mimosaceae	*Acacia disparrima*	Southern Salwood		
Angiosperms	Mimosaceae	*Acacia melanoxylon*	Blackwood, Sally Wattle		
Angiosperms	Mimosaceae	*Archidendron pruinosum*	Laceflower		
Angiosperms	Moraceae	*Ficus macrophylla*	Moreton Bay Fig		
Angiosperms	Moraceae	*Ficus obliqua*	Small leaved Fig		
Angiosperms	Moraceae	*Maclura cochinchinensis*	Cockspur Thorn		
Angiosperms	Moraceae	*Streblus brunonianus*	Whalebone Tree		
Angiosperms	Moraceae	*Trophis scandens*	Burny Vine		
Angiosperms	Myrtaceae	*Callistemon salignus var. salignus*	Pink-topped Swamp Botlebrush		

Group	Family	Scientific Name	Common Name	Weeds	Threatened
Angiosperms	Myrtaceae	*Callistemon viminalis*	Weeping Bottlebrush		
Angiosperms	Myrtaceae	*Eucalyptus microcorys*	Tallowood		
Angiosperms	Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum		
Angiosperms	Myrtaceae	*Melaleuca alternifolia*	Tea Tree		
Angiosperms	Myrtaceae	*Melaleuca quinquenervia*	Coastal Paperbark		
Angiosperms	Myrtaceae	*Melaleuca styphelioides*	Prickly Leaved Tea Tree		
Angiosperms	Ochnaceae	*Ochna serrulata*	Mickey Mouse Bush	X	
Angiosperms	Oleaceae	*Ligustrum lucidum*	Broad Leaf Privet	X	
Angiosperms	Oleaceae	*Ligustrum sinense*	Small Leaf Privet	X	
Angiosperms	Oleaceae	*Notelaea longifolia (forma glabra)*	Mock Olive		
Angiosperms	Onagraceae	*Ludwigia octovalvis*	Willow Primrose		
Angiosperms	Onagraceae	*Ludwigia peploides subsp. montevidensis*	Water Primrose		
Angiosperms	Oxalidaceae	*Oxalis corniculata*	Oxalis	X	
Angiosperms	Passifloraceae	*Passiflora edulis*	Edible Passionfruit	X	
Angiosperms	Passifloraceae	*Passiflora suberosa*	Corky Passionfruit	X	
Angiosperms	Passifloraceae	*Passiflora subpeltata*	White Passionfruit	X	
Angiosperms	Phytolaccaceae	*Rivina humilis*	Coral Berry	X	
Angiosperms	Pittosporaceae	*Pittosporum revolutum*	Hairy Pittosporum		
Angiosperms	Pittosporaceae	*Pittosporum undulatum*	Sweet Piitosporum		
Angiosperms	Poaceae	*Andropogon virginicus*	Whisky Grass	X	
Angiosperms	Poaceae	*Axonopus compressus*	Broad leaf Carpet Grass	X	
Angiosperms	Poaceae	*Cymbopogon refractus*	Barb Wire Grass		
Angiosperms	Poaceae	*Cynodon dactylon var. dactylon*	Common Couch		
Angiosperms	Poaceae	*Digitaria ciliaris*	Summer Grass	X	
Angiosperms	Poaceae	*Digitaria didactyla*	Qld Blue Couch		
Angiosperms	Poaceae	*Entolasia stricta*	Wiry Panic		
Angiosperms	Poaceae	*Imperata cylindrica*	Blady Grass		
Angiosperms	Poaceae	*Leersia hexandra*	Swamp Ricegrass		
Angiosperms	Poaceae	*Melinis repens*	Molasses Grass	X	

Group	Family	Scientific Name	Common Name	Weeds	Threatened
Angiosperms	Poaceae	*Oplismenus aemulus*	Wallaby Grass		
Angiosperms	Poaceae	*Paspalum conjugatum*	Paspalum	X	
Angiosperms	Poaceae	*Paspalum dilatatum*	Paspalum	X	
Angiosperms	Poaceae	*Paspalum weinstedii*	Broad Leaf Paspalum	X	
Angiosperms	Poaceae	*Pennisetum clandestinum*	Kikuyu	X	
Angiosperms	Poaceae	*Setaria sphacelata*	Canary Seed Grass	X	
Angiosperms	Polygonaceae	*Persicaria strigosa*	Spotted Knotweed		
Angiosperms	Pontederiaceae	*Eichhornia crassipes*	Water Hyancinth	X	
Angiosperms	Proteaceae	*Banksia integrifolia*	Coastal Banksia		
Angiosperms	Proteaceae	*Macadamia tetraphylla*	Rough-shelled Bush Nut		V (EPBC Act and TSC Act)
Angiosperms	Ranunculaceae	*Ranunculus inundatus*	River Buttercup		
Angiosperms	Rhamnaceae	*Alphitonia excelsa*	Red Ash		
Angiosperms	Rutaceae	*Flindersia australis*	Crows Ash		
Angiosperms	Rutaceae	*Pentaceras australe*	Black Teak		
Angiosperms	Salviniaceae	*Azolla pinnata*	Azolla		
Angiosperms	Sapindaceae	*Alectryon tomentosum*	Hairy Alectryon		
Angiosperms	Sapindaceae	*Cupaniopsis parviflora*	Small-leaved Tuckeroo		
Angiosperms	Sapindaceae	*Guioa semiglauca*	Guioa		
Angiosperms	Sapindaceae	*Jagera pseudorhus*	Foambark		
Angiosperms	Smilacaceae	*Smilax australis*	Sarsaparilla		
Angiosperms	Smilacaceae	*Eustrephus latifolius*	Wombat Berry		
Angiosperms	Solanaceae	*Cestrum parqui*	Green Cestrum	X	
Angiosperms	Solanaceae	*Duboisia myoporoides*	Corkwood		
Angiosperms	Solanaceae	*Solanum mauritianum*	Tobacco Bush	X	
Angiosperms	Solanaceae	*Solanum seaforthianum*	Climbing Solanum		
Angiosperms	Solanaceae	*Solanum torvum*	Devils Fig	X	
Angiosperms	Sterculiaceae	*Commersonia bartramia*	Brown Kurrajong		
Angiosperms	Thymelaeaceae	*Wikstroemia indica*	Tie Bush		

Group	Family	Scientific Name	Common Name	Weeds	Threatened
Angiosperms	Verbenaceae	*Lantana camara*	Lantana	X	
Angiosperms	Xanthorrhoeaceae	*Lomandra longifolia*	Lomandra		
Ferns & Fern Allies	Aspleniaceae	*Asplenium australasicum*	Birds Nest Fern		
Ferns & Fern Allies	Blechnaceae	*Doodia aspera*	Prickly Rasp Fern		
Ferns & Fern Allies	Dennstaedtiaceae	*Pteridium esculentum*	Bracken Fern		

APPENDIX 7

Fauna species list from field survey

Abbreviations:
Status: V: Vulnerable; **EPBC Act**: Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999; **TSC Act**: New South Wales *Threatened Species Conservation Act 1995*.

Class	Scientific Name	Common Name	Threatened	Exotic	Evidence Only
Frogs	*Crinia signifera*	clicking froglet			
Frogs	*Litoria caerulea*	common green treefrog			
Birds	*Acanthiza pusilla*	brown thornbill			
Birds	*Anas superciliosa*	Pacific black duck			
Birds	*Aquila audax*	wedge-tailed eagle			
Birds	*Ardea ibis*	cattle egret			
Birds	*Ardea modesta*	eastern great egret			
Birds	*Cacatua galerita*	sulphur-crested cockatoo			
Birds	*Centropus phasianinus*	pheasant coucal			
Birds	*Chenonetta jubata*	Australian wood duck			
Birds	*Cisticola exilis*	golden-headed cisticola			
Birds	*Colluricincla harmonica*	grey shrike-thrush			
Birds	*Coracina novaehollandiae*	black-faced cuckoo-shrike			
Birds	*Corvus orru*	Torresian crow			
Birds	*Cracticus nigrogularis*	pied butcherbird			
Birds	*Cracticus tibicen*	Australian magpie			
Birds	*Cracticus torquatus*	grey butcherbird			
Birds	*Cygnus atratus*	black swan			
Birds	*Dicrurus bracteatus*	spangled drongo			
Birds	*Egretta novaehollandiae*	white-faced heron			
Birds	*Eolophus roseicapillus*	galah			
Birds	*Gallinula tenebrosa*	dusky moorhen			
Birds	*Geopelia humeralis*	bar-shouldered dove			
Birds	*Grallina cyanoleuca*	magpie-lark			
Birds	*Haliastur sphenurus*	whistling kite			
Birds	*Lichmera indistincta*	brown honeyeater			

Class	Scientific Name	Common Name	Threatened	Exotic	Evidence Only
Birds	*Macropygia amboinensis*	brown cuckoo-dove			
Birds	*Malurus cyaneus*	superb fairy-wren			
Birds	*Malurus lamberti*	variegated fairy-wren			
Birds	*Malurus melanocephalus*	red-backed fairy-wren			
Birds	*Manorina melanocephala*	noisy miner			
Birds	*Meliphaga lewinii*	Lewin's honeyeater			
Birds	*Melithreptus albogularis*	white-throated honeyeater			
Birds	*Merops ornatus*	rainbow bee-eater			
Birds	*Neochmia temporalis*	red-browed finch			
Birds	*Ocyphaps lophotes*	crested pigeon			
Birds	*Pachycephala rufiventris*	rufous whistler			
Birds	*Phalacrocorax sulcirostris*	little black cormorant			
Birds	*Philemon corniculatus*	noisy friarbird			
Birds	*Platycercus adscitus*	pale-headed rosella			
Birds	*Rhipidura albiscapa*	grey fantail			
Birds	*Rhipidura leucophrys*	willie wagtail			
Birds	*Strepera graculina*	pied currawong			
Birds	*Taeniopygia bichenovii*	double-barred finch			
Birds	*Threskiornis molucca*	Australian white ibis			
Birds	*Trichoglossus chlorolepidotus*	scaly-breasted lorikeet			
Birds	*Trichoglossus haematodus*	rainbow lorikeet			
Birds	*Vanellus miles*	masked lapwing			
Birds	*Zosterops lateralis*	silvereye			
Mammals	*Isoodon macrourus*	northern brown bandicoot			X
Mammals	*Phascolarctos cinereus*	koala	V (EPBC Act and TSC Act)		X
Mammals	*Trichosurus vulpecula*	common brushtail possum			X
Mammals	*Vulpes vulpes*	red fox		X	X