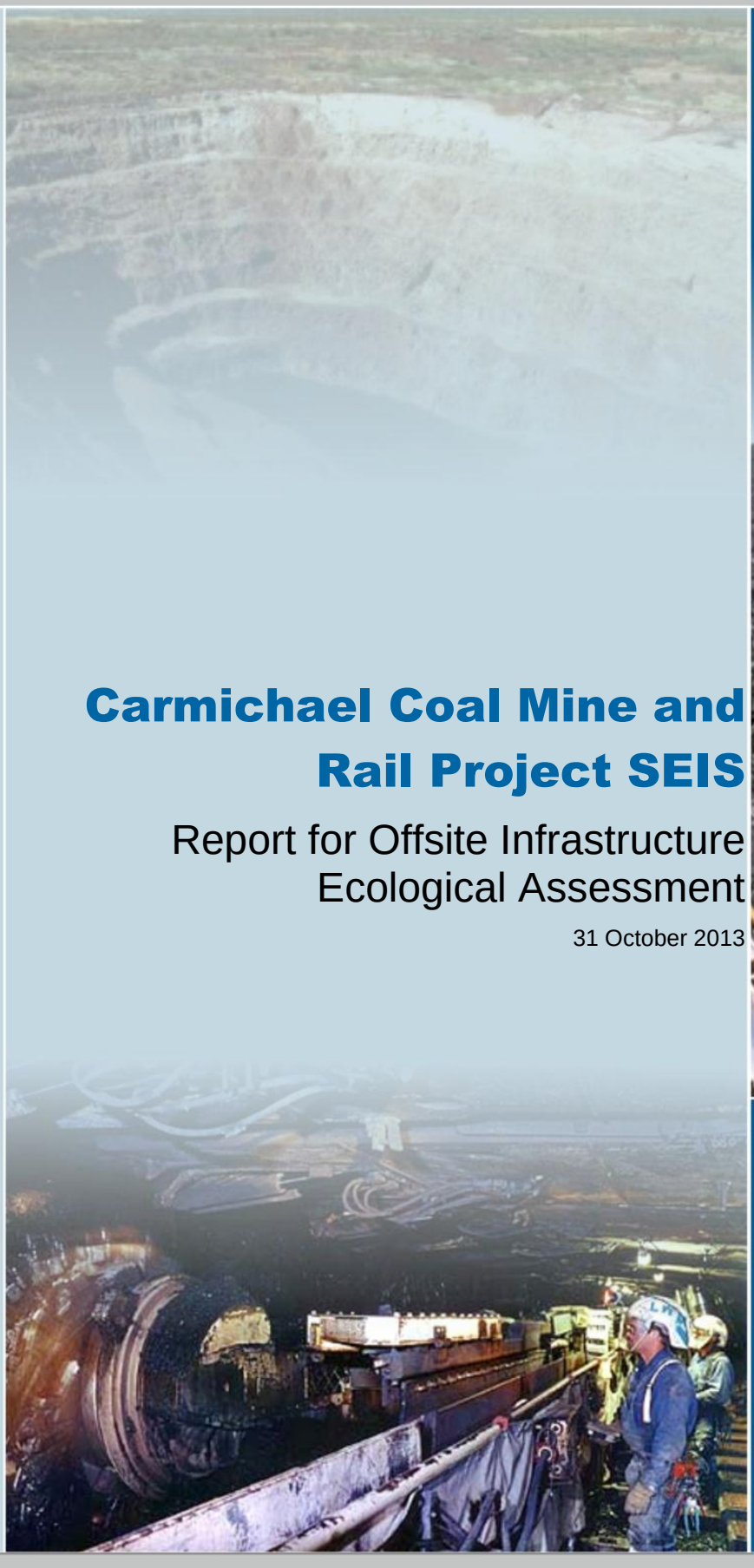
Adani Mining Pty Ltd

adani



Carmichael Coal Mine and Rail Project SEIS

Report for Offsite Infrastructure Ecological Assessment

31 October 2013

GHD

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Executive summary

In March 2013, Adani Mining Pty Ltd (Adani) commissioned an assessment of terrestrial and aquatic ecological values within and adjacent to an area proposed for offsite infrastructure for the Carmichael Coal Mine and Rail Project (the Project). This assessment has been undertaken as part of a Supplementary Environmental Impact Statement (SEIS) to provide information on areas that were not assessed during the original EIS.

Desktop and field surveys were undertaken within a 7187.2 ha area of investigation, referred herein as the 'Study Area', an area within Lot 662 on PH1491 east of the Project (Mine), encompassing the following proposed offsite infrastructure:

- Worker accommodation village and airport
- Industrial precinct including rail siding
- An off-stream storage and pump station near Belyando River
- 5 gigalitre (GL) storage dam

This report presents a summary of the existing ecological values within the Study Area, based on the results of desktop and field investigations. An additional piece of infrastructure (Moray-Carmichael Road realignment) was added to the Project (Offsite) after field surveys were completed. Wherever possible, desktop information on that area has been incorporated in this report. The report also presents a review of potential impacts that construction and operation of the Project (Offsite) may have on the ecological values of the Study Area and outlines measures to manage and mitigate those potential impacts.

Field surveys of the Study Area were undertaken between 28 April 2013 and 6 May 2013, coinciding with the late wet / early dry season.

Flora and fauna surveys incorporated:

- 10 comprehensive and 49 rapid flora assessment sites
- 2 comprehensive and 38 rapid terrestrial fauna assessment sites
- 12 rapid aquatic (flora and fauna) assessment sites
- Additional targeted survey for threatened species including:
  - 23 hrs of dam watches and 2,016 hrs of remote camera to detect the black-throated finch (southern) (*Poephila cincta cincta*)
  - 320 km of driving transects, 23 hrs of dam watches and 2,016 hrs of remote camera to detect the squatter pigeon (southern) (*Geophaps scripta scripta*)
  - 21 hrs of diurnal active search and 24 hrs of nocturnal active search for brigalow associated reptiles: yakka skink (*Egernia rugosa*), ornamental snake (*Denisonia maculata*)

A description of the existing terrestrial ecological values of the Study Area, based on the results of the desktop assessment and field studies is provided. The key findings from this terrestrial and aquatic ecological assessment are summarised below.

Study Area in the landscape

The Study Area occurs in an agricultural landscape, where historic and current land use practices associated with cattle grazing have altered the extent, connectivity and ecological integrity of vegetation communities and the habitats they provide. Furthermore, disturbances associated with introduced plant and animal species are a feature of this agricultural landscape. The Project (Offsite) footprint has been located in a predominantly cleared landscape, which is subject to ongoing cattle grazing.

Vegetation communities and fauna habitats at Study Area

Remnant vegetation occurs over approximately 4.5 percent of the Study Area (approximately 322.5 ha of the 7187.2 ha). Where remnant vegetation occurs, an assortment of habitat resources are available for fauna, in contrast with surrounding areas that have been previously cleared.

Seven broad vegetation communities were identified in the Study Area based on the particular vegetation communities and land forms present. A total of 14 field verified regional ecosystems (REs) were identified within the Study Area, 5 from the Desert Uplands bioregion and 9 from the Brigalow Belt bioregion.

Cleared land dominates much of the Study Area. Remnant vegetation persists as isolated remnants in the floodplain between Eight Mile Creek and Obungeena Creek and in narrow fringes lining North Creek and Eight Mile Creek. These areas retain structural elements that provide habitat and resources for a variety of terrestrial and aquatic fauna. However, the ecological value of these remnants has been limited by past fragmentation and associated isolation and edge effects.

A total of eight fauna habitat types were identified within the Study Area. Open cleared land was the most widespread fauna habitat type at the Study Area. Although lacking the structural complexity of other habitat types, this habitat retains foraging resources for a number of rangeland species. Fauna species diversity was higher in habitat types associated with remnant vegetation, where the structural complexity provided by remnant vegetation and ground-level substrates increases the diversity of resources and microhabitats available.

A review of the Queensland Department of Environment and Heritage Protection (DEHP) Biodiversity Planning Assessment (BPA) mapping indicated that remnant vegetation within and surrounding the Study Area has low to moderate value for both ecosystem diversity and context and connection.

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed threatened ecological community (TEC), Brigalow (*Acacia harpophylla* dominant and co-dominant), was confirmed present within the Study Area during field surveys. Approximately 9.8 ha of this TEC was confirmed from the occurrence of REs 11.3.1 and 11.4.9 within the Study Area. None of this TEC occurs within the Project (Offsite) footprint.

Approximately 9.8 ha of endangered REs (11.3.1, 11.4.9), 220.6 ha of of concern REs (11.3.3, 11.4.11, 11.4.5, 11.4.6) and 102.1 ha of least concern RE (10.3.28, 10.3.6, 10.5.5, 10.3.4, 10.3.3, 10.3.14, 11.3.25, 11.3.37, 10.4.5, 11.3.10) were confirmed present within the Study Area (based on field-verified RE mapping). Approximately 7.2 ha of least concern RE (10.3.6, 10.3.28, 10.5.5, 10.4.5, 11.3.25, 11.3.37) occurs within the Project (Offsite) footprint. No State mapped essential habitat occurs in the Study Area.

Flora species

Field studies identified 172 native flora taxa and 28 introduced taxa in the Study Area. Of the 28 introduced species, 4 are declared Weeds of National Significance (WONS) and declared weeds under the Queensland *Land Protection (Pest and Stock Route) Management* Act 2002 (LP Act). No threatened flora species were recorded within the Study Area from field surveys.

Aquatic flora and fauna species

Field surveys identified 18 native fish species, 4 bivalve species, 1 crustacean species and 1 turtle species. A total of nine aquatic plants were identified. No threatened aquatic species were recorded within the Study Area.

Terrestrial fauna species

Field studies identified 155 native terrestrial fauna species and 5 introduced fauna. The majority of fauna species recorded from the Study Area were common, widely distributed species. Pest species recorded in low densities included the cane toad (*Rhinella marina*), wild dog (*Canis lupus familiaris*), cat (*Felis catus*), rabbit (*Oryctolagus cuniculus*) and pig (*Sus scrofa*).

Threatened fauna species recorded in field surveys of the Study Area included:

- 3 EPBC Act listed species:
  - black-throated finch (southern) (*Poephila cincta cincta*) – endangered under the EPBC Act / NC Act
  - squatter pigeon (southern) (*Geophaps scripta scripta*) – vulnerable under the EPBC Act / NC Act
  - ornamental snake (*Denisonia maculata*) – vulnerable under the EPBC / NC Act
- 2 bird species listed as migratory under the EPBC Act
- 15 bird species listed as marine under the EPBC Act
- 5 NC Act listed fauna species (the 3 EPBC listed species above and:
  - Black-necked stork (*Ephippiorhynchus asiaticus*) – near threatened under the NC Act
  - Cotton pygmy goose (*Nettapus coromandelianus*) – near threatened under the NC Act

Potential habitat occurring within and beyond the Study Area for these species was identified. Two additional EPBC Act listed fauna species, yakka skink (*Egernia rugosa*) and koala (*Phascolarctos cincereus*), were not recorded from field studies, however are considered likely to occur at the Study Area (based on suitability of habitat, previous records from the region and current known distribution). Three additional NC Act listed fauna species, black-chinned honeyeater (*Melithreptus gularis*), square-tailed kite (*Lophoictinia isura*) and brigalow scaly-foot (*Paradelma orientalis*) are considered likely to occur at the Study Area (based on suitability of habitat, previous records from region, current known distribution).

Two priority fauna species described in the Burdekin NRM 'Back on Track Actions for Biodiversity' report (Department of Environment and Resource Management (DERM), 2010a) were recorded at the Project Area (black-throated finch (southern) and ornamental snake). A further three priority fauna species have the potential to occur at the Study Area: the yakka skink is considered 'likely to occur' and the red goshawk (*Erythrotriorchis radiatus*) and Australian painted snipe (*Rostratula australis*) 'may occur' at the Study Area.

Potential impacts to ecological values

Construction and operation phase impacts to the terrestrial ecological values of the Study Area were identified. The Project (Offsite) will be constructed predominately within already cleared land within to the east of the east of EPC 1080. The Project (Offsite) footprint will require clearing of 1,158 ha of land. This comprises 7.2 ha of remnant vegetation (least concern REs) and 1,151 ha non-remnant vegetation. Additional areas of officially mapped RE (36.9 ha) and non-remnant vegetation (78.7 ha) are mapped within the Moray-Carmichael Road corridor.

Direct clearing of vegetation will involve loss of:

- 313.8 ha of potential habitat for the ornamental snake
- 2.5 ha of potential habitat for the black-throated finch
- 2.5 ha of potential habitat for the squatter pigeon
- 2.7 ha of potential habitat for the koala
- 2.5 ha of potential habitat for the yakka skink
- 2.5 ha of potential habitat for the little pied bat
- 3.7 ha of potential habitat for the brigalow scaly-foot
- 2.5 ha of potential habitat for the echidna
- 314.3 ha of potential habitat for the rainbow bee-eater
- 314.3 ha of potential habitat for the fork-tailed swift
- 314.3 ha of potential habitat for the white-throated needletail

Construction and operation impacts have been reduced by considering environmental values in the design and layout of Project (Offsite) footprint. Most impacts can be minimised by implementing the mitigation measures incorporated and outlined in the EMP (Offsite) for the Project (Adani, 2013). The EMP (Offsite) incorporates opportunities for ongoing monitoring and adaptive management, to more effectively reduce the impact on local terrestrial and aquatic ecosystems. Where residual impacts remain, these will be included in a coordinated offsets strategy that is being prepared for the broader Project (Mine and Rail).

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Abbreviations and glossary

Project Specific Terminology	
Abbreviation	Term
the Proponent	Adani Mining Pty Ltd
the SEIS	Carmichael Coal Mine and Rail Project Supplementary Environmental Impact Statement
the Project	Carmichael Coal Mine and Rail Project
Study Area	Refers to the area of field investigation
Project Area	Refers to the broader Mine Project (including the Mine and offsite infrastructure area)
Offsite footprint	Refers to the actual area of direct clearing for offsite infrastructure

Generic Terminology	
Abbreviation	Term
ACA	Aquatic Conservation Assessment
BOM	Bureau of Meteorology
BPA	Biodiversity Planning Assessment
BVC	Broad Vegetation Community
BVG	Broad Vegetation Group
CAMBA	Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment
DEHP	Department of Environment and Heritage Protection
DEWHA	Department of Environment, Water, Heritage and the Arts (Cwlth) (now Department of Sustainability, Environment, Water, Population and Communities)
DNRM	Department of Natural Resources and Mines (Qld)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (former DEWHA, Department of Environment, Water, Heritage and the Arts) (Cwlth)
EIS	Environmental Impact Statement
EPA	Former Environmental Protection Agency (Qld)
EP Act	*Environmental Protection Act 1994* (Qld)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EPC	Exploration Permit for Coal
ERA	Environmentally Relevant Activity
ESA	Environmentally Sensitive Area
GAB	Great Artesian Basin
GDE	Groundwater Dependant Ecosystem
GIS	Geographic Information System
GL	gigalitre
HES	High Ecological Significance
IBRA	Interim Biogeographic Regionalisation of Australia
IRC	Isaac Regional Council
JAMBA	Agreement between the Government of Australia and the Government of Japan for

Generic Terminology	
Abbreviation	Term
	the Protection of Migratory Birds in Danger of Extinction and their Environment
LGA	Local government area
LP Act	*Land Protection (Pest and Stock Route Management) Act 2002* (Qld)
MIA	Mine Infrastructure Area
NES	National Environmental Significance
NC Act	*Nature Conservation Act 1992* (Qld)
NRM	Natural Resource Management
ROKAMBA	Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds
QBOP	Queensland Biodiversity Offset Policy
RE	Regional Ecosystem
SDPWO Act	*State Development and Public Works Organisation Act 1971* (Qld)
SP Act	*Sustainable Planning Act 2009* (Qld)
SPP	State Planning Policy
TEC	Threatened Ecological Community
ToR	Terms of Reference
TSSC	Threatened Species Scientific Committee
VAST	Vegetation Assets, States and Transitions
VM Act	*Vegetation Management Act 1999* (Qld)
VMOP	Vegetation Management Offsets Policy
WONS	Weed of National Significance

1. Introduction

1.1 Project overview

Adani Mining Pty Ltd (Adani, the Proponent), commenced an Environmental Impact Statement (EIS) process for the Carmichael Coal Mine and Rail Project (the Project) in 2010. On 26 November 2010, the Queensland (Qld) Office of the Coordinator General declared the Project a 'significant project' and the Project was referred to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (referral No. 2010/5736). The Project was assessed to be a controlled action on the 6 January 2011 under section 75 and section 87 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The controlling provisions for the Project include:

- World Heritage properties (sections 12 & 15A)
- National Heritage places (sections 15B & 15C)
- Wetlands (Ramsar) (sections 16 & 17B)
- Listed threatened species and communities (sections 18 & 18A)
- Listed migratory species (sections 20 & 20A)
- The Great Barrier Reef Marine Park (GBRMP) (sections 24B & 24C)
- Protection of water resources (sections 24D & 24E)

The Qld Government's EIS process has been accredited for the assessment under Part 8 of the EPBC Act in accordance with the bilateral agreement between the Commonwealth of Australia and the State of Queensland.

The Proponent prepared an EIS in accordance with the Terms of Reference (ToR) issued by the Qld Coordinator-General in May 2011 (Qld Government, 2011). The EIS process is managed under section 26(1) (a) of the *State Development and Public Works Act 1971* (SDPWO Act), which is administered by the Qld Government's Department of State Development, Infrastructure and Planning (DSDIP).

The EIS, submitted in December 2012, assessed the environmental, social and economic impacts associated with developing a 60 million tonne (product) per annum (Mtpa) thermal coal mine in the northern Galilee Basin, approximately 160 kilometres (km) north-west of Clermont, Central Queensland, Australia. Coal from the Project will be transported by rail to the existing Goonyella and Newlands rail systems, operated by Aurizon Operations Limited (Aurizon). The coal will be exported via the Port of Hay Point and the Point of Abbot Point over the 60 year mine life.

Project components are as follows:

- The Project (Mine): a greenfield coal mine over EPC 1690 and the eastern portion of EPC 1080, which includes both open cut and underground mining, on mine infrastructure and associated mine processing facilities (the Mine) and the Mine (offsite) infrastructure including a workers accommodation village and associated facilities, a permanent airport site, an industrial area and water supply infrastructure

- The Project (Rail): a greenfield rail line connecting to mine to the existing Goonyella and Newlands rail systems to provide for the export of coal via the Port of Hay Point (Dudgeon Point expansion) and the Port of Abbot Point, respectively including:
  - Rail (west): a 120 kilometre (km) dual gauge portion running west from the Mine site east to Diamond Creek
  - Rail (east): a 69 km narrow gauge portion running east from Diamond Creek connecting to the Goonyella rail system south of Moranbah
  - Quarries: The use of five local quarries to extract quarry materials for construction and operational purposes.

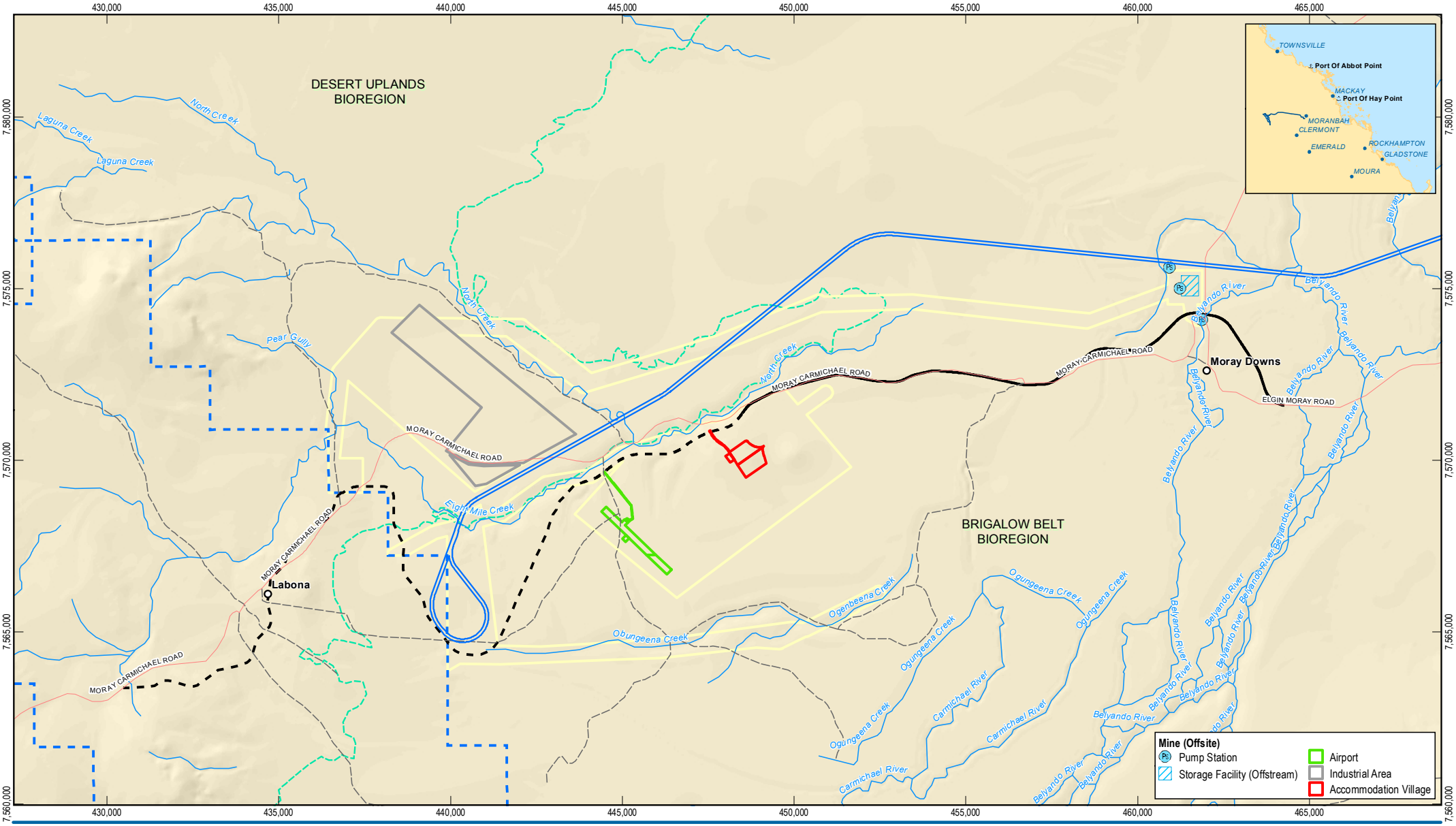
1.2 Study area

For the purposes of this report the following terminology is used:

- 'Study Area' refers to the area of field investigation shown in Figure 1
- 'Project Area' refers to the broader Mine Project, (including the Mine and offsite infrastructure area)
- 'Offsite footprint' refers to the actual area of direct clearing for offsite infrastructure

The Study Area is located on Lot 662 on PH1491 immediately east of the Mine and covers an area of 7,187.3 ha (Figure 1). The Offsite footprint assessed in this report covers a total area of 1,158 ha and comprised the following components:

- Worker accommodation village and airport (126.8 ha): comprising a construction camp (Q4, 2013) and initial mine operations accommodation (2014) as part of a master planned community.
- Industrial precinct, including rail siding (964.8 ha) to facilitate services such as a fuel farm, rail siding, freight unloading terminal).
- An off-stream storage and pump station near Belyando River (0.04 ha)
- 5 gigalitres (GL) storage dam (51 ha)
- Moray-Carmichael Road (130.9 ha).



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Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Local Road
- Track
- Watercourse
- Study Area
- Bioregion Boundary
- Rail Corridor
- Project Area
- Road Corridor
- Road Corridor (proposed)

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project SEIS
Environmental Assessment Report

Job Number	41-26422
Revision	1
Date	31-10-2013

Offsite Infrastructure Project Area and Study Area Figure 1

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Data source: DME: EPC1690 (2010)/EPC1080 (2011); DNRM: Bioregion Boundary (2011); © Commonwealth of Australia (Geoscience Australia): Watercourse, Tracks (2007); Adani: Alignment Opt11 Rev 2 (SP1 and 2)(2013), Offsite Infrastructure (2013). Created by: AJ

1.3 Scope

The scope of works for this ecological assessment was to identify within the Study Area:

- Least concern, of concern and endangered regional ecosystems (RE) protected under the Queensland *Vegetation Management Act 1999* (VM Act)
- Threatened ecological communities (TECs) that are protected under the EPBC Act
- Queensland Department of Environment and Heritage Protection (DEHP) mapped essential habitat
- Environmentally sensitive areas (ESAs) as defined in the Environmental Protection Regulation 2008
- Groundwater dependent ecosystems and wetlands
- Protected areas
- Locally and regionally important habitat remnants and habitat corridors
- Flora/fauna species listed as critically endangered, endangered or vulnerable under the EPBC Act
- Flora and fauna species listed as 'migratory' and/or 'marine' under the EPBC Act
- Flora and fauna species listed as endangered, vulnerable, near threatened or special least concern under the *Nature Conservation Act 1992* (NC Act) and associated regulations
- Priority flora and vertebrate fauna species identified in the Burdekin Natural Resource Management (NRM) Region Back on Track Actions for Biodiversity report (DERM, 2010)
- The BioCondition and 'quality' (as defined in the EPBC Act Offsets Assessment Guidelines) of all values that will require offsets under either Commonwealth or state biodiversity offset frameworks

In characterising the ecological values of the Study Area, potential impacts arising from construction and operation of the Mine offsite infrastructure were identified. The risk associated with these impacts to terrestrial and aquatic ecological values was determined. Mitigation measures and management actions seeking to avoid/minimise/reduce the risk associated with identified impacts to the terrestrial and aquatic ecological values of the Study Area were developed.

The study area for this report was defined by the Project (Mine) Offsite footprint. At the time of reporting, the footprint included an offsite bore field and associated pipelines. The bore field is no longer a component of the Carmichael Coal Mine and Rail Project. As such, the study area for this report includes areas where the bore field was to be situated.

1.4 Limitations and assumptions

Field surveys were undertaken within the Study Area shown in Figure 1. An additional area of proposed offsite infrastructure was added to the Offsite footprint after surveys were completed (realignment of parts of the Moray-Carmichael Road). This area was not assessed in current field surveys. Desktop information for Moray-Carmichael Road is presented within this report.

1.5 Legislation and policy

1.5.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Commonwealth's principal piece of environmental protection legislation. It provides a national framework for the protection of the Australian environment and its unique biodiversity. The EPBC Act also provides a systematic framework for assessment and approval of actions potentially impacting matters of NES. The Project was referred to the DSEWPaC on 18 November 2010 (EPBC 2010/5736). It was declared a 'controlled action' requiring assessment and approval under the EPBC Act on 6 January 2011. The controlling provisions for the Project (i.e. those matters of NES which the Project (Mine and Rail) is likely to have a significant impact on) include:

- World Heritage properties
- National Heritage places
- Wetlands (Ramsar)
- Listed threatened species and ecological communities
- Listed migratory species
- Great Barrier Reef Marine Park

1.5.2 Commonwealth EPBC Act Environmental Offsets Policy

The Commonwealth Government's EPBC Act Environmental Offsets Policy outlines the Australian Government's position on the use of environmental offsets under the EPBC Act.

For assessments under the EPBC Act, offsets are only required if residual impacts are significant. In order to determine whether an impact is significant or not, the assessment will need to be made against the criteria set out within (the relevant sections of) the 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' (DEWHA, 2009).

1.5.3 Queensland State Development and Public Works Organisation Act 1974

On 26 November 2010, the Project was declared a 'significant project' requiring an EIS under section 26(1)(a) of the SDPWO Act. The Commonwealth has accredited the Queensland EIS process under the SDPWO Act and as such, the Project will be assessed by the Commonwealth Environment Minister under the bilateral agreement with the Queensland Government. Approval for the Project under Part 9 of the EPBC Act will be required from the Commonwealth Environment Minister before it can proceed.

1.5.4 Queensland Nature Conservation Act 1992

The NC Act provides for the conservation of nature through protection of all native plants and animals in Queensland. Protection is provided under the NC Act through conservation of land as protected areas and wildlife protection outside of protected areas. Actions impacting on protected native flora and fauna are regulated under the NC Act. Permits for disturbance to native flora and fauna can be administered under the NC Act. The Queensland *Nature*

Conservation (Wildlife) Regulation 2006 lists flora and fauna species considered to be extinct in the wild, endangered, vulnerable, near threatened and least concern in Queensland.

1.5.5 Queensland Vegetation Management Act 1999

The VM Act provides a framework for the regulation of woody, terrestrial native vegetation located outside of protected areas. The stated purpose of the Act is to regulate the clearing of native vegetation in a way that:

- Conserves remnant vegetation that is an endangered, of concern or least concern RE
- Conserves vegetation in declared areas
- Ensures clearing does not cause land degradation
- Prevents biodiversity loss
- Maintains ecological processes
- Manages the environmental effects of the clearing to ensure the above purposes are obtained
- Reduce greenhouse gas emissions

The VM Act provides for the establishment and mapping of REs that encompass vegetation community descriptions within a geological and bioregional context, and for the creation and use of clearing codes (among other things). In addition, it provides a process for applying to change RE mapping and for the investigation and prosecution of clearing offences. Details on what clearing activities require assessment against the various regional clearing codes authorised under the VM Act are provided by the *Sustainable Planning Act 2009* (SP Act).

1.5.6 Queensland Sustainable Planning Act 2009

The purpose of the SP Act is to achieve ecological sustainability by:

- Managing the process by which development takes place, including ensuring that the process is accountable, effective and efficient and delivers sustainable outcomes
- Managing the effects of development on the environment
- Providing for the coordination and integration of planning at the local, regional and State levels

For the most part, the SP Act is not applicable to the Project (Mine), which will be assessed under the provisions of the SDPWO Act, and regulated under the various Acts relating to mining in Queensland. However, some SP Act approvals will be required for development that takes place outside of the proposed mining lease areas, this includes offsite infrastructure.

1.5.7 Queensland Land Protection (Pest and Stock Route Management) Act 2002

The *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act) identifies declared pest plant and animal species, and provides for their control. The LP Act imposes a legal responsibility on all landowners to control declared species on their land (subject to certain conditions). Specific management actions are required by landholders depending on the classification of declared pests under the LP Act, with three separate categories of declared

pest prescribed being Class 1, Class 2 and Class 3. Landowners are required to remove Class 1 and Class 2 pests from their property and prevent them spreading to other areas. Class 3 pests cannot be sold or traded but are required to be controlled only if growing adjacent to an environmentally sensitive area (as declared by local councils).

1.5.8 Queensland Environmental Protection Act 1994

The aim of the *Environmental Protection Act 1994* (the EP Act) is to protect Queensland's environment while allowing for development that improves the quality of life as well as maintaining the ecological processes on which it depends.

The EP Act also imposes a general environmental duty on all persons (including corporations) not to conduct any activity that causes, or is likely to cause, environmental harm, unless they take all reasonable and practicable measures to prevent or minimise the harm.

The *Environmental Protection Regulation 2008* identifies environmentally relevant activities (ERAs) prescribed under the EP Act. Among other matters, the regulation also defines Category A, Category B and Category C ESAs.

1.5.9 State Planning Policy (SPP) 4/11: Protecting wetlands of high ecological significance in Great Barrier Reef catchments (Wetlands SPP)

The Wetlands SPP seeks to ensure development involving high impact earthworks in or near wetlands of high ecological significance (HES) is planned, located, designed, constructed and operated appropriately. The Wetlands SPP took effect on 25 November 2011. DEHP has produced a map of referrable wetlands, indicating where the Wetlands SPP applies. Wetlands considered being of HES in Great Barrier Reef catchments have been mapped as wetland protection areas. These core protection areas have a 500 m assessable development trigger area (measured from the wetland boundary) around them. The Wetlands SPP includes an assessment code to guide decision makers with regards to future development in wetlands considered to be of HES in Great Barrier Reef catchments.

1.5.10 Queensland Government Environmental Offsets Policy framework

The Queensland Government Environmental Offsets Policy provides a framework for the use of environmental offsets in Queensland, in order to counterbalance unavoidable, negative environmental impacts that result from an activity or a development. This policy is based on the premise that offsets are used consistently and transparently across the State, and are only considered after all environmental impacts have been avoided and minimised and all other government environmental standards have been met.

In Queensland, four issue-specific offset policies have been developed to provide detailed direction for offsets that address specific environmental issues:

- Policy for Vegetation Management Offsets Version 3 (2011)
- Queensland Biodiversity Offset Policy (QBOP) Version 1 (2011)
- Marine Fish Habitat Offset Policy (FHMOP005.2) (2012)
- Koala Habitat – 'Offsets for Net Gain of Koala Habitat in South East Queensland Policy'

The QBOP applies to activities undertaken on a mining lease while the Policy for Vegetation Management Offsets will apply to the Offsite footprint. Based on the location of the Project and the environmental values documented here, the Marine Fish Habitat Offset Policy and the Offset for Net Gain of Koala Habitat in South East Queensland Policy will not apply to the Offsite footprint.

1.6 Methodology

A combination of desktop assessments and field surveys were undertaken to assess the ecological values of the existing environment within the Study Area. The following methods were scoped to address the Terms of Reference for the EIS and to be consistent with the requirements of the Carmichael Coal Mine and Rail Environmental Offset Strategies. Where necessary, they were also consistent with DSEWPaC recommended survey guidelines for species listed under the EPBC Act.

The specific survey methods employed comprised comprehensive fauna assessments (including trapping), rapid (Quaternary) vegetation surveys, rapid fauna surveys, habitat assessments, BioCondition assessments and targeted surveys for species listed under the EPBC Act considered to have the potential to occur.

1.6.1 Desktop assessments

Prior to survey, desktop assessments were undertaken for the Study Area. These included a review of the ecology section of the Project (Mine) EIS report (GHD, 2012a) and the associated terrestrial and aquatic technical reports. Desktops involved searches of the following sources:

- Review of the following databases
  - Wildlife Online (DEHP)
  - Protected Matters (DSEWPaC)
  - HERBRECS (Queensland Herbarium)
  - Records of the Queensland Museum
  - Birds Australia searches
- Review of the following mapping layers
  - Mapping of REs
  - Essential habitat, high value regrowth
  - Wetland protection areas (WPAs)
  - Biodiversity Planning Assessment (BPA) mapping.

Details of these sources are provided in Table 1.

Table 1 Summary of desktop assessments

Source/Search Tool	Search Extent	Information Note
DSEWPaC Protected Matters Search Tool and Environmental Reporting Tool.	Point search approximating the centre of the Mine Study Area - 22.041, 146.364 with a 50 km buffer	This is a predictive tool identifying species and ecological communities.
DSEWPaC Directory of Important Wetlands	Point search approximating the centre of the Mine Study Area - 22.041, 146.364 with a 50 km buffer.	This mapping identifies wetlands that satisfy at least one criterion agreed upon by the Australian and New Zealand Environment and Conservation Council (ANZECC) Wetlands Network in 1994.
Department of Natural Resources and Mines (DNRM) RE and regrowth vegetation mapping.	Geographical Information System (GIS) mapping layer issued by DNRM for within and adjacent to the Study Area.	RE mapping is informed by interpretation of landform, substrate, photo/satellite imagery and where available, field data. Regrowth mapping is informed by statewide landcover and tree study (SLATS) foliage protective cover (FPC) and pre-clearing RE mapping. The mapping has undergone little or no ground-truthing in many parts of Queensland.
DEHP ESA map – mining activities	Search based on EPC boundaries.	ESAs identified on the map may require field survey and ground-truthing exercises for accuracy.
DNRM essential habitat Mapping	GIS mapping layer issued by DNRM for within and adjacent to the Study Area. An additional area was assessed for the Moray-Carmichael Road section of the Offsite footprint.	Mapping is underpinned by RE/regrowth mapping, the constraints associated with mapping scale and lack of ground-truthing are applicable to this information source.
DEHP Wetland Mapping	GIS mapping layer issued by DEHP for within and adjacent to the Study Area.	Wetlands are identified using the DEHP AquaBAMM Methodology. The mapping has undergone little or no ground-truthing in many parts of Queensland.
DEHP BPA mapping and BPA Expert Panel Reports	GIS mapping layer issued by DEHP for within and adjacent to the Study Area.	As BPA mapping is underpinned by RE mapping, the constraints associated with mapping scale and lack of ground-truthing is applicable to this information source.
DEHP Wildlife Online Database	Point search approximating the centre of the Mine Study Area - 22.041, 146.364 with a 50 km buffer.	This database catalogues known records of species in a defined area however DEHP recommend that independent verification of records should be undertaken.
DEHP HERBRECS Specimen Database, Queensland Museum Data Search, Birds Australia Bird Atlas Data	Rectangular area was searched, such that the diagonal extending from the approximate centre of the Study Area (22.041, 146.364) to each corner was 50 km.	These databases catalogue known records of species in a defined area. The age of species records may limit their value for inclusion in current studies in some instances.
Burdekin NRM	The document covers the	Some species/impacts listed in this

Source/Search Tool	Search Extent	Information Note
Region Back on Track Actions for Biodiversity report (DERM, 2010)	entire Burdekin NRM region (in which the Study Area occurs).	document are not relevant to the Study Area, as the Burdekin NRM region encompasses a large area of central Queensland.
Burdekin Dry Tropics & Australian Government Freshwater Fish of Burdekin Dry Tropics NRM Region	The document covers the entire Burdekin Dry Tropics NRM region.	Species distributions are described in terms of sub-catchments and distribution maps are useful to identify species with potential to occur.
DEHP Expert Panel Reports: Burdekin Region	These documents assess the riverine and non-riverine wetlands of the Burdekin region.	Some species listed in this document are not relevant to the Study Area, as the Burdekin basin encompasses a large area of central Queensland.
Publically available Environmental Impact Statement (EIS) documents for projects in the wider region surrounding the Study Area.	The description of the existing environmental values of landscapes in which other major development projects are proposed to occur were assessed.	The project Study Areas of each of the EIS projects do not always correlate with the Study Area of this project rather provide regional information.

1.6.2 Field assessments

Field surveys of the Study Area were undertaken between 28 April 2013 and 6 May 2013, coinciding with the late wet / early dry season. Weather conditions during the survey were fine and warm. Temperatures ranged between daily minimums of 12.3°C and 17.7°C and daily maximums of 28.2°C and 29.5°C.

No rainfall was recorded during the field surveys. However, the surveys occurred two weeks after a localised, but heavy, rainfall event. Whilst most ephemeral creeks were dry at the time of the survey, local grasses were in good condition and there was an abundance of standing water throughout the landscape.

Weather data was recorded from the Bureau of Meteorology (BOM) weather station 035264 at Emerald Airport. Weather data from the nearest weather station (Clermont) was unavailable for this survey period.

1.6.3 Flora assessments

Terrestrial flora surveys comprised a combination of rapid (Quaternary) flora assessments and BioCondition assessments.

Rapid (Quaternary) vegetation surveys

Rapid Quaternary vegetation surveys were undertaken at 49 sites throughout the Study Area (see Figure 2). All polygons of certified mapped RE within the Study Area were assessed at this level, to verify and (if required) re-map the REs within the Study Area. The methodology was consistent with that outlined in (Neldner et al., 2012) and involved a traverse through all areas of mapped RE, documenting the land zone, species composition of vegetation and an estimation of the median height and cover of the dominant vegetation layer. Any inaccuracies of the current certified RE mapping were amended and a verified RE map produced for the Study Area.

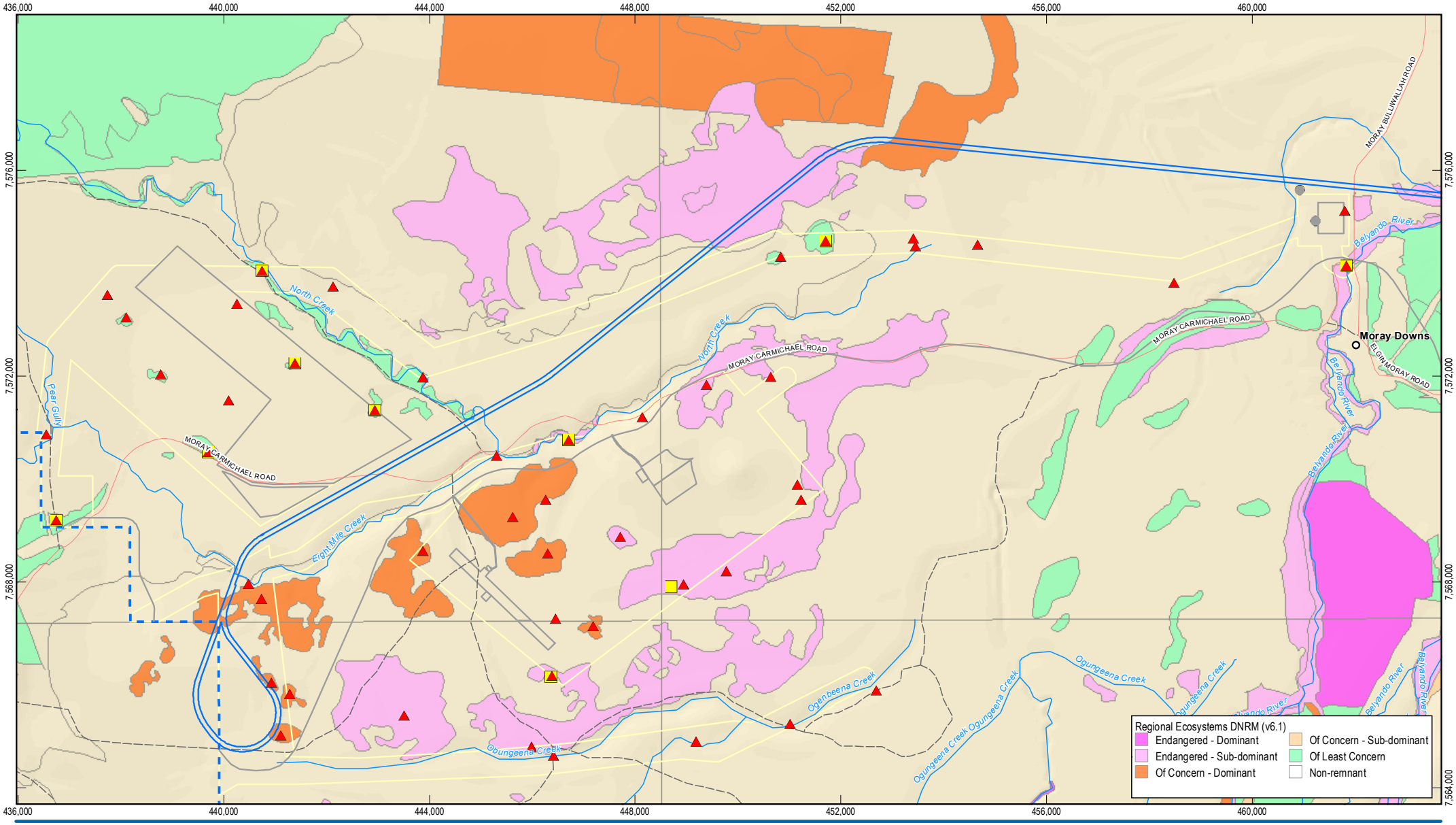
Regional ecosystems within the Moray-Carmichael Road component of the Offsite footprint (added after field surveys were completed) were not verified. However, current certified RE mapping was reviewed and summarised in this report.

Random meander and targeted habitat searches

The random meander technique (Cropper, 1993) is a widely accepted method to survey for rare or threatened plant species or other species of interest that may not occur in surveyed quadrats or sample sites. It involves traversing sections of the Study Area at random searching for flora species that may not have been located using more structured search methods. This technique is particularly suitable for locating species that typically occur at very low densities, or that may be grouped in isolated clumps, as is often the case with many plants listed as rare or threatened. In addition, literature reviews of habitat requirements were used to assist in targeted searches for rare and threatened species.

BioCondition assessments

BioCondition assessments were undertaken at 10 RE sites within the Study Area (see Figure 2). These sites were chosen as representative sites to establish a condition score for native vegetation types that are expected to be cleared for the Project. BioCondition surveys were consistent with the methods outlined in the BioCondition Assessment Methodology Manual (Eyre et al., 2011) and the Methodology for the Establishment and Survey of Reference Sites for BioCondition (Eyre et al., 2006). Assessments of areas potentially subject to clearing were undertaken to provide a comparison when determining the ecological equivalence of potential offset areas. The data from these assessments can be used once potential offset sites have been determined for the Project. BioCondition surveys were undertaken as part of this assessment. However the results have been presented separately in the Offsite Infrastructure Biocondition Report (GHD, 2013).



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0 2 4

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Quaternary Assessment Sites
- BioCondition Assessment Site
- Local Road
- Track
- Watercourse
- Study Area
- Rail Corridor
- Project Area
- Mine (Offsite)
- Mine (Offsite)

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Distribution of Flora Survey Sites

Figure 2

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Level 9, 145 Ann St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DME: EPC1690 (2010)/EPC1080 (2011); DNRM: Regional Ecosystems (2011); © Commonwealth of Australia (Geoscience Australia): Watercourse, Tracks (2007); Adani: Alignment Opt11 Rev 2 (SP1 and 2)(2013), Offsite Infrastructure (2013); GHD: Flora Sites (2013). Created by: AJ

1.6.4 Terrestrial fauna assessments

Terrestrial fauna were surveyed using a combination of:

- Rapid fauna assessments undertaken at 38 sites
- Comprehensive fauna assessments (trapping) at two sites
- Targeted surveys for species listed under the EPBC Act.

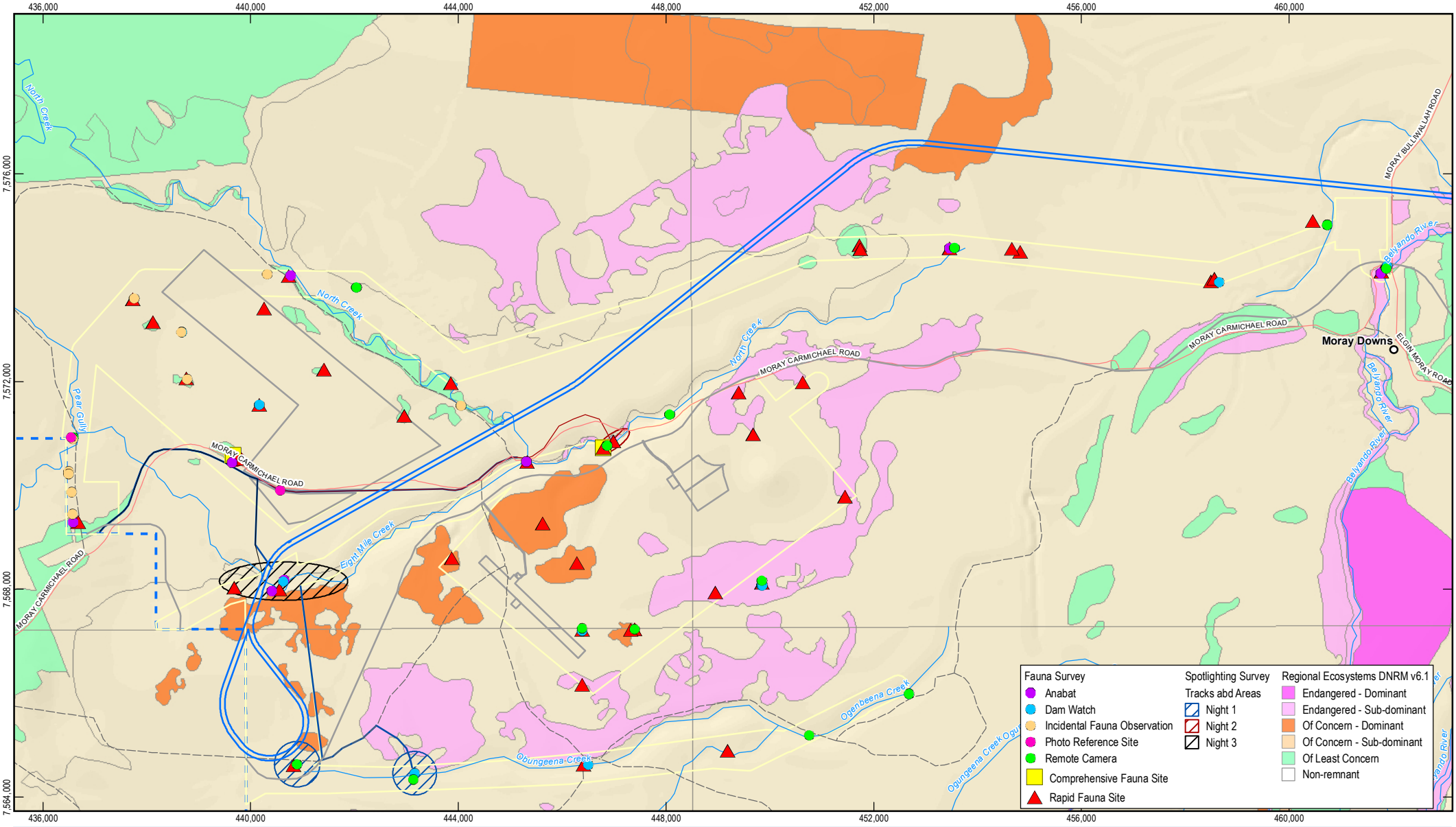
The distribution of terrestrial fauna sites is shown in Figure 3. Survey sites were selected to sample representative vegetation communities and fauna habitat types present in the Study Area. Sites were selected using a two-step process. RE mapping and aerial photography were primarily used to provide a broad indication of the diversity and distribution of habitats across the Study Area to select a series of potential survey sites. These were then ground-truthed in the field. Sites were ultimately selected based on RE type, representation of REs across the Study Area, accessibility and presence of protected areas (i.e. wetland protection areas).

Given the large size of the Study Area, and the small fragmented nature of the RE remnants within it, targeted active search methods were considered likely to be more effective than (non-targeted) trapping. As such, trapping was only undertaken at two comprehensive sites.

Terrestrial fauna survey methods employed at comprehensive and rapid survey sites are summarised in Table 2. Each method is described in greater detail below. The total sampling effort is summarised in Table 3. Information on targeted survey effort for threatened terrestrial fauna species is also discussed below and summarised in Table 2.

Table 2 Summary of survey effort at rapid and comprehensive fauna sites

Comprehensive survey sites	Rapid assessment sites	Other areas throughout Study Area
• Systematic trapping (20 Elliott 'A' traps, 10 cage traps, 8 funnel traps, 4 pitfall traps) • Habitat assessment • Opportunistic search for wildlife traces • Three standardised (20 minute) bird surveys • One hour of active searches for herpetofauna • One night (minimum) of ultrasonic bat detection (Anabat) • Standardised spotlighting for nocturnal fauna • Call-playback for owls	• Habitat assessment • Opportunistic search for wildlife traces • One standardised (20 minute) bird survey • Half an hour of active searches for herpetofauna Some rapid assessment sites • One night (minimum) of ultrasonic bat detection (Anabat) • Standardised spotlighting for nocturnal fauna • Call-playback for owls	• Remote camera • Water body watches • Opportunistic wildlife records



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Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Local Road
- Track
- Watercourse
- Study Area
- Rail Corridor
- Project Area
- Mine (Offsite)
- Mine (Offsite)

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Date	25-10-2013

Distribution of Fauna Survey Sites

Figure 3

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Data source: DME: EPC1690 (2010)/EPC1080 (2011); DNRM: Regional Ecosystems (2011); © Commonwealth of Australia (Geoscience Australia): Watercourse, Tracks (2007); Adani: Alignment Opt11 Rev 2 (SP1 and 2)(2013), Offsite Infrastructure (2013); GHD: Fauna Survey Sites (2013). Created by: AJ

Terrestrial habitat assessments

A total of 40 terrestrial habitat assessments were undertaken across the Study Area (two at comprehensive sites and 38 at rapid assessment sites). Habitat assessments were undertaken wherever there was a significant change in vegetation community and habitat characteristics. At each location, the following characteristics were recorded:

- Landscape context (size, shape, connectivity or relative isolation of habitat remnants)
- Structural and floristic complexity of vegetation (i.e. tree density, canopy cover, vertical structural complexity of vegetation strata at canopy, shrub and understorey layers, ground cover)
- Structural complexity and relative heterogeneity of ground-level microhabitats (i.e. substrate type, vegetation cover, leaf litter, woody debris, presence of rocks, logs or boulders)
- Presence of habitat features (i.e. hollows, fallen logs, rock outcrops, nests, burrows, waterbodies, gilgais)
- Relative abundance of hollows and hollow-bearing (habitat) trees
- Sources of disturbance (i.e. grazing intensity, erosion, predation and competition with feral animals, weed infestation, historic land clearing and inappropriate fire regimes)

These factors were used to describe the relative ecological values of each vegetation community, in terms of their capacity to provide resources and microhabitats for various terrestrial fauna groups and their capacity to provide habitat and resources for conservation significant species that have specific habitat requirements.

Systematic trapping surveys

Systematic trapping was undertaken at two comprehensive survey sites. This involved a five day, four night survey of each site using cage traps, Elliott 'A' traps and pitfall/funnel trap/drift fence complexes.

At each site, traps were deployed along two parallel linear transects comprising 20 Elliott 'A' traps and 10 cage traps, set within optimal microhabitats. Four pitfall trap/funnel trap/drift fence complexes were placed at each site, set in areas with suitable microhabitat adjacent to the linear transects. Traps were set and checked each morning for four consecutive nights. The trap configuration comprised:

- Pitfall traps, funnel traps and drift fence: Four complexes were established at each site. Each complex consisted of a ten metre long (30 cm high) flywire drift fence with two funnel traps along the fence line either side of a 20 L bucket (Plate 1). Wet sponges were placed in each bucket and funnel. These were covered with vegetation to provide shade and protection.
- Elliott 'A' box traps: Each site comprised 20 Elliott 'A' traps baited with universal bait (a mixture of peanut butter, rolled oats and sardines and/or honey) (Plate 2). Traps were located in shady areas or covered with hessian or vegetation to minimise heat exposure to animals.
- Cage traps: Ten cage traps were set at each site. Cages were baited with universal bait and covered with hessian to shelter trapped animals (Plate 2).

Plate 1 Pitfall trap and funnel complex

Plate 2 Elliott trap (left) and cage trap (right)

Standardised bird surveys

Standardised bird surveys were undertaken at each comprehensive and rapid assessment site using the bird census methods recommended by Birds Australia (Loyn, 1986). This involved a timed 20 minute survey of a two hectare search area by one ecologist, recording the number of birds seen or heard calling. Bird surveys were undertaken in early morning or afternoon in clear conditions. Standardised bird surveys were undertaken a minimum of three times at each comprehensive survey site and once at each rapid assessment site. A total of 15 person hours were dedicated to bird surveys within the Study Area.

Diurnal active searches for reptiles and amphibians

Active searches were undertaken for reptiles and amphibians at each site. This involved searching suitable microhabitats beneath rocks, logs, bark, and corrugated iron and among soil and leaf litter. Vegetation at the edges of local waterbodies was also searched for frogs and aquatic reptiles. Diurnal active searches were standardised by time, with each diurnal active search event lasting one person hour at each comprehensive survey site and 0.5 person hours at each rapid assessment site. A total of 21 person hours were dedicated to active searches within the Study Area.

Surveys for wildlife traces

At each site, time was dedicated to undertake searches for wildlife traces (i.e. bones, hair, tracks, scats, diggings, burrows, nests, skins) that could indicate the presence of cryptic or

nocturnal fauna species. A total of 21 person hours were dedicated to searches for wildlife traces within the Study Area.

Nocturnal spotlighting and call-playback

Nocturnal spotlighting surveys were undertaken throughout the Study Area using a combination of slow, vehicle-based surveys and nocturnal active-searches.

Active-searches were undertaken at five locations, considered to have higher ecological value based on the type and structural complexity of the vegetation community present. Two person hours were spent at each site, searching using a 2 ha area with a combination of high-powered spotlights and head torches. Trees, shrubs, logs, fallen bark and other understorey habitats were for searched EPBC listed reptiles (i.e. yakka skink, and ornamental snake) and other fauna, including arboreal mammals, ground mammals, reptiles, frogs and nocturnal birds. A total of 14 person hours was spent undertaking nocturnal active searches for wildlife.

An additional 10 person hours were spent spotlighting from vehicles on roads within the Study Area. These surveys targeted nocturnal ground-dwelling reptiles, owls, frogs and mammals. A total of 24 person hours were spent spotlighting within the Study Area.

Call-playback surveys were undertaken at five locations to detect nocturnal birds. Call-playback surveys involved broadcasting the call of individual target species for two minutes. This was followed by a listening period of two minutes. Species featured in call-playback included the spotted nightjar (*Eurostopodus argus*), white-throated nightjar (*Eurostopodus mystacalis*), Australian owlet-nightjar (*Aegotheles cristatus*), tawny frogmouth (*Podargus strigoides*), southern boobook (*Ninox novaeseelandiae*), barking owl (*Ninox connivens*), masked owl (*Tyto novaehollandiae*), eastern grass owl (*Tyto longimembris*) and eastern barn owl (*Tyto javanica*).

Microchiropteran bats

Anabat bat detectors were used to survey microchiropteran (insectivorous) bats by recording their echolocation calls. Detectors were placed at eight locations for one night each, over four nights. Anabats were placed in potential bat 'flyways' (i.e. linear gaps in vegetation through which local microbat movements are likely to be funnelled). Anabats were set just before dusk and left to record calls overnight. Detectors were positioned on the ground with the microphone orientated upwards at a 45° angle from the ground or within trees adjacent to flyways (Plate 3). All bat calls recorded were sent to an experienced bat-call analyst (Greg Ford) for identification. Only bat calls positively identified were included in the results.

Remote cameras

Remote cameras (Plate 3) were deployed at 14 sites across the Study Area and left to record images for six days / nights. The cameras were specifically used to target the black-throated finch (*Poephila cincta cincta*), an EPBC listed species that was recorded on the Mine during surveys for the EIS. Accordingly, cameras were placed at waterbodies (e.g. water troughs, dams). Cameras were deployed for a total of 2,016 hours within the Study Area.

Plate 3 Anabat detector (left), remote camera (right)


Table 3 Summary of terrestrial fauna survey effort

Survey Method	Elliott 'traps	Cage traps	Funnel traps	Pitfall traps	Ana-bat	Remote camera	Spot-lighting	Bird survey	Diurnal active search	Dam watch
Index	Number of trap nights						Person hours			
Total	160	80	64	32	8	84	24	15	21	23

Targeted surveys for EPBC Act-listed fauna species

Targeted fauna surveys were undertaken for the following EPBC Act-listed species that were considered to have the potential to occur within the Study Area (defined as confirmed present, likely to occur, or may occur within the Mine site):

- Brigalow-associated reptiles – yakka skink (*Egernia rugosa*), ornamental snake (*Denisonia maculata*)
- Koala (*Phascolarctos cinereus*)
- Black-throated finch (southern) (*Poephila cincta cincta*)
- Squatter pigeon (southern) (*Geophaps scripta scripta*)
- Australian painted snipe (*Rostratula australis*)
- Red goshawk (*Erythriotriorchis radiatus*)

Brigalow reptiles (yakka skink and ornamental snake)

Targeted surveys were undertaken for the yakka skink and ornamental snake, within suitable habitats and according to the following methods, as recommended in the *Draft Referral guidelines for the nationally-listed Brigalow Belt reptiles* (DSEWPaC, 2011):

- A total of 21 hours of diurnal searches (i.e. searching suitable microhabitats, turning woody debris and rocks, raking the soil surface and leaf litter beneath trees and peeling bark) was undertaken in suitable habitats to look for reptiles or their sloughs. These surveys were undertaken in the coolest part of the day.
- A total of 24 hours of spotlighting was undertaken in suitable habitats across the Study Area. Spotlighting was undertaken between dusk and midnight, targeting water-inundated gilgais, wetlands, riparian habitats and adjacent suitable environments.

- Comprehensive trapping (including pitfalls, funnel trapping, Elliott trapping) was undertaken in two areas of suitable habitat within the Study Area.

Koala

Surveys for the potential presence of koalas were carried out using techniques recommended in DSEWPaC's *Interim Koala Referral Advice for Proponents*. This included searches for evidence of koalas from scats and scratch marks, as well as the evaluation of habitat suitability via the identification of primary and secondary food trees within the Study Area. The Spot Assessment Technique (SAT) methodology, developed by Phillips and Callaghan (2011) was employed, wherever evidence of koalas was confirmed. Targeted koala surveys were undertaken concurrently with the habitat assessment and rapid fauna survey work.

Black-throated finch

Targeted surveys were undertaken for the black-throated finch, using the following methods, as recommended in the Background Paper to the Significant impact guidelines for the endangered black-throated finch (southern) (DSEWPaC, 2009):

- A total of 23 person hours were spent undertaking waterbody watches at 20 natural and artificial waterbodies across the Study Area. Waterbody watches were undertaken at dawn, midday and dusk by two teams. In addition, 14 remote cameras were deployed at waterbodies and left for six days and nights, recording a total of 144 hours per waterbody.
- A total of 15 person hours were spent undertaking bird surveys at 40 rapid assessment sites across the Study Area.
- Habitat characteristics important for the black-throated finch (southern) (i.e. presence of native grasses) were recorded during habitat assessments undertaken across the Study Area.
- Wherever suitable habitat was observed, targeted searches for nests and birds were undertaken within a 600 m radius of waterbodies within the Study Area with an effort of at least one hour/ha of suitable habitat found.

Squatter pigeon

Targeted surveys for the squatter pigeon (southern) involved a combination of 320 km of slow driving surveys undertaken within the Study Area, 2,016 hours of remote camera observations (with cameras set at 14 waterbodies), 44 hours of water-body watches and 15 person hours of bird surveys were used to search for the squatter pigeon (southern) and other threatened bird species potentially present (such as the red goshawk). Searches for the Australian painted snipe were undertaken during the waterbody watches required for the black-throated finch.

1.6.5 Aquatic ecology assessments

Aquatic ecology assessments were undertaken at waterways or suitable waterbodies within the Study Area, including Obungeena, Eight Mile and North Creeks, Pear Gully, Belyando River during the post wet season. Survey sites were selected to provide information representative of the aquatic ecosystems and potential habitats (lacustrine, palustrine, riverine, drainage lines and gilgais) within the offsite infrastructure footprint (Figure 4).

This assessment included the following:

- Substrate type and composition
- Surface water depth
- Type and availability of habitat structure (e.g. woody debris)
- Riparian zone characteristics
- Observations of aquatic fauna
- Pest flora and fauna
- Habitat attributes (e.g. macrophytes, substrate anoxia, trailing bank vegetation)
- Odour and turbidity
- Deposition, scouring and erosion
- Existing disturbances

The findings of the aquatic ecology assessment were used to describe the aquatic ecology values of the proposed Study Area, identification of potential impacts to aquatic ecology values and prescription of appropriate mitigation measures to avoid or minimise potential impacts.

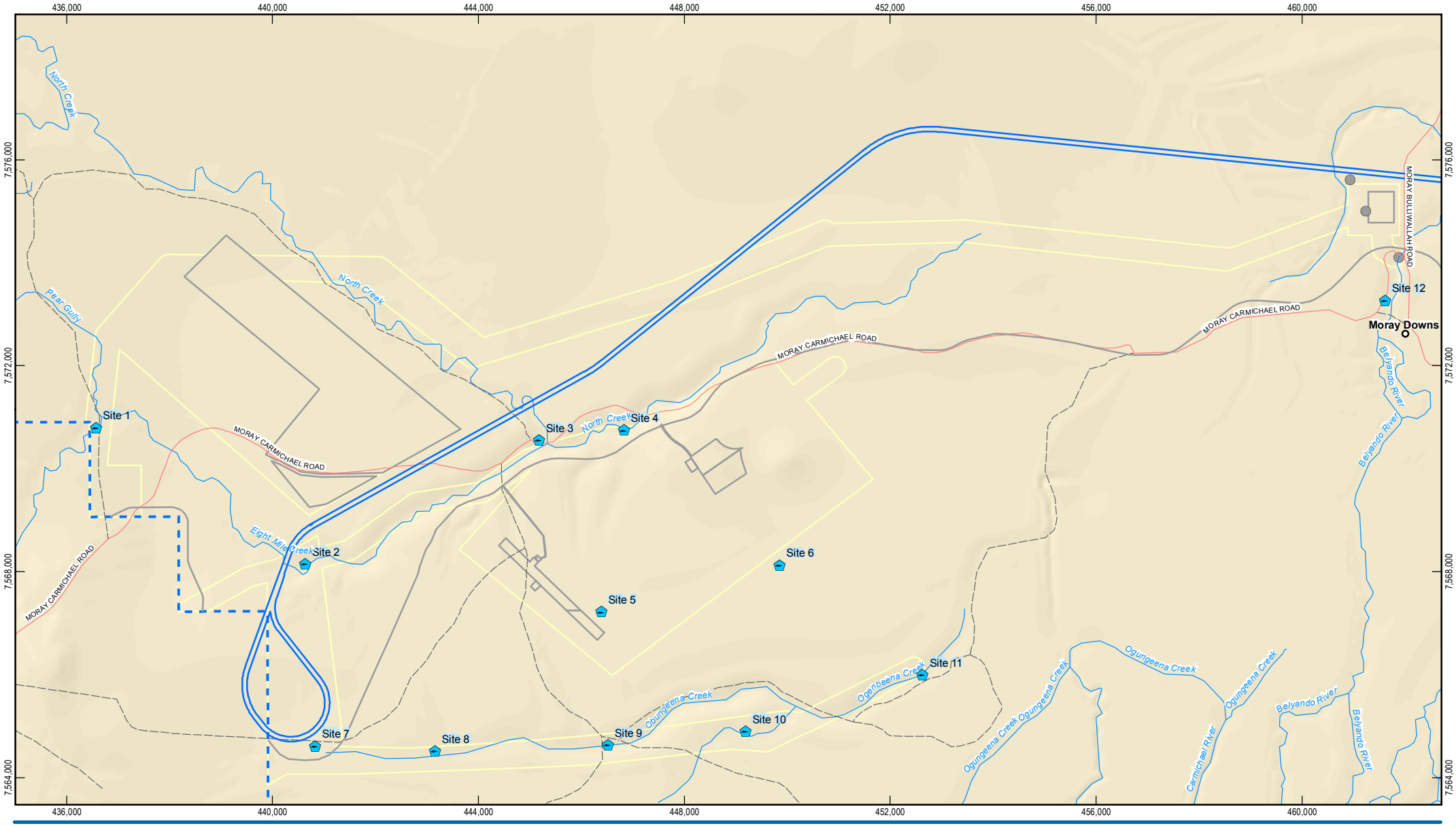
1.6.6 Likelihood of occurrence assessments

The information obtained through the desktop and field assessments was used to characterise the existing terrestrial and aquatic ecological values of the Study Area. For conservation significant species, a likelihood of occurrence assessment was undertaken to inform the impact identification process. This assessment considered information relating to:

- Habitat preferences
- Distribution
- Relative abundance
- Previous records from the region
- The occurrence of suitable habitat at the based on field observations
- The confirmed presence of conservation significant species at the Study Area

A likelihood of occurrence ranking was attributed to each conservation significant species, based on the following framework:

- **Unlikely to occur**: species has not been recorded in the region (no records from desktop search extent as defined in Table 1) AND/OR current known distribution does not encompass Study Area AND/OR suitable habitat is generally lacking from Study Area
- **May occur**: species has not been recorded in the desktop search extent (as defined in Table 1) although species' distribution incorporates Study Area AND potentially suitable habitat occurs at the Study Area
- **Likely to occur**: species has been recorded in the desktop search extent (as defined in Table 1) and potentially suitable habitat is present at the Study Area
- **Confirmed present**: species recorded during field surveys



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0 2 4

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Aquatic Ecology Survey Sites
- Local Road
- Track
- Watercourse
- Study Area
- Rail Corridor
- Project Area
- Mine (Offsite)
- Mine (Offsite)

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Aquatic Ecology Survey Sites

Figure 4

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Data source: DME: EPC1690 (2010)/EPC1080 (2011); © Commonwealth of Australia (Geoscience Australia): Watercourse, Tracks (2007); Adani: Alignment Opt11 Rev 2 (SP1 and 2)(2013), Offsite Infrastructure (2013); GHD: Aquatic Survey Sites (2013). Created by: AJ

2. Existing environment

2.1 Regional context

The Study Area occurs immediately north-east of the proposed Mine and extends approximately 14 km to the east and 5 km north and south of the Moray-Carmichael Road. Detailed information on the environmental characteristics of the local landscape and its context within the surrounding region is provided in Volume 2, Section 5 Nature Conservation and Appendix N of the EIS (GHD, 2012a). A summary of these regional environmental values is provided below.

The Study Area occurs in central Queensland within the Carmichael River sub catchment of the Burdekin basin, at the boundary of the Brigalow Belt and Desert Uplands bioregions. This region has been heavily utilised for cattle grazing and coal production. Targeted clearing of suitable grazing land has meant that, over the last 100 years, specific vegetation communities have been significantly reduced in area. These communities and a number of endemic fauna and flora species that occur within them have become threatened as a result.

The Belyando River sub catchment is characterised by generally low relief floodplains drained by braided channels and surrounded by wide alluvial plains (Dight, 2009). Within the region, connectivity of remnant vegetation is maintained by riparian vegetation including mature river red gum (*Eucalyptus camaldulensis*) and paper bark (*Melaleuca leucadendra*) associated with the Carmichael and Belyando rivers. The elevated location of the Study Area in the Burdekin basin in combination with seasonality of rainfall means stream flows are generally restricted to the wetter months (November to March). During the dryer months (June and July) many streams and drainage channels dry while larger rivers sustain only pools or low flows. It is thought that major watercourses and associated remnant riparian vegetation are dependant on groundwater to maintain a series of semi-permanent and permanent waterholes in regions upstream of the Project (Mine).

2.2 Local context

Environmental values were considered in the selection of Offsite footprint, avoiding areas of native vegetation wherever possible. As a result, the proposed location of the Offsite footprint is within an area that has been predominantly cleared of natural vegetation.

The Study Area occurs within one pastoral lease at the north-east of the Mine. This property has been intensively grazed for many decades. The landscape has been heavily fragmented by historic land-clearing. Only small patches of remnant vegetation persist. These are predominantly located along the four ephemeral watercourses that occur within the Study Area: North Creek, Eight Mile Creek, Obungeena Creek and the Belyando River.

2.3 Terrestrial flora

2.3.1 Regional ecosystems and Environmentally Sensitive Areas

Regional ecosystem framework

REs are ordered on three levels, reflected in the three part codes used to identify them. At the highest level is the bioregion – the Queensland Herbarium (the organisation responsible for defining REs and for the initial creation of RE maps) has adopted the Stanton and Morgan

(1977) bioregional mapping for Queensland as outlined in Sattler and Williams (1999). Each bioregion is given a number, which is the first number that appears in the RE code (for example, the RE 11.7.2 belongs to bioregion 11).

The second level is that of the land zone, of which there are 12 (the land zone is the second number – the RE 11.7.2 is found on land zone seven). Land zones are a landscape unit based on a combination of geology, pedology and land form pattern. The final level of organisation is the ecosystem (described in terms of the dominant vegetation in terms of above ground biomass), which is specific to a land zone within a bioregion (unlike bioregional organisation and land zone units, which are consistent across Queensland) (Sattler and Williams, 1999). Therefore, the RE 11.7.2 is the second described ecosystem on land zone seven in bioregion eleven.

Under the VM Act, the remnant extent of an RE is measured against the estimated extent before Europeans began clearing (Sattler and Williams, 1999). This is a quantitative measure of an RE's remnant extent and has legislative force. The categories under the VM Act are as follows:

- **Endangered REs** are those that have either:
  - less than 10 percent of the pre-clearing extent remaining or
  - 10 to 30 percent of the pre-clearing extent remaining and the remnant vegetation remaining is less than 10,000 ha
- **Of concern REs** are those that have either:
  - 10 to 30 percent of the pre-clearing extent remaining or
  - more than 30 percent of the pre-clearing extent remaining and the remnant vegetation remaining is less than 10,000 ha
- **Least concern REs** are those that have more than 30 percent of the pre-clearing extent remaining and the remnant vegetation remaining is more than 10,000 ha.

Regional ecosystems in the Study Area

A total of seven Desert Uplands REs and 10 Brigalow Belt REs are mapped within the Study Area (see Figure 5 and Table 5). All of the mapped Desert Uplands REs are classified by the VM Act as being least concern. The mapped Brigalow Belt REs include three endangered REs and four of concern REs. However, results of the flora surveys indicate that three Desert Uplands REs and one Brigalow Belt REs are not actually present within the Study Area. Additionally, one desert upland RE was observed within the Study Area, but is not mapped.

These changes from the latest DNRM certified RE mapping are summarised in Table 4 and presented in Figure 6. In total, 14 REs were identified within the Study Area, five from the Desert Uplands and nine from the Brigalow Belt. Henceforth, this report will refer to the field verified REs unless otherwise indicated (by the prefix 'officially mapped').

Table 4 Summary of Regional ecosystem mapping changes

Bioregion	Officially mapped but not present	Observed but not officially mapped
Brigalow Belt	11.4.8 (1 RE)	
Desert Uplands	10.3.3, 10.3.4 and 10.4.3 (3 REs)	10.3.14 (1 RE)

REs within the Study Area occur on three land zones, summarised here in order of the relative extent in which they occur (higher to lower):

- Land zone four – represented by clay plains with minor gilgai micro-relief in places – much of this land zone has been cleared and is now dominated by pasture grasses
- Land zone five – represented by broad plains of red or grey sands and sandy loams, and covering the majority of the site
- Land zone three – represented by alluvium plains associated with the Belyando River and its tributaries; this land zone is the second most common in terms of area, with large alluvial plains present in the southern half of the Study Area

Land zone four

Land zone four is the most common landzone mapped within the Study Area. Land zone four is represented in the Study Area by five REs, one from the Desert Uplands and four from the Brigalow Belt. This land zone occurs on level to gently undulating plains formed from Cainozoic clay deposits. Two of the land zone four REs within the Study Area (REs 11.4.5 and 11.4.9) are dominated by brigalow open woodland to open forest or *Acacia argyrodendron* low open woodland. Two other land zone four REs within the Study Area include a woodland to low woodland dominated by gidgee (*Acacia cambagei*) (10.4.5 and 11.4.6). The final land zone four RE (11.4.11) is a grassland dominated by white speargrass (*Aristida leptopoda*). These REs are likely to have been more common in the area prior to European settlement. However, as clay plains are often highly suitable for improved pastures, they have generally been targeted for clearing, and as a consequence they are now poorly represented in terms of area. The REs on land zone four as a group have the highest conservation value of all of the REs within the Study Area – the one Desert Uplands RE is classed as least concern, but the Brigalow Belt REs are classed as of concern (RE 11.4.5, 11.4.6 and 11.4.11) or endangered (RE 11.4.9). In addition, the RE 11.4.9 is a component of the EPBC Act listed endangered Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC.

Land zone three

The next most common land zone within the Study Area is land zone three. This land zone is represented by landforms derived from alluvial processes, and can be divided into two main types – level to gently undulating plains, and river channels, minor creeks, drainage lines and relict channels. Land zone three has the greatest RE diversity of the Study Area, with eight REs represented - three Desert Uplands REs and five Brigalow Belt REs. Of the eight land zone three REs recorded within the Study Area that are present on alluvial plains, seven are dominated by eucalyptus (REs 10.3.6, 10.3.14, 10.3.28, 11.3.3, 11.3.10, 11.3.25 and 11.3.37) – either Reid River box (*Eucalyptus brownii*), silver-leaved ironbark (*Eucalyptus melanophloia*), coolabah (*Eucalyptus coolabah*) or river red gum (*Eucalyptus camaldulensis*). Cumulatively, these seven REs account for most of the area covered by land zone three REs within the Study Area, occurring as fragmented patches within broad plains as well as along watercourses. The remaining RE, 11.3.1, is dominated by brigalow (*Acacia harpophylla*) and occurs as heterogeneous RE polygons fringing watercourses.

Two land zone three RE occurs as open forest fringing watercourses. The REs 11.3.14 and 11.3.25 are dominated by river red gum (*Eucalyptus camaldulensis*) and weeping paperbark (*Melaleuca leucadendra*) (11.3.25, only), and is restricted within the Study Area to the Belyando

River channel and North Creek. Six of the land zone three REs recorded within the Study Area are classed as least concern under the VM Act. The remaining two REs, 11.3.1 and 11.3.3, are classed as endangered and of concern, respectively.

Land zone five

This land zone is represented in the region by broad sand plains comprised of either red or grey sand. There is one RE mapped in the amended RE mapping for this land zone, which is a low open woodland dominated by silver-leaved ironbark. This RE, 11.5.5, occurs as a heterogeneous polygon with two other REs and the vegetation within the polygon represents all three REs. Other dominant canopy species include Reid River box and Dallachy's gum (*Corymbia dallachiana*). The RE representing land zone 5 within the Study Area is classed as least concern under the VM Act.

Environmentally sensitive areas within the Study Area

Category A ESAs include national parks, conservation parks and forest reserves listed under the NC Act; the wet tropics area listed under the *Wet Tropics World Heritage Protection and Management Act 1993*; the Great Barrier Reef Region listed under the *Great Barrier Reef Marine Park Act 1975* and marine parks (not including general use zones) listed under the *Marine Parks Act 2004*. No Category A ESAs are present within the Study Area. Regional ecosystems with a biodiversity status of endangered are classified as Category B ESAs. The DEHP ESA Map for Mining Activities identifies a number of patches of Category B ESA areas as present within the Study Area. Six RE types classified as Category B ESAs (10.4.3, 11.3.1, 11.4.5, 11.4.6, 11.4.8 and 11.4.9), are mapped from DNRM certified RE mapping within the Study Area (refer to Figure 5). Field verifications of the DNRM certified RE mapping identified that four REs (11.3.1, 11.4.5, 11.4.6 and 11.4.9), classified as Category B ESAs, were present within the Study Area. The field verified Category B ESA REs cover an approximate area of 63.32 ha within the Study Area. Their location within the EPC 1690 Study Area is presented in Figure 5. A summarised description of Category B ESA RE types is summarised in Table 5.

2.3.2 Regulated regrowth vegetation

Regrowth vegetation as defined by the VM Act comprises vegetation that is non-remnant. Regrowth vegetation specially regulated under the VM Act is non-remnant vegetation that has reached an advanced stage of regrowth, generally having not been cleared since 31 December 1989. The Study Area includes eight patches of mapped regulated regrowth vegetation containing endangered (sub-dominant) RE and a single patch of mapped regulated regrowth containing least concern RE, with an area of approximately 78.40 ha. An additional four patches of regrowth were observed within the Study Area. Henceforth, this report will refer to the field verified regrowth unless otherwise indicated (by the prefix 'officially mapped').The certified and field confirmed regrowth mapping is provided in Figure 5 and Figure 6, respectively.

Table 5 Regional ecosystem descriptions

RE	VM Act class/ Biodiversity status	Land form	Description	Comments (inc. area within Study Area)
Desert Uplands REs				
10.3.3	least concern / no concern at present	Occurs on alluvial plains.	Low open-woodland of *Acacia harpophylla* +/- *Eucalyptus cambageana* emergents or open-woodland of *Eucalyptus cambageana* +/- understorey of *Acacia harpophylla* over a very open tussock grassland ground layer.	Mapped at eight locations across the Study Area as a heterogeneous polygon with 10.3.4 and 10.3.6. Not observed within the Study Area. Not present within the Offsite footprint.
10.3.4	least concern / of concern	Occurs on heavy clay and texture contrast soils on alluvial plains.	Low open-woodland to woodland of Acacia cambagei with very open tussock grassland. Minor occurrences of Acacia tephrina woodland.	Mapped at eight locations across the Study Area as a heterogeneous polygon with 10.3.4 and 10.3.6. Not observed within the Study Area. Not present within the Offsite footprint.
10.3.6	least concern / no concern at present	Occurs on alluvial plains with clays and texture contrast soils.	*Eucalyptus brownii* open-woodland to woodland.	One of the major vegetation communities in the Study Area, often on plains in small and often isolated patches. Observed as homogeneous RE polygons and as a heterogeneous polygon with 10.3.14. Approximately 68.2 ha within the Study Area. Approximately 2.9 ha within the Offsite footprint.
10.3.14	least concern / of concern	Occurs on channels, levees and flood plains with sandy to clayey soils along larger watercourses.	*Eucalyptus camaldulensis* and/or *E. coolabah* woodlands and open-woodlands on channels, levees and floodplains.	Present along North Creek in the northern section of the Study Area. Occurs as a heterogeneous polygon with 10.3.6. Approximately 3.32 ha within the Study Area. Not present within the Offsite footprint.

RE	VM Act class/ Biodiversity status	Land form	Description	Comments (inc. area within Study Area)
10.3.28	least concern / no concern at present	Occurs on sandy alluvial fans with yellow earth and duplex soils formed from outwash from sandstone hills.	Open-woodland to woodland of *Eucalyptus melanophloia* or *Eucalyptus crebra*. *Eucalyptus melanophloia* dominates the very sparse to sparse canopy (8-18 m tall). *Corymbia dallachiana* is occasional present in the canopy or subcanopy. A low tree layer or shrub layer are usually absent although there can be scattered small trees and shrubs present. *Aristida benthamii, Sehima nervosum, Digitaria brownii, Chrysopogon fallax, Enneapogon polyphyllus, Schizachyrium fragile* and *Eriachne mucronata* occur as dominants and some co dominants. Other graminoids usually present include *Aristida* spp., *Panicum effusum, Tripogon loliiformis* and *Heteropogon contortus*. Forbs usually present include *Evolvulus alsinoides, Rostellularia adscendens, Sauropus trachyspermus* and *Brunoniella australis*.	Present within two small areas directly adjacent to the EPC 1690 at the western end of the Study Area. This RE occurs as a heterogeneous polygon with 10.3.6 and 10.5.5. Habitat for *Acacia ramiflora.* Approximately 15.6 ha within the Study Area. Approximately 1.3 ha within the Offsite footprint.
10.4.3	least concern / endangered	Occurs on clay and texture contrast soils, gently undulating downs and plains on Cainozoic lake deposits.	*Acacia harpophylla* and/or *Eucalyptus cambageana* open-woodland.	Mapped within a small and isolated patch of remnant vegetation on the western end of the Study Area as a heterogeneous polygon with 10.4.5. Not observed within the Study Area. Not present within the Offsite footprint.

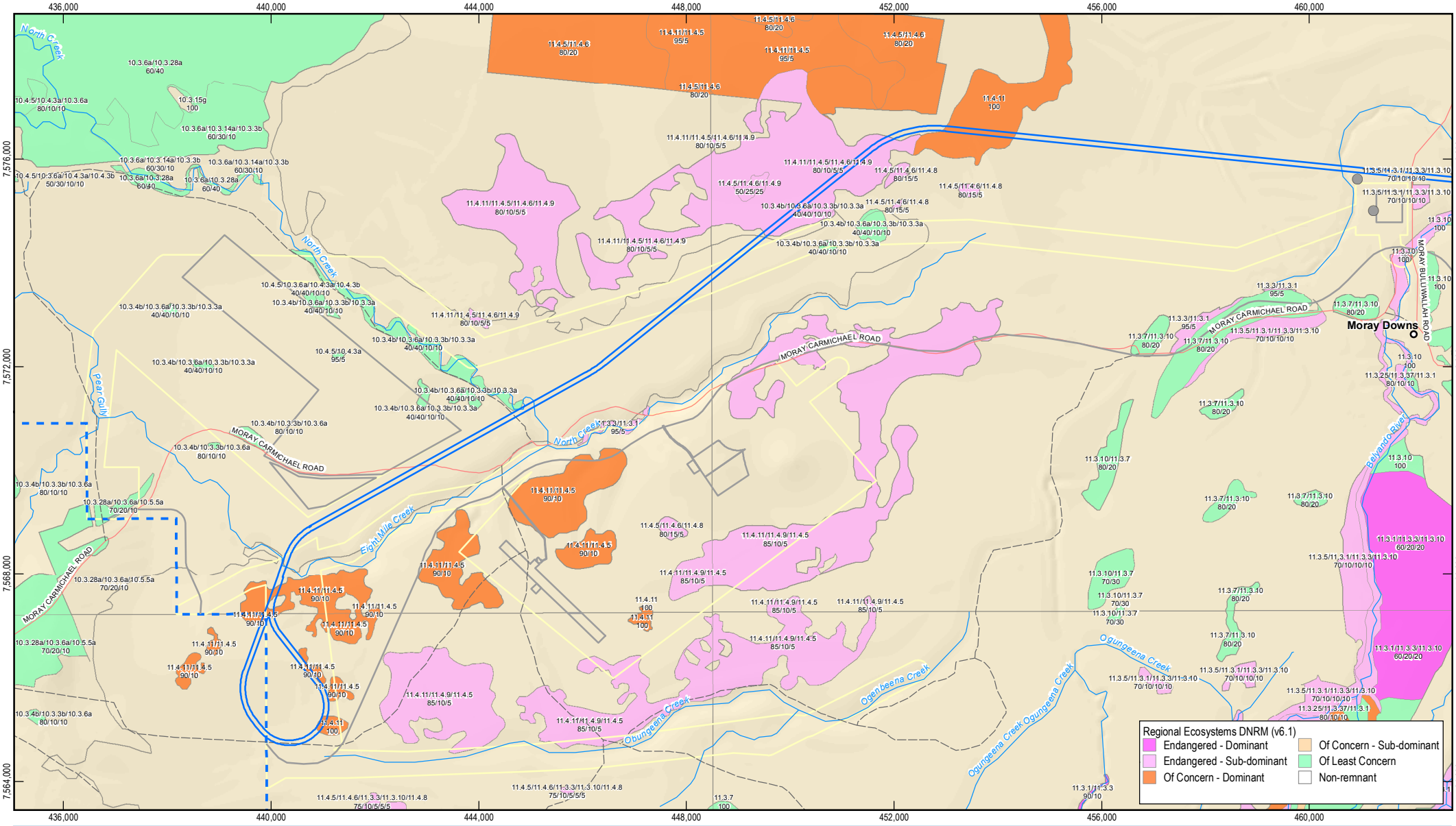
RE	VM Act class/ Biodiversity status	Land form	Description	Comments (inc. area within Study Area)
10.4.5	least concern / of concern	Occurs on plains and gently undulating downs on Cainozoic lake deposits. Cracking clay soils, usually gilgaied, and minor areas of texture contrast soils.	*Acacia cambagei* low woodland sometimes with *A. harpophylla.* *Acacia cambagei* dominates the very sparse to sparse canopy (6-15 m tall). Other trees often present in the canopy or occur as scattered small trees include *Terminalia oblongata* and *Acacia harpophylla.* *Eremophila mitchellii* and *A. cambagei* usually dominate the very spares large shrub layer (2-4 m tall). *A. cambagei, Eremophila deserti, Senna artemisioides* and *Carissa lanceolata* are usually common or dominant in the small shrub layer (0.5-2 m tall). *Enteropogon acicularis, Eragrostis lacunaria, Tripogon loliiformis* and *Oxychloris scariosa* or *Leptochloa decipiens* occasionally occur as dominant graminoids in the very sparse ground layer. Other graminoids often present include *Sporobolus actinocladus, Enneapogon polyphyllus* and *Paspalidium caespitosum. Enchylaena tomentosa* and *Sclerolaena* spp. are forbs usually present.	Present within a small and isolated patch of remnant vegetation on the western end of the Study Area as a heterogeneous polygon with 10.4.3. Approximately 2.5 ha within the Study Area. Approximately 2.5 ha within the Offsite footprint.
10.5.5	least concern / no concern at present	Occurs on loamy red and yellow earths on undulating sand plains.	Mostly *Eucalyptus melanophloia* open-woodland with open-grassland understorey of *Aristida* spp. and/or *Triodia* spp. Occasionally present are small areas of *Acacia coriacea* or *Archidendropsis basaltica* or rarely grassland.	Present within two small areas directly adjacent to the EPC 1690 mine lease at the western end of the Study Area. This RE occurs as a heterogeneous polygon with 10.3.28 and 10.3.6. Habitat for *Acacia ramiflora.* Approximately 2.2 ha within the Study Area. Approximately 0.2 ha within the Offsite footprint.

RE	VM Act class/ Biodiversity status	Land form	Description	Comments (inc. area within Study Area)
Brigalow Belt REs				
11.3.1	endangered / endangered	Associated with Cainozoic alluvial plains which may be occasionally flooded. Landforms range from level to very gently sloping plains, alluvial flats, drainage floors, back-swamps and abandoned channels. Associated soils are predominantly deep to very deep cracking clays, sometimes with gilgai or texture contrast soils with sandy surface.	Open-forest dominated by *Acacia harpophylla* and/or *Casuarina cristata* (particularly in southern parts), with or without scattered emergent *Eucalyptus* spp. such as *E. coolabah, E. largiflorens, E. populnea, E. orgadophila,* and *E. pilligaensis*. A low tree layer dominated by *Geijera parviflora* and *Eremophila mitchellii* is usually present. The vegetation sometimes occurs as low open-forest or woodland. Tree height generally about 11-15 m and the low tree (to tall shrub) understorey layer is between 2 and 8 m high (where present). Ground cover is generally sparse.	Present in one narrow area along an ephemeral watercourse in the centre of the Study Area. Occurs as a heterogeneous polygon with 11.3.3. Part of the EPBC Act Threatened Ecological Community 'Brigalow'. Approximately 0.3 ha within the Study Area. Not present within the Offsite footprint.
11.3.3	of concern / of concern	Occurs on Cainozoic alluvial plains or levees with clay or sometimes texture contrast soils.	*Eucalyptus coolabah* woodland to open-woodland with a grassy understorey. A mid layer is often absent but scattered tree or shrub species, such as *E. populnea, Melaleuca bracteata, Alectryon oleifolius, Terminalia oblongata* (in the north) and *Acacia pendula, A. cambagei*, and occasionally *Muehlenbeckia florulenta* may be present. The ground layer is dominated by a range of grass and forb species depending on season, soil and management conditions. Can include small areas of grassland with scattered trees.	Present in one narrow area along an ephemeral watercourse in the centre of the Study Area. Occurs as a heterogeneous polygon with 11.3.1. Approximately 5.7 ha within the Study Area. Not present within the Offsite footprint.
11.3.10	least concern / no concern at present	Occurs on Cainozoic alluvial plains.	*Eucalyptus brownii* grassy woodland. This unit usually occurs as a woodland of *E. brownii.* There is usually a grassy ground layer or *Aristida* spp., *Chloris* spp., *Fimbristylis dichotoma, Eriachne* spp., *Eragrostis* spp. and *Chrysopogon fallax.*	Present in one small patch adjacent to riparian vegetation associated with Belyando River, at the eastern end of the Study Area. Approximately 0.4 ha within the Study Area. Not present within the Offsite footprint.

RE	VM Act class/ Biodiversity status	Land form	Description	Comments (inc. area within Study Area)
11.3.25	least concern / of concern	Occurs on fringing levees and banks of major rivers and drainage lines of alluvial plains throughout the region. Soils are very deep, alluvial, grey and brown cracking clays with or without some texture contrast. These are usually moderately deep to deep, soft or firm, acid, neutral or alkaline brown sands, loams or black cracking or non-cracking clays, and may be sodic at depth.	*Eucalyptus camaldulensis* or *E. tereticornis* open-forest to woodland. Other tree species such as *Casuarina cunninghamiana, E. coolabah, Melaleuca bracteata, Melaleuca viminalis, Livistona* spp. (in north), *Melaleuca* spp. and *Angophora floribunda* are commonly present and may be locally dominant. An open to sparse, tall shrub layer is frequently present dominated by species including *Acacia salicina, A. stenophylla* or *Lysiphyllum carronii*. Low shrubs are present, but rarely form a conspicuous layer. The ground layer is open to sparse and dominated by perennial grasses, sedges or forbs such as *Imperata cylindrica, Bothriochloa bladhii, B. ewartiana, Chrysopogon fallax, Cyperus dactylotes, C. difformis, C. exaltatus, C. gracilis, C. iria, C. rigidellus, C. victoriensis, Dichanthium sericeum, Leptochloa digitata, Lomandra longifolia* or *Panicum* spp..	Comprises the vegetation fringing the Belyando River, in the form of *E. camaldulensis* open forest with *Melaleuca leucadendra and M. trichostachya* lining the actual channel, and forming woodland along the north-western bank. Occurs within a heterogeneous polygon with 11.3.37. Approximately 6.9 ha within the Study Area. Approximately 0.16 ha within the Offsite footprint.
11.3.37	least concern / no concern at present	Includes larger waterholes and stream channels. Occurs on fringing stream channels, usually braided. Soils are bed loads of clay or silt with cobbles and boulders in some areas.	*Eucalyptus coolabah with Eucalyptus camaldulensis* form a distinct but discontinuous woodland to low woodland canopy layer (7-11 m high). Other scattered trees such as *Lysiphyllum gilvum*, *Melaleuca trichostachya*, *Melaleuca bracteata* and *Eucalyptus populnea* may occur. The mid layer varies from absent to a tall shrubland dominated by species such as *Acacia stenophylla* and *Acacia salicina*. Ground cover is variable composed of grasses and sedges.	Occurs along the Belyando River at the eastern extent of the Study Area. Occurs within a heterogeneous polygon with 11.3.25. Approximately 2.9 ha within the Study Area. Approximately 0.1 ha within the Offsite footprint.

RE	VM Act class/ Biodiversity status	Land form	Description	Comments (inc. area within Study Area)
11.4.5	of concern / endangered	Occurs on flat to gently undulating plains formed from unconsolidated Cainozoic deposits.	*Acacia argyrodendron* dominates the very sparse canopy (12-16 m high). There are usually scattered small trees (6-10 m high) including *A. argyrodendron*, *Terminalia oblongata*, *Owenia acidula*, *Lysiphyllum carroni* and *Eremophila mitchellii*. Grasses usually dominate the very sparse to mid-dense ground layer. *Dichanthium sericeum*, *Panicum decompositum* and *Aristida latifolia* can also be dominants.	Occurs within the southern extent of the Study Area occurring in heterogeneous polygons with 11.4.11 and 11.4.9, and as an heterogeneous RE polygon. Approximately 53.5 ha within the Study Area. Not present within the Offsite footprint.
11.4.6	of concern / endangered	Occurs on gently undulating plains formed from Cainozoic sediments.	*Acacia cambagei* dominates the tree canopy (10 – 13 m high). There is a sparse to open low tree layer (7 – 9 m high) dominated by *Lysiphyllumm carronii, Geijera parviflora, Acacia harpophylla,* and sometimes, *A. argyrodendron, Terminalia oblongata, and Eremophila mitchellii.* An open shrub layer (1 m high) dominated by species such as *Carissa ovata, Capparis lasiantha, Eremophila deserti, Apophyllum anomalum* and *Alectryon diversifolius* is also often present. The ground layer is sparse to open and dominated by grasses.	Present at two locations: as a single small and isolated homogeneous polygon within the central part of the Study Area; and, as a small homogeneous polygon located at the south-western corner of the accommodation and airport infrastructure area. Approximately 2.5 ha within the Study Area. Not present within the Offsite footprint.
11.4.8	endangered / endangered	Occurs on level to gently undulating plains formed from Cainozoic deposits. Associated soils are usually deep texture contrast with thin loamy or sandy surface horizons overlying strongly alkaline clay subsoils. Surface or subsurface gravel is common.	Woodland to open-forest dominated by *Eucalyptus cambageana* and *Acacia harpophylla* or, sometimes in the north, *A. argyrodendron*. *E. thozetiana* is sometimes present on shallower soils. There is a moderately dense low tree layer (5 m high) layer dominated by species such as *Eremophila mitchellii* and a low shrub layer (2 m high) dominated by species such as *Carissa ovata* and *Geijera parviflora*.	Mapped within the accommodation and airport infrastructure footprint in a small heterogeneous polygon with 11.4.5 and 11.4.6. Not observed within the Study Area. Not present within the Offsite footprint.

RE	VM Act class/ Biodiversity status	Land form	Description	Comments (inc. area within Study Area)
11.4.9	endangered / endangered	Occurs on level to gently undulating Cainozoic plains, including weathered basalt. Associated soils are predominantly moderately deep to deep cracking clays that may be brown, red-brown or grey-brown, and with much surface gravel in some areas.	Open-forest, occasionally woodland, dominated by *Acacia harpophylla* usually with a low tree mid-storey of *Terminalia oblongata* and *Eremophila mitchellii*. *Casuarina cristata* sometimes replaces *Acacia harpophylla* in the overstorey and *Lysiphyllum cunninghamii* sometimes co-dominates. Other low tree or shrub species such as *Alectryon diversifolius, Carissa ovata, Pittosporum spinescens, Ehretia membranifolia, Geijera parviflora* and *Flindersia dissosperma* may occur in the mid-storey or low shrub layer. *Acacia harpophylla* trees have been recorded as 11- 17 m high, the mid-storey layer 2- 8 m high and the low shrub layer 1-2 m high.	Mapped within the southern port of the Study Area in large heterogeneous polygons with 11.4.5 and 11.4.11. Part of the EPBC Act Threatened Ecological Community 'Brigalow'. Occurs as a single small and isolated patch within the proposed accommodation and airport infrastructure area in the southern part of the Study Area. Approximately 9.5 ha within the Study Area. Not present within the Offsite footprint.
11.4.11	of concern / of concern	Occurs in shallow open valleys and poorly drained Cainozoic clay plains with deep cracking clay soils.	Grassland dominated by *Dichanthium sericeum* and forms a mosaic with clumps of *Acacia harpophylla*, *Lysiphyllum hookeri* and *L. carroni* (usually 8+/-5 m high). A wide range of other grasses and forb species are usually present and may dominate depending on seasonal conditions and management regime. Frequently occurring species include *Aristida leptopoda*, *A. latifolia*, *Astrebla lappacea*, *Bothriochloa erianthoides*, *Digitaria brownii*, *D. divaricatissima* and the forbs *Boerhavia dominii*, *Glycine latifolia* and *Rhynchosia minima*.	Mapped within the southern extent of the Study Area occurring in heterogeneous polygons with 11.4.5 and 11.4.9. Approximately 161.4 ha within the Study Area. Not present within the Offsite footprint.



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0 2 4

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Local Road
- Track
- Watercourse
- Study Area
- Rail Corridor
- Project Area
- Mine (Offsite)
- Mine (Offsite)

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Carmichael Coal Mine and Rail Project SEIS
Environmental Assessment Report

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Regional Ecosystems - DNRM Certified

Figure 5

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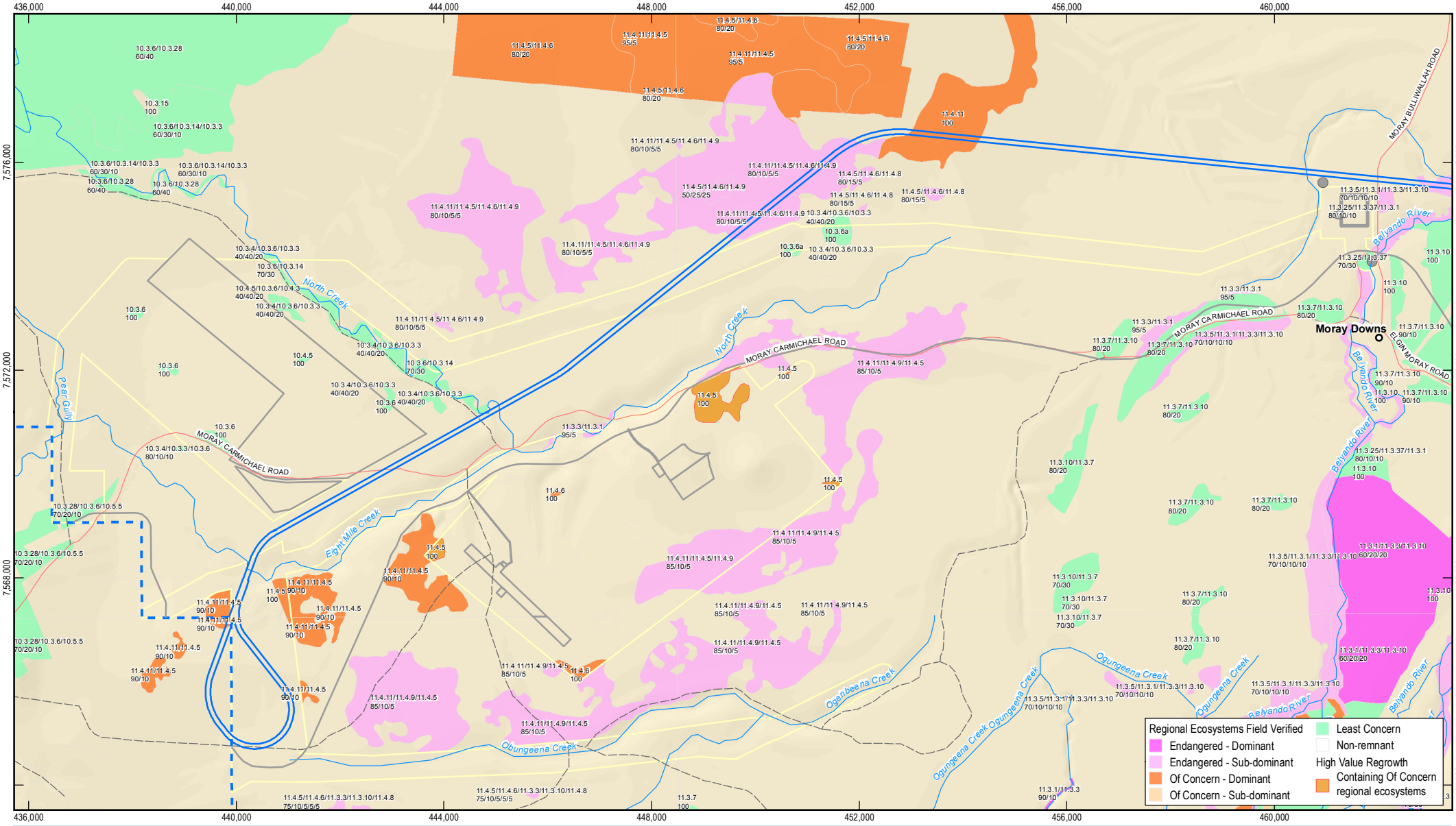

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0 2 4

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Local Road
- Track
- Watercourse
- Study Area
- Rail Corridor
- Project Area
- Mine (Offsite)
- Mine (Offsite)

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Regional Ecosystems - Field Verified

Figure 6

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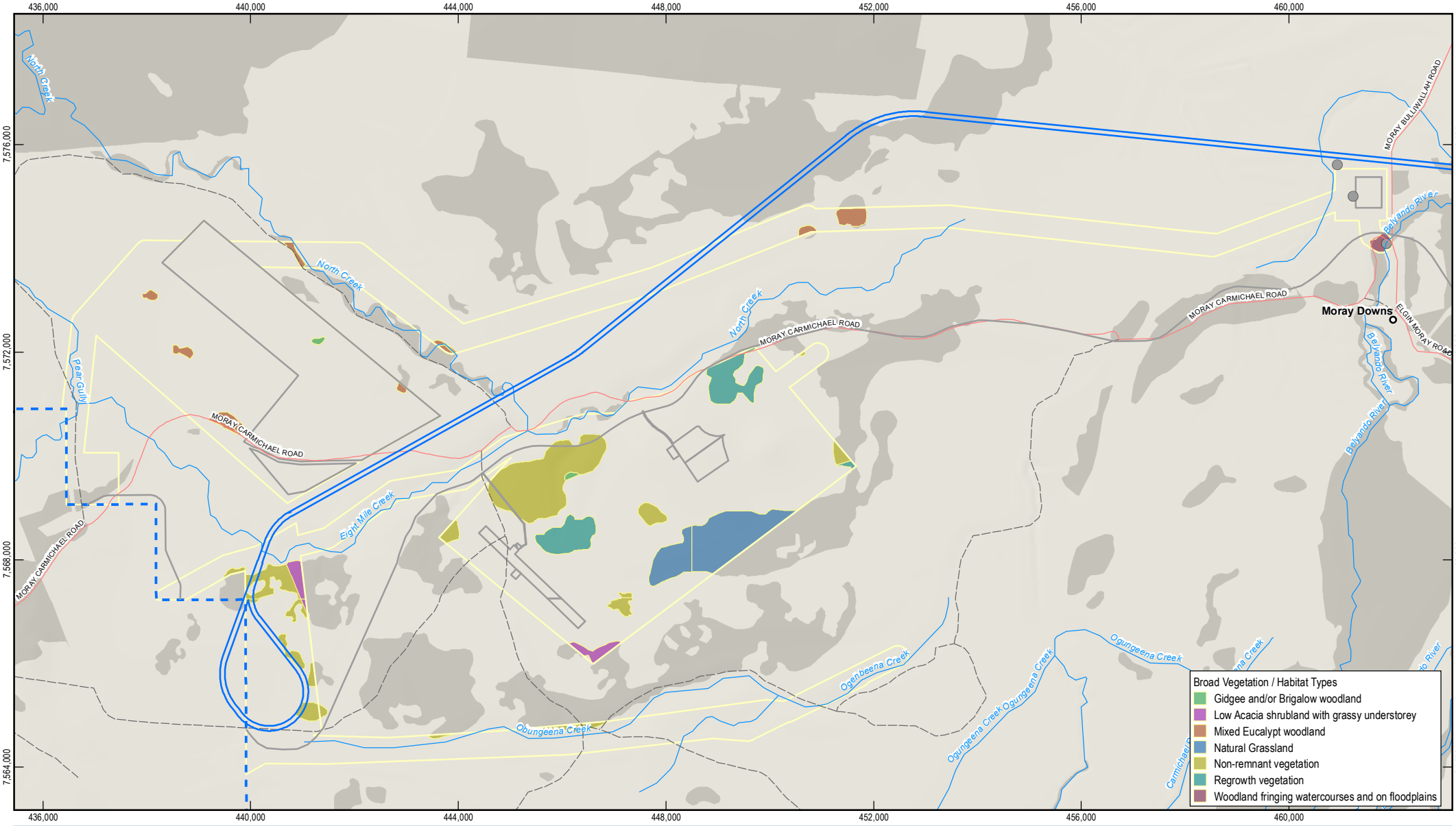
Data source: DME: EPC1690 (2010)/EPC1080 (2011); DNRM\GHD: Field Verified Regional Ecosystems (2011); © Commonwealth of Australia (Geoscience Australia): Watercourse, Tracks (2007); Adani: Alignment Opt11 Rev 2 (SP1 and 2)(2013), Offsite Infrastructure (2013). Created by: AJ

2.3.3 Vegetation communities

The current certified RE mapping (version 6.1b) identified the Study Area as predominately supporting non-remnant vegetation. Eleven REs were confirmed present within the Study Area, including a large number of small areas mapped as the least concern REs 10.3.6a and the of concern 11.4.11/11.4.5, as well as smaller areas mapped as the least concern 11.3.25, 11.3.3 and 11.3.37, consistently associated with watercourses (see Table 5 and Section 2.3.1 for a description of these REs).

Quaternary level surveys (as per Neldner et al., 2012) were undertaken within the eleven distinct mapped RE units present within the Study Area. The survey, which considered species composition, geology and landform, indicated that the certified mapping is consistent with the vegetation communities observed within the Study Area.

To provide a strategic understanding of the vegetation communities present across the Study Area, seven 'broad vegetation communities' (BVCs) were assigned to the vegetation types recorded. These BVCs are based on the particular communities (i.e. REs) and land forms present within the Study Area and are consistent with the broad vegetation groups developed by the Queensland Herbarium. The BVCs recorded on site are described in Table 6 below.



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0 2 4

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Local Road
- Track
- Watercourse
- Study Area
- Rail Corridor
- Project Area
- Mine (Offsite)
- Mine (Offsite)

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Distribution of Broad Vegetation/ Habitat Types within the Study Area

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Figure 7

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Data source: DME: EPC1690 (2010)/EPC1080 (2011); DNRM\GHD: Field Verified Regional Ecosystems, Broad Vegetation Communities (2011); © Commonwealth of Australia (Geoscience Australia): Watercourse, Tracks (2007);
Adani: Alignment Opt11 Rev 2 (SP1 and 2)(2013), Offsite Infrastructure (2013). Created by: AJ

Table 6 Broad vegetation communities within the Study Area (in order of area)

Community name	REs	Landform	Characteristic species	Sites2	Comments
Open, previously cleared areas, with patchy and low native vegetative cover (Map code: Non-remnant vegetation)	Non-remnant	Generally located on clay plains in lower catchment positions across a large area of the Study Area.	Buffel grass (*Cenchrus ciliaris*) and Parthenium (*Parthenium hysterophorus*) dominate the ground cover. Often with sparse low-tree or shrubby regrowth *Acacia harpophylla*, *Acacia cambagei*, *Lysiphyllum carroni* and *Eucalyptus* spp.	Q4, Q5, Q6, Q11, Q12, Q17, Q20, Q25, Q28, Q31, Q32, Q33, Q36, Q37, Q39, Q40, Q41, Q42, Q43, Q45, Q47, Q48	Covers 6692.4 ha of the Study Area, primarily on the more fertile clay plains. Representative image 
Ironbark-box grassy woodland and open woodland on sandy plains (Map code: Mixed eucalypt woodland)	10.3.5, 10.3.6a, 10.3.28, 10.5.5	Level to gently undulating Tertiary sand plains, sometimes derived from alluvium (10.3.6, 10.3.28). Soils are sands, sandy loams, and clay loams (the latter often duplex soils).	*Eucalyptus brownii, E. melanophloia, Corymbia dallachiana, C. clarksoniana, Eremophila mitchellii, Acacia excelsa, Carissa lanceolata, Aristida latifolia, Aristida calycina var. calycina, Enneapogon gracilis, Heteropogon contortus*.	Q3, Q9, Q10, Q14, Q15, Q18, Q19, Q21, Q27	Present over 92.1 ha of the Study Area; the most common BVC present. Often with the ground layer dominated by buffel grass; rarely dominated by native grasses. Representative image 

Community name	REs	Landform	Characteristic species	Sites2	Comments
Riparian open forest and woodlands fringing watercourses and on alluvial floodplains subject to flooding (Map code: Woodland fringing watercourses and on floodplains)	11.3.3, 11.3.37, 11.3.25, regrowth vegetation	Level to gently undulating Tertiary red sand plains. Soils are red sands and orange/brown sandy loams.	*Eucalyptus camaldulensis, Eucalyptus coolabah, Acacia salicina, A. stenophylla, Melaleuca leucadendra, M. trichostachya, Lysiphyllum carronii, Corymbia dallachiana, Cenchrus ciliaris*, Heteropogon contortus, Aristida calycina var. calycina, Lomandra longifolia, Juncus usitatus.*	Q1, Q7, Q13, Q15, Q16, Q21	Present over 19.3 ha of the Study Area. Associated with Belyando River and other minor ephemeral watercourses that intersect the Study Area. Representative image 
Previously cleared land with advanced regrowth (Map code: Previously cleared regrowth)	Non-remnant / mapped regrowth vegetation	Generally located on clay plains in lower catchment positions across most of the Project Area, east of Theresa Creek.	*Acacia harpophylla, Eucalyptus brownii, Eucalyptus coolabah, Lysiphyllum carronii, Eremophila mitchellii, Atalaya hemiglauca, Carissa lanceolata, Cenchrus ciliaris*, Dichanthium sericeum, Echinochloa colona**	Q2, Q8, Q25, Q35, Q38, Q44, Q49	Present over 153 ha of the Study Area, primarily on the more fertile clay plains. Represented in the Study Area as regrowth woodlands. Patchily distributed throughout the Study Area. Generally has moderate– to- high value but also has moderate-high levels of disturbance (grazing, weed invasions) present. Representative image 

Community name	REs	Landform	Characteristic species	Sites2	Comments
Natural grassland (Map code: Natural grassland)	11.4.11	Level to undulating plains and rises formed from flood basalt. Soils are deep, black cracking clays.	*Astrebla lappacea, A. elymoides, Dichanthium sericeum, Aristida leptopoda, Digitaria divaricatissima, Panicum decompositum, Parthenium hysterophorus*, Cenchrus ciliaris*, Desmodium campylocaulon, Rhynchosia minima, Stemodia glabella, Neptunia gracilis.*	Q30	Present over 189.8 has of the Study Area. Occurs as a large area in the southern part of the Study Area. Predominantly within the southern extent of the Study Area, occurring in a mixed polygon with Res 11.4.5 and 11.4.9. With high native grass species diversity generally. Representative image 
Gidgee and/or brigalow woodland and low woodland, on clay and clay loam plains (Map code: Gidgee and/or brigalow woodland)	10.4.5 11.4.9	Level to undulating Cainozoic clay plains, generally with heavy, cracking clay soils.	*Acacia cambagei, A. harpophylla, Casuarina cristata, E. mitchellii, Terminalia oblongata, C. lanceolata, Santalum lanceolatum, Alectryon diversifolius, Aristida calycina* var. *calycina, Leptochloa digitata, Cenchrus ciliaris* , Tribulus terrestris, Glinus lotoides*	Q26, Q29, Q46	Present over 5 ha in relatively high quality, intact and large patches across the Study Area. Representative image 

Community name	REs	Landform	Characteristic species	Sites2	Comments
Sparse to very sparse low open acacia woodland with a grassy understorey (Map code: Low open acacia woodland with a grassy understorey)	11.4.5	Level to undulating Cainozoic clay plains, generally with heavy, cracking clay soils.	*Acacia argyrodendron, Lysiphyllum carronii, Terminalia oblongata, Owenia acidula, Eremophila mitchellii, Atalaya hemiglauca, Capparis lasiantha, Cenchrus ciliaris*, Neptunia gracilis, Parthenium hysterophorus, Desmodium campylocaulon*	Q34	Present over 32 ha in relatively moderate quality, small patches across the Study Area. Representative image 

[1] *Broad vegetation communities within the Study Area refer only to those that are mapped within the proposed Offsite footprint.*

[2] *Q indicate quaternary assessment sites conducted from 29 April 2013 to 6 May 2013*

**indicates introduced species*

2.3.4 Flora species diversity – desktop assessment results

Searches of relevant databases (see Appendix B) and existing reports for the area identified a broad diversity of flora species within the Study Area and broader region. These investigations were combined and summarised below:

- Predicted species data:
  - Protected matters Search Tool and Environment Reporting Tool:
    - Three threatened flora species, including *Acacia ramiflora*, salt pipewort (*Eriocaulon carsonii*) and blue devil (*Eryngium fontanum*)
    - Five weeds of national significance (WoNS), including rubber vine (Cryptostegia grandiflora), hymenachne (*Hymenachne amplexicaulis*), lantana (*Lantana camara*), parkinsonia (*Parkinsonia aculeata*) and parthenium (*Parthenium hysterophorus*)
- Existing species records databases:
  - Wildlife Online: 962 vascular taxa of which 56 were introduced species
  - HERBRECS: 701 vascular taxa of which 38 were introduced species

A total of 13 threatened flora species were identified as being relevant to the Study Area or surrounding region through desktop review. These species are discussed in Section 3.2.4.

2.3.5 Flora species diversity – field assessment results

Field surveys recorded 200 plant taxa, of which 172 were native (86 percent). Overall, 55 plant families are represented in the Study Area. The most species rich plant families represented in the Study Area were:

- Poaceae (49 taxa)
- Malvaceae (13 taxa)
- Fabaceae (12 taxa)
- Myrtaceae (11 taxa)
- Mimosaceae (11 taxa)
- Asteraceae (10 taxa)

One NC Act listed Type A Restricted flora species was recorded within the Study Area. Black orchid (*Cymbidium canaliculatum*) was observed at six survey sites during surveys (see Appendix A and Appendix C for locations). No flora species of conservation significance were recorded within the Study Area. Flora field survey results for the Study Area are presented in Appendix C.

2.3.6 Exotic and weed flora species

A desktop review for weed and exotic flora species within the Study Area and surrounding region was undertaken utilising the following resources:

- EPBC Environment Reporting Tool search results
- Queensland Herbarium specimen database (HERBRECS) search results

- DEHP Wildlife Online search results
- Biosecurity Queensland's Annual Pest Distribution Survey 2008 data and predictive maps
- Isacc Regional Council Draft Pest Management Plan 2011-2015 (IRC, 2011). The draft plan lists 17 weed species that are identified as a priority for management within the Local Government Area.

The information gathered from the above sources included predictive weed mapping information (based on climate suitability) over the region and historical confirmed records of weed species in the Study Area and surrounding region. The desktop review for weed species identified 19 species of 'declared plants' under the LP Act that have been recorded or are within potentially suitable distribution. These are listed in Appendix D.

During the field surveys, 28 introduced species were recorded, of which four species are 'declared plants' under the LP Act, and WoNS. These species are listed in Table 7.

Table 7 Queensland declared plants recorded within the Study Area

Scientific name	Common name	Study Area distribution
Parkinsonia aculeata	parkinsonia	Coolibah open woodland
Parthenium hysterophorus	parthenium weed	Non-remnant areas, brigalow, box woodland, generally in dense clusters
Opuntia stricta	prickly pear	Non-remnant areas, brigalow and box woodland patches. Not as common as *Opuntia tomentosa*
Opuntia tomentosa	velvety tree pear	Non-remnant areas, brigalow and box woodland patches. Common but found in low numbers

2.4 Terrestrial fauna

2.4.1 Terrestrial fauna habitats

Eight broad fauna habitat types were observed across the Study Area:

- Ironbark – box open woodland with a grassy understorey
- Brigalow and / or gidgee shrubby woodland
- Riparian forest fringing waterbodies and on floodplains
- Previously cleared land with advanced regrowth
- Natural grassland
- Non-remnant vegetation
- Sparse to very sparse, low open acacia woodland
- Natural and artificial waterbodies

The general characteristics of these broad habitat types are summarised in Table 8 and discussed further below. The spatial distribution of fauna habitats (analogous to vegetation community mapping) at the Study Area is presented in Figure 7.

Table 8 Terrestrial fauna habitats observed within the Study Area

Broad habitat type	General characteristics	Representative photos
Ironbark-box open woodlands with a grassy understorey 'Ironbark-box woodland'	Occurs in isolated remnants. Sparse canopy layer, sparse to absent shrub layer and ground layer of buffel and native grasses. Forage resources for folivorous mammals, nectarivorous mammals and birds, granivores, insectivorous mammals, reptiles and birds, and grazing mammals. Predators including raptors, snakes and dingos. Shelter include occasional hollows in mature eucalypts (density dependent on age of woodland and tree species), log piles, dense ground cover. Ephemeral waterbodies present – permanent water (farm dams / troughs occasionally present.	 
Brigalow and/or gidgee shrubby woodland and low woodland on clay and clay loam plains 'Brigalow / gidgee shrubland'	Sparse to dense canopy layer. Typically sparse shrub layer, with understorey of native (less often introduced) grasses. Forage resources for nectarivorous mammals and birds, granivores and insectivores. Predators include raptors, snakes and dingos. Shelter including log piles and shed bark, defoliating bark and cracking soils few hollows. Gilgais often associated with this habitat type – seasonal water source and localised habitat node.	 

Broad habitat type	General characteristics	Representative photos
Open forest and woodland fringing watercourses and relict stream channels, and alluvial plains subject to flooding 'Fringing open forest / woodland'	Restricted to riparian zone and floodplain adjacent to creeks within the Study Area. Moderate to dense canopy layer. Shrub layer generally lacking. Dense ground cover of grasses and sedges. Sandy substrate. Important water source and foraging habitat for folivorous mammals, nectarivorous mammals and birds, granivores, insectivorous mammals, reptiles and birds, and grazing mammals. Predators include raptors, snakes and dingos. Mature *Eucalyptus camaldulensis* support relatively high density of hollows.	 
Previously cleared land with advanced regrowth	Restricted to narrow linear patches along drainage channels and on the floodplain. Canopy absent. Presence of a moderate to dense shrub layer of regrowth Acacias. Seasonally inundated, cracking clay soils. Habitat for reptiles, frogs and shrub-dwelling birds. Predators include snakes and birds of prey.	 
Sparse to very sparse low open acacia woodland	Canopy layer absent. Very sparse shrub layer and buffel understorey. Some peeling bark and fallen woody debris. Refuge for macropods, reptiles and shrub-nesting birds. Predators include snakes and raptors.	 

Broad habitat type	General characteristics	Representative photos
Open, previously cleared areas lacking native vegetative cover 'Open cleared land'	This vegetation type dominates the Study Area. Typically dominated by introduced buffel grass. Forage resources limited, although habitat supports some granivores and insectivores, and grazing mammals. Predators including birds of prey, snakes and dingos. Shelter resources limited, although log piles resultant from historic clearing likely to provide shelter to grassland reptile species.	 
Natural grasslands	Small patches of natural grassland occur in isolated locations within the Study Area. This habitat type is characterised by the absence of a canopy tree and shrub layer. Ground vegetation is dominated by native grasses and forbs. Buffel occurs in very low densities. This provides foraging habitat for macropods, snakes, rabbits, birds of prey and grass-dwelling birds such as finches, pigeons and quails.	 
Natural and artificial waterbodies 'Natural and artificial waterbodies'	Natural waterways include North Creek, Eight Mile Creek, Obungeena Creek and Belyando River. Artificial waterbodies include numerous small to large farm dams. Waterbodies (and adjacent vegetation) provide drinking resource for numerous animal species and breeding habitat for some (i.e. amphibians, some birds). Provide foraging habitat for water birds and wading birds, birds of prey and some snakes.	 

Summary of fauna habitats in the Study Area

Much of the natural environment within the Study Area has been historically cleared for cattle grazing. Areas of non-remnant vegetation account for 6,692.4 ha (93.2 percent) of the Study Area. These areas are still actively grazed. Much of the non-remnant vegetation areas are dominated by buffel grass. The proliferation of buffel grass and the clearance of ground-level structural characteristics have caused significant homogenisation of ground-level habitats and a reduction in resource availability. As a result, these open areas of non-remnant vegetation have low value for native wildlife, only providing habitat for generalist species that are tolerant of vegetation clearing.

Remnants of native vegetation persist predominantly along the ephemeral creeks within the Study Area: North Creek, Eight Mile Creek, Obungeena Creek and along the Belyando River. These riparian woodlands have strategic importance in the local landscape, providing a combination of habitat features, foraging and nest/shelter resources, wet-season water sources and a level of connectivity that would assist the movement of some species that cannot tolerate open landscapes. All creeks within the Study Area are used by cattle as drinking points. As a result, these areas do contain a concentration of trampling impacts.

Patches of remnant open woodland and brigalow and / or gidgee were generally small and isolated. Nevertheless, these habitat types provide important refuges for wildlife within the Study Area, retaining hollows, peeling bark, cracking clay, hollow logs, fallen woody debris and other resources required by specialist species. These remnants provide important relicts of vegetation communities that would have previously been widely distributed throughout the local and regional landscape. These small patches of native woodland still accommodate local populations of woodland-dependent species, including species that have become threatened as a result of the broad-scale clearance of their habitats. Although a number of these species currently occur or are likely to occur within these remnants, their long-term persistence is uncertain, given their isolation and subsequent restricted resource availability.

Habitats within the Study Area are likely to display marked seasonal variability in structural and floristic composition in response to the seasonal rainfall. During the dry season, many fauna species would tend contract to areas of habitat that occur adjacent to waterbodies. Following seasonal rainfalls, fauna have a greater capacity to disperse across the landscape, as native grasses and natural waterbodies become more widespread. With respect to fauna habitats, it is considered likely that the:

- Availability of forage resources for herbivorous animals (i.e. grazers, nectarivores, granivores and folivores) would be seasonally variable, and driven by local climatic conditions. This may result in variable use of different habitats by resident and sedentary species during the year, and temporary occupancy in response to availability of forage resources by nomadic and migratory species
- Availability of prey for predators may change during the year in response to variable densities and diversity of herbivorous animals
- Extent of habitat for semi-aquatic species (i.e. amphibians, water birds) would fluctuate during the year in response to rainfall. Large waterbodies (i.e. some farm dams) that retain water throughout year may become localised nodes for water birds in response to regional reduction in extent of aquatic habitat

- Microhabitats may vary during the year in response to climate (i.e. reduced ground cover during dry season)
- Less predictable forces such as fire and flooding may alter the availability of important habitat resources for ground-dwelling / ground-foraging animals and arboreal animals.

Fauna survey results by fauna habitat type (from comprehensive survey sites) are summarised in Section 2.4.3.

Habitat connectivity within the Study Area

The Offsite footprint has been specifically located in an area of low environmental value. This was evident from a desktop review of habitat connectivity within the local and surrounding landscape using DNRM RE mapping. Remnant vegetation within the Study Area has been extensively fragmented by past land clearing. As a result, local habitat connectivity within the Study Area is extremely low, with most vegetation remnants existing as isolated patches. Within the Study Area, remnant vegetation along Eight Mile Creek and North Creek provide some level of habitat connectivity.

In contrast, much of the landscape surrounding the Study Area retains remnant vegetation coverage. To the south and north of the Study Area remnant vegetation coverage is almost uninterrupted for at least 15 km in each direction. Remnant vegetation occurs along the length of the western boundary of EPC 1690, and this persists, largely intact to the west (for at least 14 km from the north-west corner of EPC 1690, and at least 34 km from the south-west corner of EPC 1690). South of the Study Area, the Belyando River and Carmichael River retain relatively large remnants of riparian vegetation that create east-west connectivity. This area would be important for regional movement of native fauna.

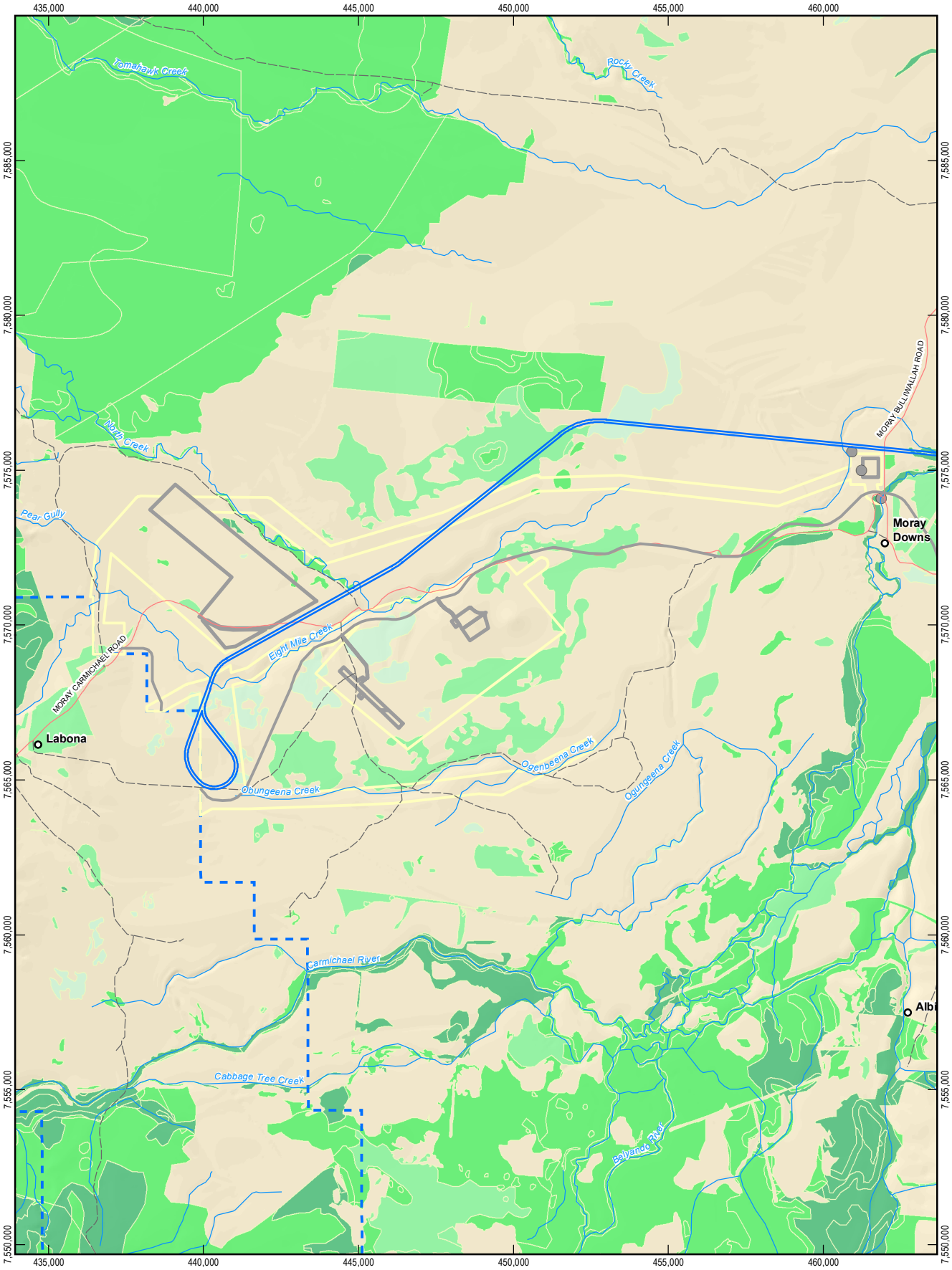
Summary of BPA mapping

The DEHP mapping for the Brigalow Belt and Desert Uplands bioregions was reviewed to provide an indication of the quality and value of remnant vegetation within and beyond the Study Area. Specifically, two BPA mapping criteria were applied to the Study Area and surrounding landscape, such that the potential habitat values could be described.

The criteria applied include:

- Criteria F – Ecosystem diversity. This criterion describes habitat complexity, based on the number and size of ecosystems and wetlands present in an area (EPA, 2002). The concepts of ‘richness’ (number of different ecosystems) and ‘evenness’ (relative abundance of ecosystems) are considered when attributing an ecosystem diversity rating to a particular area (EPA, 2002). By way of example, areas with high ecosystem diversity typically have relatively many REs and ecotones (EPA, 2002). Simpson’s Diversity Index is used to determine ecosystem diversity (EPA, 2002). As shown in Figure 8, most remnant vegetation at the Study Area is categorised as having low or moderate ecosystem diversity. Only remnant vegetation along North Creek was categorised as having high ecosystem diversity. Much of the landscape to the north, west and south of the Study Area is ranked as very high or high ecosystem diversity. Remnant vegetation along the Belyando River and Carmichael River to the south and south-east are ranked as high and very high ecosystem diversity.
- Criteria G – Context and connection. This criterion is based upon the extent to which a mapped RE polygon incorporates or buffers other ecologically noteworthy areas (i.e.

other remnant vegetation units and/or wetlands/waterways) (EPA, 2002). With respect to connection, remnant vegetation units that are connected to other REs are considered to be more representative of biodiversity, contribute more to a habitat network (i.e. connectivity) and exhibit greater resilience to disturbance (EPA, 2002). Much of the remnant vegetation within the Study Area is mapped as low for context and connection (Figure 9). Extensive remnants of vegetation north-west of the Study Area are mapped as high, as are remnants along the Carmichael River and Belyando River to the south and south-east of the Study Area. The remnants along the Carmichael and Belyando Rivers form part of state significant bioregional wildlife corridor. This area is important for regional movement of native fauna. The low ratings for context and connectivity within the Study Area are further evidence of the fragmented nature of the local landscape. The isolation and lack of connectivity will tend to reduce fauna diversity within the Study Area.



LEGEND

- Homestead
- Local Road
- Track
- Watercourse
- Study Area
- Biodiversity Planning Assessment Criteria F
- Very High
- High
- Medium
- Low
- Rail Corridor
- Project Area
- Mine (Offsite)
- Mine (Offsite)

1:175,000 (at A4)

0 1 2 3 4 5

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project SEIS
Environmental Assessment Report

Job Number	41-26422
Revision	1
Date	15-10-2013

BPA Mapping - Ecosystem Diversity

Figure 8

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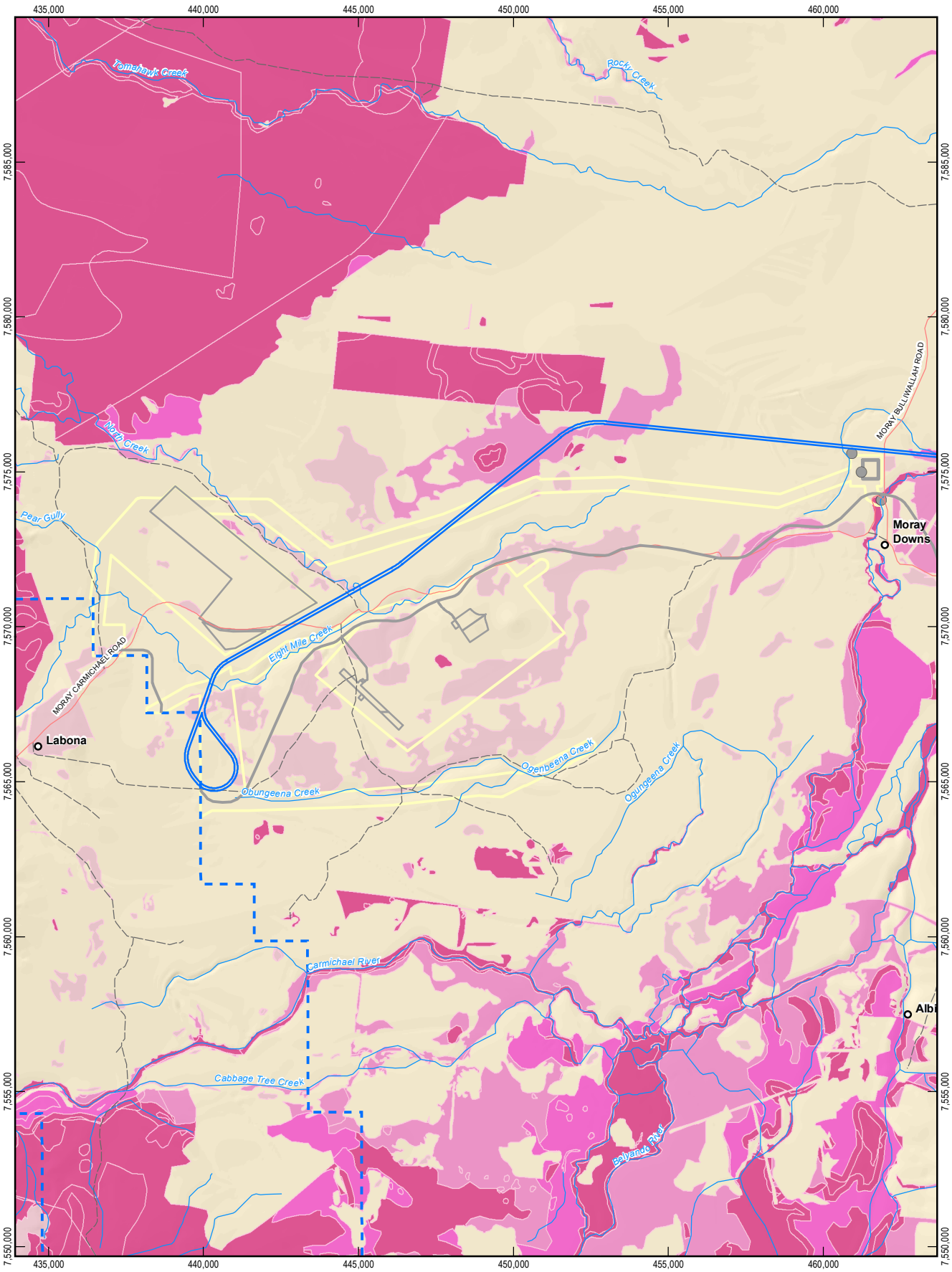
Data Source: DME: EPC 1690 (2012), EPC 1080 (2012); DNRM: Biodiversity Planning Assessment v1.3, BVG (2013); © Copyright Commonwealth of Australia - Geoscience Australia: Mainland, Homestead, Locality, Road, Watercourse (2007); Adani: Alignment Opt11 Rev 2 (SP1 and 2)(2013), Offsite Infrastructure (2013). Created by: AJ



LEGEND

- Homestead
- Local Road
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- Watercourse
- Study Area
- Biodiversity Planning Assessment Criteria G
- Very High
- High
- Medium
- Low
- Rail Corridor
- Project Area
- Mine (Offsite)
- Mine (Offsite)

1:175,000 (at A4)

0 1 2 3 4 5

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

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BPA Mapping - Context and Connection

Figure 9

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Data Source: DME: EPC 1690 (2012), EPC 1080 (2012); DNRM: Biodiversity Planning Assessment v1.3, BVG (2013); © Copyright Commonwealth of Australia - Geoscience Australia: Mainland, Homestead, Locality, Road, Watercourse (2007); Adani: Alignment Opt11 Rev 2 (SP1 and 2)(2013), Offsite Infrastructure (2013). Created by: AJ

2.4.2 Fauna species diversity – desktop assessment results

A summary of the results of the desktop assessment, with respect to terrestrial fauna species that have the potential to occur, or have been previously recorded, within the vicinity of the Offsite footprint is provided in Table 9.

Table 9 Summary of desktop assessment results for terrestrial fauna

	Protected Matters search and Environmental Reporting tool (predicted to occur)	DEHP Wildlife Online database (historically recorded)	QLD Museum specimen database (historically recorded)	Birds Australia Atlas (historically recorded)
Species diversity		17 amphibians 78 reptiles 52 mammals 207 birds	13 amphibians 40 reptiles 24 mammals 37 birds	140 birds
EPBC Act and/or NC Act threatened species	2 reptiles 1 mammal 5 birds	4 reptiles 3 mammals 6 birds	2 reptiles 2 mammals	3 birds
EPBC marine and/or migratory birds	10 migratory 11 marine	14 migratory 50 marine	2 marine	1 migratory 23 marine
Introduced/pest species	1 amphibian 5 mammals	1 amphibian 1 bird 9 mammals	1 amphibian 2 mammals	-

Consolidation of the results of the three databases from which historical terrestrial fauna species records were obtained (Wildlife Online, Queensland Museum and Birds Australia) revealed that 372 species have been previously recorded from the desktop search area, comprising:

- 18 amphibian species (17 common native species, 1 introduced species)
- 84 reptile species (79 common native species, 5 threatened species)
- 55 mammal species (43 common native species, 3 threatened species, 9 introduced species)
- 209 birds (203 common native species, 5 threatened species, 1 introduced species)

Threatened and conservation significant terrestrial fauna species (including likelihood of occurrence assessment) are discussed in more detail in Section 3 and Appendix F.

The desktop database search results are provided in full in Appendix B.

2.4.3 Fauna species diversity – field assessment results

A total of 160 terrestrial fauna species were recorded in field surveys of the Study Area, including 117 birds, 15 reptiles, 21 mammals and 7 amphibians. A summary of the results from the field surveys of the Study Area, (including the number of threatened, near-threatened, EPBC migratory and EPBC marine species recorded), is provided in Table 10 below. A discussion of the conservation significant species recorded is provided in Sections 3.2.6and 3.3.6. The terrestrial fauna field survey results, including site-specific species lists and the total species list are provided in Appendix E.

Table 10 Summary of field assessment results - terrestrial fauna

	Amphibians	Reptiles	Mammals	Birds	Total
Total species	7	15	21	117	160
Introduced species	1	-	5	-	6
Threatened species	-	1	-	2	3
Near threatened species				2	2
EPBC Act migratory	-	-	-	2	2
EPBC Act marine	-	-	-	15	15

Fauna diversity by fauna habitat type is summarised in Table 11.

Artificial and natural waterbodies supported the highest diversity of terrestrial fauna species. This is, in part, due to the high number of survey sites and time spent undertaking water-body watches (as part of the targeted surveys for the black-throated finch). Nevertheless, the high fauna diversity observed at artificial and natural waterbodies and fringing riparian woodlands demonstrates the local importance that waterbodies play in providing resources for native terrestrial fauna.

The other habitat type that supports relatively high species diversity was ironbark-box open woodland. This habitat type generally has higher structural complexity than the surrounding landscape and therefore provides a greater variety of resource for native fauna.

Areas of advanced regrowth and non-remnant vegetation accounted for the majority of the land area within the Study Area. The low diversity of fauna species recorded in these habitats demonstrates their relatively low value for native terrestrial fauna. The low diversity recorded in brigalow/gidgee shrubland is attributed to the low number of survey sites that occur within the Study Area.

Table 11 Fauna species diversity by habitat type

	Ironbark-box woodland	Brigalow / gidgee shrubland	Fringing riparian woodland	Advanced regrowth	Natural grassland	Non-remnant	Natural / Artificial waterbodies
	n = 9	n=2	n=8	n=5	n=2	n=15	n=19
Amphibians	-	-	6	-	-	-	3
Reptiles	4	5	9	1	1	2	2
Mammals	5	3	10	3	-	2	7
Birds	49	12	57	17	13	28	93
Total species	58	20	82	21	14	32	105

Amphibians

A total of seven amphibian species were recorded during field surveys of the Study Area. This comprised six native frog species and one exotic species, the cane toad (*Rhinella marina*). No threatened species were recorded or are considered likely to occur within the Study Area. All amphibians were recorded from fringing riparian woodland and artificial and natural

waterbodies. Cane toads were the most frequently encountered species. The cane toad is ubiquitous across the local landscape, taking advantage of the disturbed terrestrial and aquatic environments within the Study Area. Native frog species that were commonly encountered included the spotted marsh frog (*Limnodynastes tasmaniensis*) and bumpy rocket frog (*Litoria inermis*). Frogs including the broad-palmed rocket (*Litoria latopalmata*) and the, green tree frog (*Litoria caerulea*) (both identified in Plate 4), emerald-spotted tree frog (*Litoria peronii*) and green-striped burrowing frog (*Cyclorana alboguttata*) were encountered in low numbers. The number of amphibian species recorded is expected to be a relatively conservative indication of the number and diversity of amphibians occurring within the Study Area. The local environment is strongly seasonal, with pronounced wet and dry seasons. Amphibian activity (and subsequent diversity during survey) responds to this change in rainfall. The current surveys were undertaken in the early post-wet season. Although recent rainfall meant there was an abundance of standing waterbodies within the Study Area, many native frog species are likely to have already finished breeding for the year and would have entered a period of low activity.

Plate 4 Broad-palmed rocket frog (left), green tree frog (right)


Reptiles

A total of 15 native reptile species were recorded during field surveys of the Study Area. This comprised six skinks, four snakes, three geckos and two dragons. One threatened reptile, the ornamental snake, was recorded from two locations within the Study Area in the current surveys. More information on this species and the likely occurrence of other threatened reptile species is provided in Sections 3.2.6 and3.3.6.

Skinks were the most widely encountered reptiles within the Study Area. Reptiles that were commonly observed included the open litter rainbow-skink (*Carlia pectoralis),* Peron's snake-eyed skink (*Cryptoblepharus plagiocephalus*), wall skink (*Cryptoblepharus virgatus*) and dubious dtella (*Gehyra dubia*). Other reptiles that were encountered in lower numbers included the copper-tailed skink (*Ctenotus taeniolatus*), eastern striped skink (*Ctenotus robustus*), nobbi dragon (*Amphibolurus nobbi*), Gilbert's dragon (*Amphibolurus gilberti*), pale-headed snake (*Hoplocephalus bitoquatus*), yellow-faced whipsnake (*Demansia psammophis*), eastern brown snake (*Pseudonaja textilis*), zigzag velvet gecko (*Oedura rhombifer*) and Bynoe's gecko (*Heteronotia binoei*).

In general, reptile diversity was highest in the three habitat types that have the highest structural complexity in the understorey and shrub layer (ironbark-box woodland, brigalow/gidgee shrubland and fringing riparian woodland). In these habitats, woody debris, peeling bark, logs and heterogeneity in ground level vegetation provides a diversity of microhabitats that is missing

from areas of non-remnant vegetation and regrowth. In non-remnant, regrowth and smaller, edge-affected patches of vegetation, these natural elements have been replaced by a homogenous covering of buffel grass.

Plate 5 Eastern brown snake (left), pale-headed snake (right)


Mammals

A total of 21 mammal species were recorded in field surveys of the Study Area. This included 16 native species and 5 exotic mammal species. Macropods were the most abundant and evident native mammal species recorded within the Study Area. Eastern grey kangaroos ((*Macropus giganteus*) Plate 6) were the most abundant macropod species, however, red kangaroos ((*Macropus rufus*) Plate 6) were also recorded. Macropods and rufous bettongs (*Aepryprymnus rufescens*) were distributed throughout the Study Area, including areas of grassland and non-remnant vegetation.

Mammal species that were only found in patches of remnant woodland vegetation included the northern brown bandicoot (*Isoodon macrourus*) (Plate 7), common brushtail possum (*Trichosurus vulpecula*) (Plate 7) and short-beaked echidna (*Tachyglossus aculeatus*). These species are generally dependent on structural features such as hollows and ground-level shelter that are absent from areas of non-remnant vegetation that cover most of the Study Area. No koalas or evidence of koalas were observed in the current survey. If they do occur, it is likely to be at low densities and along riparian fringing woodland, where there is access to nutrient-rich food trees. In general, the riparian fringing woodland is likely to be important for allowing local movement of mammals (other than macropods). Artificial waterbodies are an important source of drinking water for many mammals within the Study Area. However, they are particularly well-utilised by exotic mammals such as wild dogs, cats and pigs. The only listed mammal species recorded within the Study Area in the current surveys was the short-beaked echidna, (listed as special least concern under the Queensland *Nature Conservation (Wildlife) Regulation 2006*). Conservation significant species will be discussed in greater detail in Section 3.

Nine microbat species were recorded from the Study Area. Species that were commonly recorded were Gould's wattled bat (*Chalinolobus gouldii*), inland broad-nosed bat (*Scotorepens balstoni*), inland forest bat (*Vespadelus baverstocki*), northern freetail bat (*Chaerephon jobensis*) and yellow-bellied sheathtail bat (*Saccolaimus flaviventris*). No microbat species listed under the EPBC Act or NC Act were recorded from the Study Area.

Plate 6 Eastern grey kangaroos (left), red kangaroo (right)

Plate 7 Common brushtail possum (left), northern brown bandicoot (right)

Birds

A total of 117 bird species were recorded in the field surveys of the Study Area. Two EPBC listed threatened species, the black-throated finch (southern) and squatter pigeon (southern) were recorded within the Study Area, as were two species listed as near threatened under the NC Act, the black-necked stork (*Ephippiorhynchus asiaticus*) and cotton-pygmy goose (*Nettapus coromandelianus*), two EPBC listed migratory species, the great egret (*Ardea modesta*) and white-bellied sea-eagle (*Haliaeetus leucogaster*) and 15 EPBC listed marine species. Conservation significant species will be discussed in Section 3.

In general, the bird species community recorded represented a mix of waterbirds, grassland birds, woodland birds and generalist species. The bird community also represents a mix of resident species and seasonal migrants from drier inland areas. The recent rainfalls meant that the Study Area contained an abundance of drinking water and relatively healthy ground-level vegetation. These conditions appear to have attracted large flocks of birds such as budgerigars (*Melopsittacus undulatus*), black-faced woodswallows (*Artamus cinereus*), white-browed woodwallows (*Artamus superciliosus*) and white-breasted woodswallows (*Artamus leucorynchus*) that have not been previously recorded in such high densities within the region in surveys for the Mine.

The number of wetland bird species recorded within the Study Area was also relatively high and are likely to reflect the recent rainfall and availability of wetland habitats within the local landscape. Flocks of Australian pelicans (*Pelecanus conspicillatus*), black swans (*Cygnus*

atratus), pink-eared ducks ((*Malacorhynchus membranaceus*), Plate 8), wandering whistling ducks (*Dendrocygna arcuata*), plumed whistling ducks (*Dendrocygna eytoni*) and Australian wood ducks were observed. Artificial waterbodies provided habitat for a variety of other wetland birds such as the black-fronted dotterel (*Elseyornis melanops*), black-tailed native hen (*Tribonyx ventralis*), royal spoonbill (*Platalea regia*), Lewin's rail (*Lewinia pectoralis*), Australasian darter (*Anhinga novaehollandiae*), black-winged stilt ((*Himantopus himantopus*), (Plate 8) and little black cormorant (*Phalacrocorax sulcirostris*). Food availability appeared particularly high at some farm dams, with one in particular, (WB3) attracting high densities of raptors and larger waterbirds (Plate 9).

Bird species that are likely to reside permanently within the Study Area included a variety of generalists, grassland specialists and woodland species. Generalists such as the Australian raven (*Corvus coronoides*), magpie-lark (*Grallina cyanoleuca*), pied butcherbird (*Cracticus nigrogularis*), grey butcherbird (*Cracticus torquatus*) and willie wagtail (*Rhipidura leucophrys*) were ubiquitous throughout the Study Area. Open areas of non-remnant vegetation supported low bird species diversity, lacking the diversity of nesting habitats that would be available in woodland areas. Nevertheless, cleared areas provided habitat for open grassland specialists such as the Australasian pipit (*Anthus novaeseelandiae*), rufous songlark (*Cincloramphus mathewsi*), brown quail (*Coturnix ypsilophora*) and emu (*Dromaius novaehollandiae*). Woodland areas supported the highest bird species diversity. This is attributed to the diversity of nesting and foraging resources available in these habitats. Common woodland birds encountered included the rufous whistler (*Pachycephala rufiventris*), yellow-throated miner (*Manorina flavigula*), weebill (*Smicrornis brevirostris*), singing honeyeater (*Lichenostomus virescens*), red-backed fairy wren (*Malurus melanocephalus*), pale-headed rosella (*Platycercus adscitus*), yellow-rumped thornbill (*Acanthiza chrysorrhoa*) and grey-crowned babbler (*Pomatostomus temporalis*). A number of nocturnal bird species including the Australian owlet-nightjar ((*Aegotheles cristatus*), Plate 10) and barn owl ((*Tyto javanica*), Plate 10), were also recorded from woodland areas and are likely to forage widely within the surrounding cleared areas.

Plate 8 Pink-eared duck (left), black-winged stilt (right)

Plate 9 Raptors and large waterbirds at Farm Dam WB3

Plate 10 Australian owlet-nightjar (left), eastern barn owl (right)

2.4.4 Introduced fauna species

Six introduced terrestrial vertebrates were recorded from the Study Area. These comprised:

- One amphibian – cane toad (*Rhinella marina*)
- Five mammals – wild dog (*Canis lupus familiaris*), cat (*Felis catus*), European rabbit (*Oryctolagus cuniculus*), black rat (*Rattus rattus*) and pig (*Sus scrofa*)

Of these species the cane toad, dog, cat, European rabbit and pig are Class 2 Declared Animals under the LP Act. Class 2 Declared Animals are species that are established in Queensland and currently do, or potentially may, have a notable negative economic, environmental or social impact. Local governments, communities and landowners are required to manage these species under the LP Act.

Cane toads were ubiquitous across all habitats within the Study Area. Based on the generalist habitat requirements of the other introduced species recorded, it is considered likely that these species would also occur through much of the Study Area.

The Queensland Department of Primary Industries and Fisheries (now the Department of Agriculture, Fisheries and Forestry) produced maps indicating the distribution and abundance of a range of pest animal species. These maps were reviewed to provide further information on the likely extent of occurrence (and potential abundance) of pest species at the Study Area. In the landscape in which the Study Area occurs the maps indicated that:

- Cats are considered to be widespread (distribution) and common (abundance) (Department of Employment, Economic Development and Innovation (DEEDI), 2007a)
- Dogs (i.e. dingos) are considered to be widespread and common (DEEDI, 2007b)
- European rabbits are considered to be widespread and occasionally present (DEEDI, 2008a)
- Cane toads are considered to be widespread and common (DEEDI, 2008b)
- Pigs are considered to be widespread and common (DEEDI, 2008c)

The European fox (*Vulpes vulpes*) (LP Act Class 2 Declared Animal), which was not recorded during field assessments at the Study Area (but has been previously recorded in the region – Wildlife Online), is also considered to be widespread and common in the region (DEEDI, 2007c).

Other introduced species that may occur at the Study Area (based upon desktop assessments, and excluding livestock) include the house sparrow (*Passer domesticus*) and the feral goat (*Capra hircus*) (LP Act Class 2 Declared Animal).

2.5 Aquatic flora and fauna

2.5.1 Aquatic habitats in the Study Area

From the 12 sites surveyed, three broad aquatic habitat types were observed across the Study Area, including:

- Riverine habitat: Site 1, Site 2, Site 3, Site 4, Site 10 and Site 12
- Lacustrine habitat: Site 2, Site 5, Site 6, Site 7, Site 8, Site 9 and Site 11
- Palustrine habitat: Site 2, Site 7 and Site 8

The general characteristics of these sites and broad habitat types are summarised in Table 12 and discussed further below.

Runoff from the top of the catchment within the Offsite footprint is directed east via Obungeena, Eight Mile and North Creeks towards the Belyando River. Riverine habitats can be natural or artificial and are characterised by a formed channel that periodically or continuously contains flowing water such as rivers, creeks and waterways (DEHP, 2013). The Belyando River (Site 12) (Plate 11) is the largest riverine watercourse in the Study Area, and is considered to be perennial, with continuous flows in parts of its stream bed year round. The Belyando River has extensive forested floodplains on both banks and maintains aquatic habitat throughout the year, even if in isolated pools, for aquatic fauna such as invertebrates and fish.

Pear Gully (Site 1) and Eight Mile Creek (Site 2) had water present during the survey but low flows. Both sites had little riparian vegetation and no macrophytes were observed. However, these sites potentially provide permanent aquatic habitat for flora and fauna within the Study Area. Isolated pools were present along the stream bed of North Creek (Site 4) while 16 Mile Creek (Site 3) was dry. Submerged macrophytes were abundant at North Creek (Site 4). The sandy banks along North Creek may also provide turtle nesting habitat; as such, this creek offers a number of aquatic habitat values.

Drainage lines are narrow drainage paths (often 1st order streams or not mapped) that mainly occur at the top of stream catchments. The drainage lines provide a pathway for runoff during

high flow events and are not expected to accommodate long term flows. Site 10, a drainage line off Ogenbeena Creek, was mainly dry with only some surface water present. However, the presence of diverse habitat niches, dead crabs, as well as fresh crab burrows, indicates this ephemeral water way provides good habitat for aquatic fauna during the wet season and is most likely important for dispersal of aquatic fauna.

Most of these riverine habitats can be considered to be ephemeral, showing seasonal variability in the presence and flow of water. All of these waterbodies provided a range of diverse habitats suitable for aquatic fauna such as invertebrates, fish and turtles.

Plate 11 Riverine habitat (Site 12 - Belyando River)

Lacustrine habitat is defined as wetland and deep, open water habitats located in a topographic depression or a damned river channel (DERM, 2010a; DEHP, 2013). Artificial dams are considered to have similar characteristics as natural lacustrine systems (DEHP, 2013). Lacustrine habitats are also characterised as having less than 30 percent vegetation coverage (including trees, shrubs, persistent emergents, mosses or lichens) (DERM, 2010a). The dams in the Study Area (Plate 12) predominantly have little bank and riparian vegetation, most often due to disturbance from cattle, but also pest species, such as pigs. Submerged macrophytes are generally not present, however algae and fringing grasses and sedges were observed. Overall, the dams provide limited habitat for aquatic invertebrate fauna; however, at larger, more permanent dams, habitat is suitable for turtles and fish.

Plate 12 Lacustrine habitat (Site 2 - Eight Mile Creek)

Palustrine habitat is characterised as having greater vegetation coverage (including trees, shrubs, persistent emergents, mosses or lichens) than lacustrine systems and do not have defined borders or edges (DERM, 2010a; DEHP, 2013). Field assessments identified three areas of this habitat type in the Study Area, which were present alongside other habitat types (riverine and/or lacustrine) (Plate 13).

Within the Study Area, Sites 7 and 8 are situated towards the beginning of Obungeena Creek, near dams. These sites are both small, swamp-like waterbodies with numerous floating and emergent macrophytes, including floating macrophytes, reeds and bulrushes (Plate 13). Site 2 is to the north, situated near Eight Mile Creek, and was vegetated with a number of macrophytes and sedges and would have some fringing trees.

All palustrine habitats were considered to provide diverse aquatic habitats at the time of the survey, however the ephemeral nature of these waterbodies makes them short-term habitat.

Plate 13 Palustrine habitat (Site 8 - Obungeena Creek Dam Central)

Overall, riverine habitats (Belyando River, 16 Mile Creek, Pear Gully and North Creek) provided the greatest diversity of aquatic habitats for aquatic fauna including invertebrates, fish and turtles. Palustrine habitats also provide diverse habitats with abundant macrophytes; however, their ephemeral nature makes them less suitable as long-term habitat.

The aquatic habitats within the Study Area are likely to exhibit marked seasonal variability in the presence of water and flow in response to the seasonal rainfall. Habitat features at the sites assessed are summarised in Table 12.

Table 12 Aquatic habitat assessment summary

Site no.	Site name	Habitat assessment summary	General description and other notes	Photograph example
1	Pear Gully Creek	Habitat type: Riverine Substrate: 100 percent silt/clay Snags and woody debris: Little detritus and sticks, some branches and many logs Habitat attributes: Little bank overhang vegetation and trailing bank vegetation Sediment deposits: Silt Odour: None Variety of habitat: shallow, deep, pool, undercut bank Bioassessment: Provides good habitat for macroinvertebrates and fish	Approximately 1.2 m wide and 0.5 m deep Low flow Quite turbid Fauna included water birds and crabs Channel incised with undercut banks Erosion and scour prevalent Riparian zone narrow, mostly tall trees Some algae present Cattle disturbance Important water body for dispersal of fauna	 Pear Gully Creek – Riverine habitat
2	Eight Mile Creek and two farm dams	Habitat type: Riverine, lacustrine and palustrine Substrate: 100 percent silt/clay Snags and woody debris: Little detritus and sticks Habitat attributes: Small amount of macrophytes, little bank overhang and trailing bank vegetation Sediment deposits: Silt Odour: None Variety of habitat: shallow, deep, pool, macrophytes Bioassessment: Provides fair habitat for macroinvertebrates and fish	Large dam 70 m wide and approximately 6 m deep Small dam 15 m wide and 0.3 m deep Heavily modified water body Low shading and little riparian vegetation, predominantly bare ground Lots of sedges in dam Low macrophytes presence Water turbid Some cattle disturbance Fauna included invertebrates (mussels and crabs) and fish, may provide turtle habitat	 Eight Mile Creek – Riverine habitat

Site no.	Site name	Habitat assessment summary	General description and other notes	Photograph example
				 Large Dam - Lacustrine habitat  Small Dam - Palustrine habitat
3	16 Mile Creek	Habitat type: Riverine Substrate: 100 percent silt/clay Snags and woody debris: Large amount of detritus, many sticks, some branches and logs Habitat attributes: Bank overhang vegetation and some trailing bank vegetation Sediment deposits: sand No water present Bioassessment: When flowing would provide excellent habitat for macroinvertebrates and fish	Dry creek bed, ephemeral channel Shaded Some riparian vegetation Moderate grass groundcover and tall trees on margins Cattle and animal tracks in creek bed Evidence of fauna (crab burrows and mussel shells)	 16 Mile Creek - Riverine habitat

Site no.	Site name	Habitat assessment summary	General description and other notes	Photograph example
4	North Creek	Habitat type: Riverine Substrate: 100 percent silt/clay Snags and woody debris: Moderate amount of detritus and sticks, some branches and logs Habitat attributes: some periphyton, moderate amount of filamentous algae, macrophytes and bank overhang vegetation, low trailing bank vegetation Sediment deposits: sand and other coarse gravel Odour: None Variety of habitat: shallow, deep, pool, undercut bank Bioassessment: Provides very good habitat for macroinvertebrates and fish	Approximately 3 m wide No flow Shading from mature trees Some turbidity in large pool Dense emergent, floating and submerged macrophytes Cattle disturbance Fauna included fish, turtles, water birds and water rats. Sand bank may provide turtle nesting habitat	 North Creek - Riverine habitat
5	Farm Dam West	Habitat type: Lacustrine Substrate: 100 percent silt/clay Snags and woody debris: None Habitat attributes: little algae and submerged and floating macrophytes, High banks Sediment deposits: Silt Odour: None Variety of habitat: shallow, deep, pool, macrophytes Bioassessment: Provides fair habitat for macroinvertebrates and fish	High banks, approximately 4 m high, approx. 1.5 m deep Some turbidity No flow Some shade Algae and macrophytes present Little riparian vegetation, moderate grass groundcover Cattle and pig disturbance	 Farm dam west – Lacustrine habitat

Site no.	Site name	Habitat assessment summary	General description and other notes	Photograph example
6	Two Farm Dams	Habitat type: Lacustrine Substrate: 100 percent silt/clay Snags and woody debris: None Habitat attributes: Steep banks Sediment deposits: Silt Odour: None Variety of habitat: shallow, deep, pool, macrophytes Bioassessment: Provides poor habitat for macroinvertebrates and fish	Large dam approximately 50 m wide Small dam approx. 10 m wide Steep banks at large dam, approximately 45 degree angle Brigalow regrowth on western edge of dams Extensive exotic riparian species and bare ground No flow No shade Turbid water Cattle disturbance Fauna included water birds, fish and invertebrates (mussels) Provides limited habitat for fauna	 Large dam – Lacustrine habitat  Small dam – Lacustrine habitat

Site no.	Site name	Habitat assessment summary	General description and other notes	Photograph example
7	Three dams at Finch Spot	Habitat type: Lacustrine and palustrine Substrate: 100 percent silt/clay Snags and woody debris: None Habitat attributes: some algae and macrophytes Sediment deposits: Silt Odour: None Variety of habitat: shallow, deep, pool, macrophytes Bioassessment: Provides fair habitat for macroinvertebrates and fish	Three dams, range from 1 to 1.5 m deep Two large dams approx. 20 m wide Some turbidity No flow Low shading Some riparian vegetation, mainly grasses and exotic riparian species Some algae and macrophytes (including emergent and floating plants) Cattle disturbance Fauna included fish and water birds	 Large dam 1 - Lacustrine habitat  Large dam 2 - Lacustrine habitat

Site no.	Site name	Habitat assessment summary	General description and other notes	Photograph example
				 Small dam - Palustrine habitat
8	Three dams at Obungeena Creek	Habitat type: Lacustrine and palustrine Substrate: 100 percent clay Snags and woody debris: None Habitat attributes: Some emergent and fringing vegetation on small dam. Little vegetation on large dam Sediment deposits: Clay Odour: none Variety of habitat: shallow, deep, pool, macrophytes, swamp area Bioassessment: Provides fair habitat for macroinvertebrates and fish	One large dam, with 5 m bank height Two smaller dams, one for water supply and one palustrine No shading Fairly turbid Cattle disturbance Fauna present included turtles, fish, water birds and invertebrates (clams and mussels)	 Large dam - Lacustrine habitat

Site no.	Site name	Habitat assessment summary	General description and other notes	Photograph example
				 Small water supply dam – Lacustrine habitat  Small swamp - Palustrine habitat

Site no.	Site name	Habitat assessment summary	General description and other notes	Photograph example
9	Three Farm Dams at 5 ways	Habitat type: Lacustrine Substrate: 100 percent silt/clay Snags and woody debris: None Habitat attributes: steep banks, heavily modified Sediment deposits: Silt Odour: None Variety of habitat: shallow, deep, pool Bioassessment: Provides poor habitat for macroinvertebrates and fish	Three large dams ranging from 20 to 40 m wide, and between 3 to 4 m deep Steep and bare banks No shade No flow Turbid Some algae Fauna included turtles (possibly *Emydura macquarii krefftii)* and water birds Extensive cattle disturbance	 Large dam 1 - Lacustrine habitat  Large dam 2 - Lacustrine habitat

Site no.	Site name	Habitat assessment summary	General description and other notes	Photograph example
				 Large dam 3 - Lacustrine habitat
10	Ogenbeena Creek tributary	Habitat type: Riverine Substrate: 100 percent silt/clay Snags and woody debris: Little detritus, sticks, branches and logs Habitat attributes: Extensive bank overhang vegetation and moderate trailing band vegetation Sediment deposits: silt Odour: None Variety of habitat: shallow, pool Bioassessment: Provides good to fair habitat for macroinvertebrates and fish	Dry creek bed with some surface water, ephemeral drainage line No flow Shaded Turbid water Moderate riparian vegetation Moderate shrub and exotic grass presence and extensive trees Fauna included invertebrates (crabs) High pig and cattle disturbance	 Ogenbeena Creek tributary – Riverine habitat

Site no.	Site name	Habitat assessment summary	General description and other notes	Photograph example
11	Ogenbeena Creek Farm Dam	Habitat type: Lacustrine Substrate: 100 percent silt/clay Snags and woody debris: None Habitat attributes: some algae and emergent macrophytes Sediment deposits: Odour: None Variety of habitat: Shallow, deep, macrophytes Bioassessment: Provides poor habitat for macroinvertebrates and fish	Approximately 80 m wide and 4 m deep Some shade Low turbidity Moderate algae presence Some riparian vegetation Moderate grass groundcover on margin and low tree cover Some exotic riparian grass present Fauna included fish, turtles and invertebrates (mussels)	 Farm dam – Lacustrine habitat
12	Belyando River	Habitat type: Riverine Substrate: 100 percent silt/clay Snags and woody debris: Large amount of wood debris Habitat attributes: Little trailing bank vegetation, undercut banks frequent, filamentous algae present Sediment deposits: Sand Odour: none Variety of habitat: deep, flowing, riparian vegetation Bioassessment: Provides very good habitat for macroinvertebrates and fish	Perennial waterbody with floodplains on either side and dry drainage lines Approximately 10 m across and 3 m deep Shading from large trees and riparian vegetation Little erosion of banks, mature trees keep stability Turbid No damage from cattle or pest species observed High presence of filamentous algae and leaf litter Fauna included fish and water birds	 Belyando River – Riverine habitat

2.5.2 Aquatic flora species diversity

Aquatic flora – desktop assessment results

The Great Barrier Reef catchments Aquatic Conservation Assessments (ACA) for both riverine and non-riverine wetlands identify 'aquatic dependant flora' within the Burdekin basin (Inglis and Howell, 2009). Aquatic dependant flora includes both riparian and macrophyte species and are defined as: 'those species that are adapted to and dependant on living and wet conditions for at least part of their lifecycle and found either within or immediately adjoining a non-riverine or riverine wetland' (Inglis and Howell, 2009).

Review of the aquatic dependant native and exotic flora species listed for the Burdekin basin identified 150 native species and 20 exotic species previously recorded within the basin. A search of the DEHP Wildlife Online database identified 37 native and one exotic flora species from the ACA list have previously been recorded within 50 km of the Study Area. Of the 38 species (Carmichael Coal Mine and Rail EIS Volume 4, Appendix O1 Aquatic Ecology Report) previously recorded in the vicinity of the Study Area, four are listed as endangered or vulnerable under the NC Act, including:

- *Eriocaulon carsonii subsp. orientale* – endangered
- *Hydrocotyle dipleura* – vulnerable
- *Myriophyllum artesium* – endangered
- *Sporobolus pamelae* – endangered

Eriocaulon carsonii subsp. *orientale* and *Hydrocotyle dipleura* are predominantly found near springs, springs were not observed during current surveys (Sainty and Jacobs, 1994; WetlandInfo, 2013). *Myriophyllum artesium* and *Sporobolus pamelae* are not listed as wetland indicator species (WetlandInfo, 2013).

Aquatic flora – field assessment results

Field assessments indicated that the Study Area has a variety of floating, emergent and submerged macrophyte species, predominantly at lacustrine and palustrine habitats. No macrophytes were observed during the aquatic field survey in the Belyando River (Site 12); however, the flora field assessment observed a number of fringing sedges. This is typical of riverine habitats that experience high flow events for short durations followed by extended dry periods.

Macrophytes were most abundant in the ephemeral creeks and dams including Site 2, Site 4, Site 5, Site 6, Site 7, Site 8 and Site 11.

Overall aquatic and terrestrial field surveys recorded nine aquatic flora species, of which eight were native (88.9 percent) and one was an introduced species (11.1 percent). The macrophyte species detected at each site for both the aquatic and terrestrial field surveys are presented in Table 13.

Table 13 Aquatic flora identified during field surveys

Site	Flora Species
1 (Pear Gully)	• *Cyperus difformis* (native)
2 (Eight Mile Creek - Dam 8)	• *Hymenachne amplexicaulis* (introduced) • *Cyperus difformis* (native) • *Monochoria cyanea* (native) • Sedges (*Cyperus* spp.)
3 (16 Mile Creek)	• *Juncus usitatus* (native)
4 (North Creek)	• *Juncus usitatus* • Sedges (*Cyperus* spp.)
5 (Farm Dam West)	• *Marsilea* sp. • *Potamogeton crispus* (native) • Sedges (*Cyperus* spp.)
6 (Farm Dam East - Dam 9)	• *Potamogeton crispus* (native)
7 (Obungeena Creek Dam West - Finch Spot)	• Sedge (*Cyperus* sp.) • *Typha orientalis* (native) • Swamp lily (*Ottelia ovalifolia*)
8 (Obungeena Creek Dam Central - Dam 12)	• *Typha* sp. (native)
9 (Obungeena Creek Farm Dams - 5 ways)	• Sedge (*Cyperus* sp.)
10 (Ogenbeena Creek drainage line - H27)	• Sedges (*Cyperus* spp.)
11 (Ogenbeena Creek Farm Dam - Dam 13)	
12 (Belyando River)	• *Cyperus exaltatus* (native) • *Marsilea mutica* (native) • Sedges (*Cyperus* spp.)

Of the aquatic flora species identified in the field, none are listed as conservation significant species, however, they are all wetland indicator species (WetlandInfo, 2013). Most of the species are common and widespread to the area, further information pertaining to each species is presented below:

- *Cyperus difformis:* is an annual sedge with an emergent narrow-leaf, native to shallow stationary waterbodies and wetlands (Plate 14) (Sainty and Jacobs, 1994).
- *Hymenachne amplexicaulis:* is an introduced perennial grass that prefers stream banks, shallow wetlands and irrigation ditches (Sainty and Jacobs, 1994).
- *Monochoria cyanea:* is a native perennial with both emergent and floating leaves, found in stationary or slow-moving waterbodies, such as swamps, pools and shallow lagoons (Plate 14) (Anderson, 2003).
- *Juncus usitatus:* is a native perennial found in damp and periodically wet areas, usually only in shallow water (Sainty and Jacobs, 1994).
- *Potamogeton crispus*: is a native common to slow-moving waterbodies, coastal and inland rivers and creeks (Plate 15) (Sainty and Jacobs, 1994).

- *Typha orientalis (Cumbungi):* is a tall, rigid perennial reed common to edges of lakes, billabongs, swamps, slow flowing creek banks and lagoons (Plate 15) (Sainty and Jacobs, 1994).
- Swamp lily (*Ottelia ovalifolia*) is a native macrophyte with floating leaves that can be found in still or slow-flowing surface waters (Sainty and Jacobs, 1994).
- *Cyperus exaltatus:* is a native perennial sedge typically present along creek and river banks, and margins of lagoons and swamps (Anderson, 2003).
- *Marsilea mutica:* is a widespread but uncommon native fern found in stationary or slow-moving waterbodies (Sainty and Jacobs, 1994).

Plate 14 *Cyperus difformis* (left) and *Monochoria cyanea* at Site 2 (right)


Plate 15 *Potamogeton crispus* present at Site 5 (left) and *Typha orientalis* present at Site 7 (right)


2.5.3 Aquatic fauna species diversity

Aquatic fauna – desktop assessment results

From the previous desktop searches, 97 aquatic fauna species are predicted to occur (Carmichael Coal Mine and Rail EIS Volume 4, Appendix O1 Aquatic Ecology Report). Table 14 provides a summary of aquatic fauna species predicted to occur from desktop assessments in the Carmichael Coal Mine and Rail EIS Study Area and the species which have the potential to occur in the Study Area.

Table 14 Summary of desktop assessment of aquatic fauna species

	Mine EIS Study Area	Potential to occur in the Study Area
Species diversity	88 fish 7 reptiles 2 invertebrates	18 fish 5 reptiles
EPBC Act and/or NC Act threatened species	2 fish 2 reptiles	
Introduced/pest species	4 fish	

Fish

Desktop assessment identified approximately 88 fish species that occur within the Burdekin basin (Carter and Tait, 2008; DEHP Wildlife Online; Inglis and Howell, 2009). These include:

- Two freshwater fish species listed as vulnerable under the EPBC Act, the freshwater sawfish (*Pristis microdon*) that has historically been recorded in the Burdekin basin (Inglis and Howell, 2009), and the Australian lungfish (*Neoceratodus forsteri*) that was recorded in the basin in 1870 (DEHP Wildlife Online)
- Two endemic species, the soft-spined catfish (*Neosilurus mollespiculum*) and the small-headed grunter (*Scortum parviceps*)
- One translocated native species, the golden perch (*Macquaria ambigua*)
- Native species
- Introduced exotic species

Both of the conservation significant freshwater sawfish and Australian lungfish have not been recorded within or adjacent to the Study Area. The freshwater sawfish occurs in lower reaches of large river systems in areas of mud bottoms though it is occasionally found up to 400 km upstream (DSEWPaC, 2011a). As a result of the Burdekin River barriers (the falls dam and weirs), as well as lack of habitat in the Study Area, it is considered highly unlikely that this species occurs within the Study Area and surrounds. The distribution of the Australian lungfish is restricted to south-eastern Queensland (DSEWPaC, 2011b) and the only record of the species in the basin is from 1870 (DEHP Wildlife Online) and is therefore also not considered likely to occur.

Fish community structure and distribution within the Burdekin basin has been directly influenced by the Burdekin Falls in the lower end of the catchment, historically acting as a natural barrier to fish passage and preventing the colonisation of upstream habitats by diadromous species (fish species that migrate between the marine and freshwater environment). Artificial impoundments such as Burdekin Falls Dam and Clare Weir have further restricted the distribution of these species. The Burdekin Falls Dam has been in place since 1985 and diadromous species populations would not have been sustained since this barrier was installed given a lack of access to marine areas for lifecycle processes. Most, if not all, diadromous species are thought to be restricted to the lower Burdekin basin (Pusey et al., 1998; Cater and Tait, 2008) and as such only potamodromous species (fish species move only within freshwater) are likely to persist. Therefore, fish species found in the Study Area and surrounding catchment are likely to be potamodromous species.

Desktop sources (published and grey literature) and species profiles identified 17 fish species that may occur in the Study Area. None of these species are listed as threatened under the EPBC Act or NC Act.

The 18 fish species that may occur in the Study Area are:

- Agassiz's glassfish (*Ambassis agassizii*)
- Barred grunter (*Amniataba percoides*)
- Black catfish (*Neosilurus ater*)
- Bony bream (*Nematalosa erebi*)
- Eastern rainbowfish (*Melanotaenia splendida splendida*)
- Flathead gudgeon (*Philypnodon grandiceps*)
- Fly-specked hardyhead (*Craterocephalus stercusmuscarum*)
- Golden perch[2] (*Macquaria ambigua*)
- Hyrtl's tandan (*Neosilurus hyrtlii*)
- Midgley's carp gudgeon (*Hypseleotris* species 1)
- Purple-spotted gudgeon (*Mogurnda adspersa*)
- Rendahl's catfish (*Porochilus rendahli*)
- Seven-spot archerfish (*Toxotes chatareus*)
- Sleepy cod (*Oxyeleotris lineolata*)
- Small-headed grunter[1] (*Scortum parviceps*)
- Soft-spined catfish[1] (*Neosilurus mollespiculum*)
- Spangled perch (*Leiopotherapon unicolor*)
- Western carp gudgeon (*Hypseleotris klunzingeri*)

The identified species and their ecology, including habitat preferences, dietary requirements, movement behaviours and environmental tolerances of these species is presented in Carmichael Coal Mine and Rail EIS Volume 4, Appendix O1 Mine Aquatic Ecology Report.

Reptiles

Desktop assessments identified seven aquatic reptiles to inhabit the Burdekin basin, including two crocodile and five freshwater turtle species (Protected Matters Search; Cann, 1998; Cann, 2008).

The estuarine crocodile (*Crocodylus porosus*) and freshwater crocodile (*Crocodylus johnstoni*) are conservation significant species under the EPBC Act. The estuarine crocodile has only been recorded below the Burdekin Falls Dam and is not expected to be found in the Study Area. Surveys of the east coast of Queensland have detected a number of freshwater crocodiles in the Burdekin River, though these were also recorded below the Burdekin Falls Dam (Sullivan et al., 2010). Desktop searches identified no previous records within 50 km of the Study Area and the Study Area is not expected to provide important habitat for any crocodile species and therefore these species are unlikely to occur in the Offsite footprint.

Freshwater turtle species known to occur within the Burdekin basin include:

- Cann's long-necked turtle (*Chelodina canni*)
- Snake-necked turtle (*Chelodina longicollis*)
- Irwin's turtle (*Elseya irwini*)
- Saw-shelled turtle (*Wollumbinia latisternum*)
- Krefft's turtle (*Emydura macquarii krefftii*)

None of these turtle species are listed as conservation significant species under the EPBC Act or NC Act. Irwin's turtle is endemic to the Burdekin basin and has been listed as high priority for conservation under the DEHP 'Back on Track' prioritisation framework for conservation management of Queensland's wildlife (DERM, 2010a). 'Back on Track' species are discussed in further detail in Section 3.4.1.

Invertebrates

Desktop assessment (Queensland Museum crustacean database) identified two crustacean species recorded within 50 km of the Study Area. Both species, *Daphniopsis pusilla* and *Moina baylyi*, were recorded near a salt lake, Lake Buchanan, which is outside the Burdekin basin. These species inhabit halophilic waters of salinity of 3 to 60 g l-1 (Timms, 1987) and are unlikely to occur in the Study Area.

Aquatic fauna – field assessment results

No targeted aquatic fauna surveys were conducted as part of the field surveys; however, opportunistic observation where made while conducting aquatic habitat assessments.

Observations made during field surveys identified a number of waterbodies with fish present, including Site 2, Site 4, Site 6, Site 7, Site 8, Site 9 and Site 12. Specifically, where fish were noted they were often in large numbers and the water ways provided good habitat (debris, some aquatic vegetation). Some of the species noted included spangled perch (*Leiopotherapon unicolor*), eastern rainbowfish (*Melanotaenia splendida splendida*) and Pacific blue-eye (*Pseudomugil signifer*). None of the species identified are threatened or conservation significant species. The spangled perch and eastern rainbowfish were also identified in the desktop assessment and previous field surveys of the Study Area. They are both habitat generalists, common and widely distributed species throughout the Burdekin basin (Pusey et al., 2004; Carter and Tait, 2008). *Pseudomugil signifer* has not previously been identified in the Study Area. However, it is a widespread native species that occurs in coastal streams and drainages along the eastern coast of Australia (Pusey et al., 2004).

During field surveys freshwater turtles were noted at a number of waterbodies which were mainly large dammed areas of water or flowing water ways, including Site 4, Site 8, Site 9 and Site 11. At Site 8 and Site 11 farm dams, numerous turtles (> 20), across most life stages (adult to juvenile), were observed. At Site 9, the species' were most likely *Emydura macquarii krefftii*, as they were noted as having yellow markings on their heads and smooth shells. Habitat suitable for turtle nesting was also observed at Eight Mile Creek (Site 2) and North Creek (Site 4). Overall, turtles were most abundant to the south of the Study Area along the Obungeena and Ogenbeena Creeks.

Freshwater bivalves (clams and mussels) were observed during field surveys (Plate 16 and Plate 17), as well as indirect evidence of crabs such as burrows (Plate 18), at Site 1, Site 2, Site 3, Site 6, Site 8 and Site 11. Dead crab shells and freshwater crab burrows were also noted at Site 2 and Site 10. At Site 11 farm dam, numerous freshwater mussels were noted and included two species *Alathyria condola* and *Velesunio ambiguous*.

Plate 16 Freshwater mussels *Alathyria condola* (left) and *Velesunio ambiguous* (right)

Plate 17 Freshwater clams, *Corbicula sp*.

Plate 18 Crab shell of genus *Austrothelphusa* (left) and crab burrows (right)

The aquatic ecology field survey identified four aquatic bivalve species, none of which are of conservation significance, including:

- *Alathyria condola*: Observed at Site 2, Site 4 and Site 11

- *Velesunio ambiguous*: Observed at Site 11
- *Corbicula sp*.: Observed at Site 6 and Site 8
- *Austrothelphusa sp*.: observed at Site 2, Site 10

The freshwater mussels are widespread species found in permanent lowland water ways, such as creeks and rivers, with finer sediments (MDFRC, 2013a). Both species of mussel were found in riverine and lacustrine habitats. *Corbicula* sp. (Plate 17) inhabit soft substrates of shallow, flowing rivers and creeks, as well as lacustrine habitats, including artificial farm dams (MDFRC, 2013a). Species of the genus *Austrothelphusa* are mostly widespread and common to creeks, swamps and farm dams of Queensland (Williams, 1980; MDFRC, 2013b).

Waterbirds

Bird surveys were conducted as part of the terrestrial fauna surveys. These surveys included birds which utilise waterbodies (waterbirds) (See Section 2.4.3). Waterbirds were also identified at a number of the aquatic field survey sites (Site 1, Site 6, Site 7, Site 8, Site 11 and Site 12).

Water bird species observed included:

- Black swan *(Cygnus atratus)*
- Pacific black duck *(Anas superciliosa)*
- Eurasian coot *(Fulica atra)*
- Hardhead *(Aytha australis)*
- Cotton pygmy-goose *(Nettapus coromandelianus)*
- Black-necked stork *(Ephippiorhynchus asiaticus)*
- Royal spoonbill *(Platalea regia)*
- Great egret *(Ardea alba)*
- Wood duck *(Chenonetta jubata)*

The great egret is listed under the EPBC Act as marine and migratory; however, this is a common and wide spread species occurring across Australia in a variety of wetland habitat types (DSEWPaC, 2013).

2.6 Threatening processes

The landscape in which the Study Area occurs has been exposed to a diverse array of historic and ongoing threatening processes. Tree clearing, high total grazing pressure and exotic species are identified as major threats to biodiversity in the Brigalow Belt bioregion (Sattler and Williams, 1999). Other threatening processes occurring in both bioregions include:

- Habitat fragmentation
- Changed fire regimes
- Changed hydrology (of waterways)
- Salinity
- Pathogens

- Firewood collection (DSEWPaC, 2009a; DSEWPaC, 2009b)

The Burdekin NRM 'Back on Track Actions for Biodiversity' (DERM, 2010a) report details a variety of threatening processes impacting upon priority taxa in the region. These are largely analogous to those mentioned above, and include:

- Feral animals
- Inappropriate grazing regimes
- Drainage of habitat
- Groundwater extraction
- Weeds
- Altered flow regimes
- Vegetation clearing
- Site/road maintenance
- Mining
- Urban development
- Baiting
- Disease
- Road kill (DERM, 2010a)

Within the Study Area, and the wider landscape, historic and ongoing threatening processes are largely linked to the sites' cattle-grazing land use. The Study Area has been extensively cleared for many decades. Remnant vegetation persists in fragments, along waterways and isolated patches. This is likely to have resulted in direct mortality of flora and fauna, and indirectly caused the localised decline and disappearance of species that are sensitive to the loss and fragmentation of habitats.

The understorey of both remnant and non-remnant vegetation within the Study Area is extensively covered with the exotic pasture buffel grass. The homogenisation and resulting loss of microhabitats associated with the proliferation of buffel grass is likely to have reduced the diversity of native grasses, forbs, reptiles and small mammals. Impacts of cattle grazing (i.e. dung deposition, over-grazing, soil compaction, trampling and stripping of bark from fallen woody debris) are ubiquitous across the Study Area and intensified around waterbodies where cattle congregate to drink. Feral animals and weeds were recorded; however, high concentrations of these pests were not noted.

3. Conservation significant values

3.1 Introduction

Conservation significant areas and species occurring within or of relevance to the Study Area include those classified as having Commonwealth, Queensland and/or regional biodiversity significance. The conservation significant ecological values identified during desktop and field investigations of the Study Area are summarised in Table 15 and discussed in detail in this section.

Table 15 Summary of conservation significant values of the Study Area

Provision	Comment	Section
Commonwealth		
Commonwealth EPBC Act – matters of NES (controlling provisions based on referral of Project (2010/5736))		
World Heritage properties (section 12 & 15A)	No World Heritage properties within or of relevance to Study Area.	Section 3.2.1
National Heritage places (section 15B & 15C)	No National Heritage places within or of relevance to Study Area.	Section 3.2.2
Wetlands (Ramsar) (section 16 & 17B)	Coongie Lakes. These are located 852 km south-west of the Study Area in north-east South Australia. More detail is provided in the EIS.	Section 3.2.3
Listed threatened species and communities (sections 18 & 18a)	No EPBC Act listed threatened flora species recorded during field surveys in Study Area. Three EPBC Act listed threatened fauna species were recorded during field surveys in Project Area (a further two EPBC Act listed threatened fauna species considered likely to occur) . One EPBC Act listed TEC recorded during field surveys in Study Area.	Section 3.2.4 Section 3.2.5 Section 3.2.6
Listed migratory species (section 20 & 20A)	Two EPBC Act listed migratory species recorded during field surveys in Study Area (a further 12 EPBC Act listed migratory species considered likely to occur).	Section 3.2.7
Great Barrier Reef Marine Park (section 24B & 24C)	The Study Area is located over 273 km due east. Significant overland barriers would inhibit any site attributes having an influence on the Marine Park and, as such, this is considered to be not applicable to Study Area.	Section 3.2.1
Other Commonwealth matters		
Listed marine Species	15 EPBC Act listed marine species recorded during field surveys in Study Area	Section 3.2.8

Provision	Comment	Section
State		
Queensland VM Act		
Regional ecosystems	Approximately 332.5 ha of REs occur in Study Area (based on amended RE mapping), comprising: • 9.8 ha of endangered REs • 220.6 ha of concern REs • 102.1 ha of least concern REs	Section 3.3.1
Regrowth vegetation	78.4 ha of mapped regrowth vegetation occurs in the Study Area.	Section 3.3.3
Essential habitat	No mapped essential habitat occurs within the Study Area.	Section 3.3.4
Queensland EP Act		
ESAs	No Category A ESAs are located within the Study Area. Approximately 9.8 ha of Category B ESAs (endangered Biodiversity Status REs) are located within the Study Area (based on amended RE mapping).	Section 2.3.1
Queensland NC Act		
Threatened flora species	No NC Act-listed threatened flora species recorded during field surveys in Study Area.	Section 3.3.5
Threatened fauna species	Four NC Act threatened fauna species recorded during field surveys in Study Area (including two of EPBC listed species; a further 2 NC Act listed threatened fauna species considered likely to occur). Five special least concern animals recorded during field surveys in Project Area (a further 11 NC Act listed special least concern species considered likely to occur).	Section 3.3.6
Protected areas	Six protected areas occur within 50 km of the Project Area: • Bygana West Nature Refuge – occurs 12 km south-west of the Study Area within the Project Area (Mine) • Epping Forest National Park (Scientific) – approx. 39 km southeast of Study Area • Doongmabulla Mound Springs Nature Refuge – approx. 19 km west of Study Area • Bygana Nature Refuge – approx. 14 km southeast of Study Area • East Top Nature Refuge – approx. 26 km southeast of Study Area • Wilandspey Conservation Park – approx.19 km northeast of Study Area	Section 3.3.7

Provision	Comment	Section
Regional		
Burdekin Natural Resource Management (NRM) Region Back on Track Actions for Biodiversity report priority taxa	Report identifies priority vertebrate fauna taxa for the Burdekin NRM region, including: • 21 plants • 8 terrestrial reptiles • 13 terrestrial mammals • 6 birds	Section 3.4.1

3.2 Commonwealth matters of national environmental significance

3.2.1 World heritage properties

World heritage properties are identified as a controlling provision for the Project under the EPBC Act. The Study Area is located over 273 km due west and approximately300 km upstream of the Great Barrier Reef World Heritage Area. The Carmichael River that bisects the site flows east for approximately 20 km to its juncture with the Belyando River. From this point the Belyando River flows in a northerly direction for approximately 90 km where it joins the Suttor River. Beyond its juncture with the Belyando River, the Suttor River flows north (approximately 50 km) to the Burdekin Falls Dam (Lake Dalrymple). The Burdekin River downstream of Burdekin Falls Dam flows for approximately 160 km to its mouth at Upstart Bay near Ayr. These water courses flow through a modified landscape matrix dominated by cattle grazing, with other land uses including mining, urban and cropping. Downstream impacts to the Great Barrier Reef World Heritage Area resultant from activities at the Project Area are not expected.

The Study Area is located over 300 km south of the Wet Tropics World Heritage Area with no direct connection between the two.

3.2.2 National heritage places

National Heritage Places are identified as a controlling provision for the Project under the EPBC Act. In addition to the World Heritage Places, which are also listed as National Heritage Places, one other place of national heritage significance is identified.

The Tree of Knowledge and curtilage at Barcaldine is the closest National Heritage Place to the Project Area. It is located approximately 225 km south-west of the Study Area.

3.2.3 Ramsar wetlands

The closest wetland of international importance (Ramsar Wetland) is the Shoalwater and Corio Bays Areas, approximately 380 km east of the Study Area. The DSEWPaC Protected Matters Search Tool indicated that the Coongie Lakes Ramsar site in South Australia (located approximately 852 km south-west of the Study Area).

3.2.4 Listed threatened flora species

The desktop assessment and Project terms of reference identified 11 EPBC Act listed threatened flora species with the potential to occur within the Study Area. None were confirmed present by field surveys of the Study Area. A likelihood of occurrence assessment for EPBC Act

listed threatened flora was undertaken and no species were ranked likely to occur. However, one species, waxy cabbage palm (*Livistona lanuginosa*), may occur within the Study Area, due to the presence of suitable habitat and its recent confirmed presence in the adjacent EPC 1690 Study Area. The results of the likelihood of occurrence assessment can be found in Appendix F.

3.2.5 Listed threatened ecological communities

TECs are ecological communities that have been assessed under the EPBC Act and assigned one of the following categories based on the level of threat to the community:

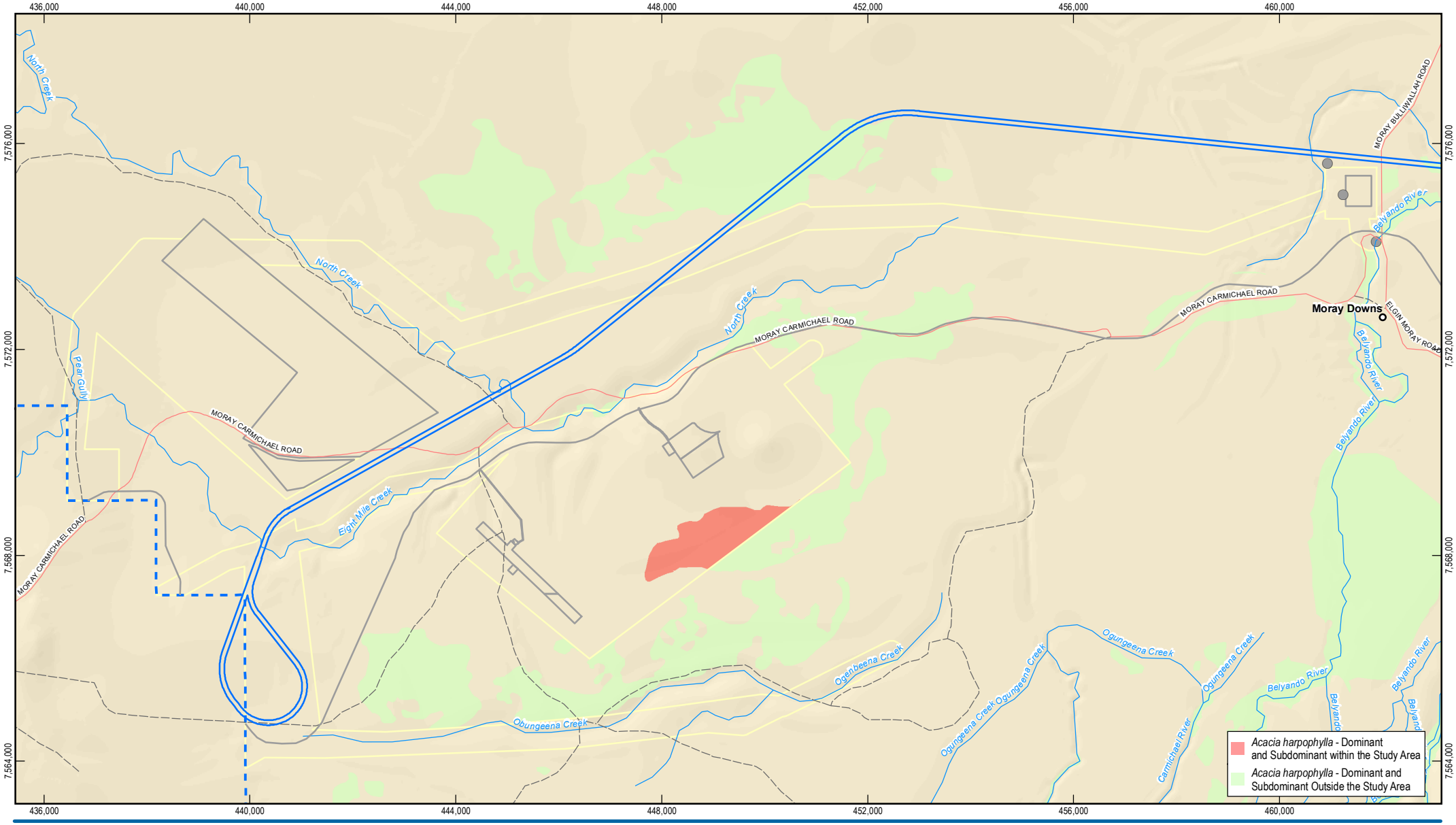
- Conservation dependent
- Vulnerable
- Endangered
- Critically endangered
- Extinct in the wild

The desktop assessment identified the two following TECs with potential to occur in the Study Area. Both TECs are classified as endangered.

- Brigalow (*Acacia harpophylla* dominant and co-dominant)
- The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin (GAB)

The Brigalow TEC was identified as occurring in the Study Area from field surveys. This TEC occurred in small patches, often in heterogeneous polygons with mixed eucalypt woodland REs and grassland communities. The REs representing this TEC include the endangered REs 11.3.1 and 11.4.9 (see Table 5 for a description of these REs). The condition of the TEC within the Study Area was moderate, due to disturbance from cattle grazing, clearing and weed invasion. This TEC covers a total of 9.8 ha (0.14 percent) of the Study Area. This TEC does not occur within the Project (Offsite) footprint.

The nearest GAB discharge spring is a cluster of 11 springs approximately 15 km south-west of the Study Area, known as Doongmabulla Springs. However, the TEC was not observed within the Study Area.



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0 2 4

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Local Road
- Track
- Watercourse
- Study Area
- Rail Corridor
- Project Area
- Mine (Offsite)
- Mine (Offsite)

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project SEIS
Environmental Assessment Report

Job Number	41-26422
Revision	1
Date	15-10-2013

Threatened Ecological Communities

Figure 10

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Level 9, 145 Ann St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DME: EPC1690 (2010)/EPC1080 (2011); DNRM\GHD: Threatened Ecological Communities (2011); © Commonwealth of Australia (Geoscience Australia): Watercourse, Tracks (2007);
Adani: Alignment Opt11 Rev 2 (SP1 and 2)(2013), Offsite Infrastructure (2013). Created by: AJ

3.2.6 Listed threatened fauna

The desktop assessment identified 15 EPBC Act listed threatened fauna species within Study Area. The following three species were confirmed present during field surveys:

- Black-throated finch (southern)
- Squatter pigeon (southern)
- Ornamental snake

Two other species were considered likely to occur, based on the results of the likelihood of occurrence assessment:

- Koala
- Yakka skink

The likelihood of occurrence assessment for the 15 EPBC listed species identified within desktop assessments is provided in Appendix F. Details on the threatened EPBC listed fauna observed and the potential habitats for species confirmed present and likely to occur is presented below.

Ornamental snake – confirmed present

The ornamental snake is listed as vulnerable under both the EPBC Act and NC Act. The species occurs in the Brigalow Belt bioregion, where the majority of natural vegetation has been cleared for agriculture, mining and urban development, and has been degraded by overgrazing by stock. This has resulted in a decline in abundance in the past few decades (Cogger *et. al*., 1993). The ornamental snake was predicted to occur within the Carmichael Coal Mine and Rail Project Areas. However, this cryptic species was not recorded in surveys for the EIS.

The ornamental snake is primarily associated with cracking clay soils. Ornamental snakes are nocturnally active, sheltering during the day under fallen timber, rocks, bark and in deep soil cracks. The species is probably active year round with the exception of the cooler months, with peak activity likely to be early summer through to the wet season. During dry times the snake can remain inactive in suitable shelter sites for months (DSEWPaC, 2013).

The ornamental snake prefers habitat within, or close to, habitat that is favoured by its prey (namely frogs). Preferred habitat includes woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions in Queensland RE land zone 4 (DSEWPaC, 2011c). The most common habitat of ornamental snake is brigalow, gidgee, blackwood or Coolabah dominated vegetation communities, or pure grasslands associated with gilgais (DSEWPaC, 2011c). REs from which this species is most commonly recorded in Queensland that are mapped within the Study Area include:

- RE 11.4.6 *Acacia cambagei* woodland on Cainozoic clay plains
- RE 11.4.8 *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains
- RE 11.4.9 *Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains
- 11.3.3 *Eucalyptus coolabah* woodland on alluvial plains

Ornamental snakes in the Study Area

Targeted survey effort for the ornamental snake undertaken in the current survey comprised 21 hours of diurnal active search, 14 hours of nocturnal active search, 10 hours of nocturnal road transects and trapping at two areas of potential habitat using elliotts, cages and funnels.

Two ornamental snakes were recorded from separate locations within the Study Area. One individual was observed foraging within a patch of open woodland habitat that contained small amounts of brigalow (Site H12) (Plate 19). The other individual was found sheltering beneath fallen woody debris within a small, isolated patch of relatively high quality brigalow (Site H34 (Plate 19). Both individuals were found in active searches, one nocturnal, one diurnal.

A total of 322.3 ha of potential habitat for the ornamental snake occurs within the Study Area, with 313.8 ha within the Offsite footprint (Figure 11). A conservative approach has been taken to mapping of potential habitat for this species. Areas of potential habitat included areas of non-remnant and regrowth vegetation that contain suitable microhabitats (i.e. cracking clay soil with gilgais). The ornamental snake can occur in cleared areas, where suitable REs once occurred (DSEWPaC, 2013). This is due the strong association between the ornamental snake and gilgais (which remain after vegetation has been cleared). These microhabitat features provide important refuges and foraging habitat for the ornamental snake.

On-ground assessments of habitat quality were undertaken within those areas of mapped potential habitat and suggest the quality of potential habitats is likely to vary substantially. The quality of areas of non-remnant vegetation containing gilgais is expected to be very low, compared with areas of suitable RE. Factors that are likely to reduce the value of habitats for the ornamental snake include the degradation or alteration of gilgais by cattle and land-clearing. These are important for providing foraging habitat. One of the main limiting factors determining the utilisation of potentially suitable habitat by the ornamental snake is likely to be related to the density of frog populations, which in turn may be driven by the localised availability of frog breeding sites (i.e. standing water associated with gilgais, ephemeral creeks and rivers). More details have been provided in the Biocondition Report for the Offsite footprint (GHD, 2013).

Plate 19 Ornamental snake at Site H12 (left) and Site H34 (right)


Black-throated finch (southern) – confirmed present

The black-throated finch (southern) (Plate 20) is listed as endangered under both the EPBC Act and NC Act. This species has experienced a significant decline in range in recent decades (DSEWPaC, 2013). Where it was once previously found throughout eastern and central

Queensland north of the New South Wales border, it is now only known from the Townsville region and scattered sites in central Queensland (DSEWPaC, 2013). The extent of occurrence of the species (i.e. *Poephila cincta*) has declined by approximately 80 percent since the 1980s, with the majority of this decline in the range of the endangered southern subspecies (DSEWPaC, 2013).

The black-throated finch (southern) is predominantly a sedentary (BTF Recovery Team, 2007; DEWHA, 2009) and gregarious species that typically forages in groups of up to 30 birds (DEWHA, 2009). During the breeding season (in the Townsville region breeding coincides with wet season (February to May)), only small daily movements between forage sites are made. Movements of up to three km a day may occur during periods where forage resources are scarce. Larger movements are thought to be related to periods of drought and/or when water availability is reduced (DEWHA, 2009). It often forms loose breeding colonies, where a number of nests are made in a single tree, or in neighbouring trees. The average clutch size is five, with chicks reaching sexual maturity at six months (DEWHA, 2009).

The subspecies inhabits grassy open woodland and open forest habitats characterised by trees belonging to the genera *Eucalyptus, Corymbia, Acacia* and *Melaleuca* (DSEWPaC, 2013). Generally it occurs in habitats near watercourses or waterbodies - almost all recent records of the subspecies south of the tropics have been in riparian areas (DSEWPaC, 2013). Three critical habitat resources are required to support the subspecies:

- Water sources (both natural and artificial)
- Grass seeds (a mosaic of species that provide forage throughout the year (particularly during the wet season)
- Trees that provide suitable nesting habitat (DEWHA, 2009)

Grass species that are considered to be important forage species for the black-throated finch (southern) include *Urochloa mosambicensis, Enteropogon acicularis, Panicum decompositum, Panicum effusum, Dichanthium sericeum, Alloteropsis semialata, Eragrostis sororia* and *Themeda triandra* (DEWHA, 2009). REs from which the subspecies has been recorded in north Queensland since 1994 (as presented in the National Recovery Plan for the Black-throated Finch Southern Subspecies (BTF Recovery Team, 2007) that are mapped within the Study Area include:

- RE 10.3.6 *Eucalyptus brownii* open woodland on alluvial plains
- RE 10.3.28 *Eucalyptus melanophloia* or *E. crebra* open woodland on sandy alluvial fans
- RE 10.5.5 *Eucalyptus melanophloia* open woodland on sand plains
- RE 11.3.25b *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines – this RE occurs within the rail corridor and infrastructure footprints

Existing populations of the black-throated finch (southern) are thought to be highly fragmented (DSEWPaC, 2013). As such, the *Significant Impact Guidelines for the Endangered Black-throated Finch (southern) (Poephila cincta cincta)* (hereafter, the 'Black-throated Finch (southern) Significant Impact Guidelines') (DEWHA, 2009) define any habitat within five km of a post-1995 sighting as an 'important area' for the subspecies. The guidelines also state "that the presence of the black-throated finch (southern) at a site indicates that existing management regime is likely to be compatible with maintaining suitable habitat for the subspecies".

This species has been confirmed present on the Project Area (Mine). Substantial numbers of black-throated finches have been recorded in surveys of the Project Area (Mine) between 2010 – 2012.

Plate 20 Black-throated finches previously recorded on the Mine Lease

Source: GHD 2011- photos from Project (Mine) Study Area

Black-throated finches in the Study Area

In the current survey, targeted survey effort for black-throated finches comprised 44 hours of water-body watches, undertaken at 22 natural and artificial waterbodies, 2,016 hours of remote-camera observations (with cameras set at 14 waterbodies), 15 hours of bird surveys and targeted habitat assessments at 40 locations.

One individual black-throated finch was observed in the south-western corner of the Study Area during field surveys. This individual was observed at Dam 11 during a targeted water-body watch. This dam is surrounded by relatively low value habitat (i.e. an area of open woodland with a buffel grass-dominated understorey and low density of native grasses). However, areas west of the bird's location were found to represent potential habitat value for the species within surveys of the Mine. A total of 415 common finches were observed during the surveys, including 145 double-barred finches (*Taeniopygia bichenovii*), 150 zebra finches (*Taeniopygia guttata*) and 120 plum-headed finches (*Neochmia modesta*).

Habitats for black-throated finches were generally poor across the Study Area. The quality and abundance of native grasses was substantially lower within the Study Area than on the northern and southern sections of theEPC1690. Much of the Study Area has been historically cleared and relatively intensively grazed by cattle. Modelling of habitat criteria for the EIS indicates 94.3 ha of suitable habitat for black-throated finches within the Study Area, with 2.5 ha within the Offsite footprint (Figure 12). This predominantly occurs within riparian fringing woodlands adjacent to North Creek. On-ground verification of these in the current surveys indicates these areas have been substantially degraded by the proliferation of buffel grass and are unlikely to represent important breeding or foraging habitat for the black-throated finch.

Squatter pigeon (southern) – confirmed present

The squatter pigeon (southern) is listed as vulnerable under both the EPBC Act and NC Act. This species distribution extends from central Queensland as far north as the Burdekin-Lynd divide to the south-east of the state (DSEWPaC, 2013). At present the total population size of

the squatter pigeon (southern) is estimated to be around 40,000 breeding birds, with the population likely to be stable (DSEWPaC, 2013). The squatter pigeon (southern) is locally abundant at some locations in the northern part of its current distribution and is considered to be common in cattle grazed country north of the Tropic of Capricorn (DSEWPaC, 2013).

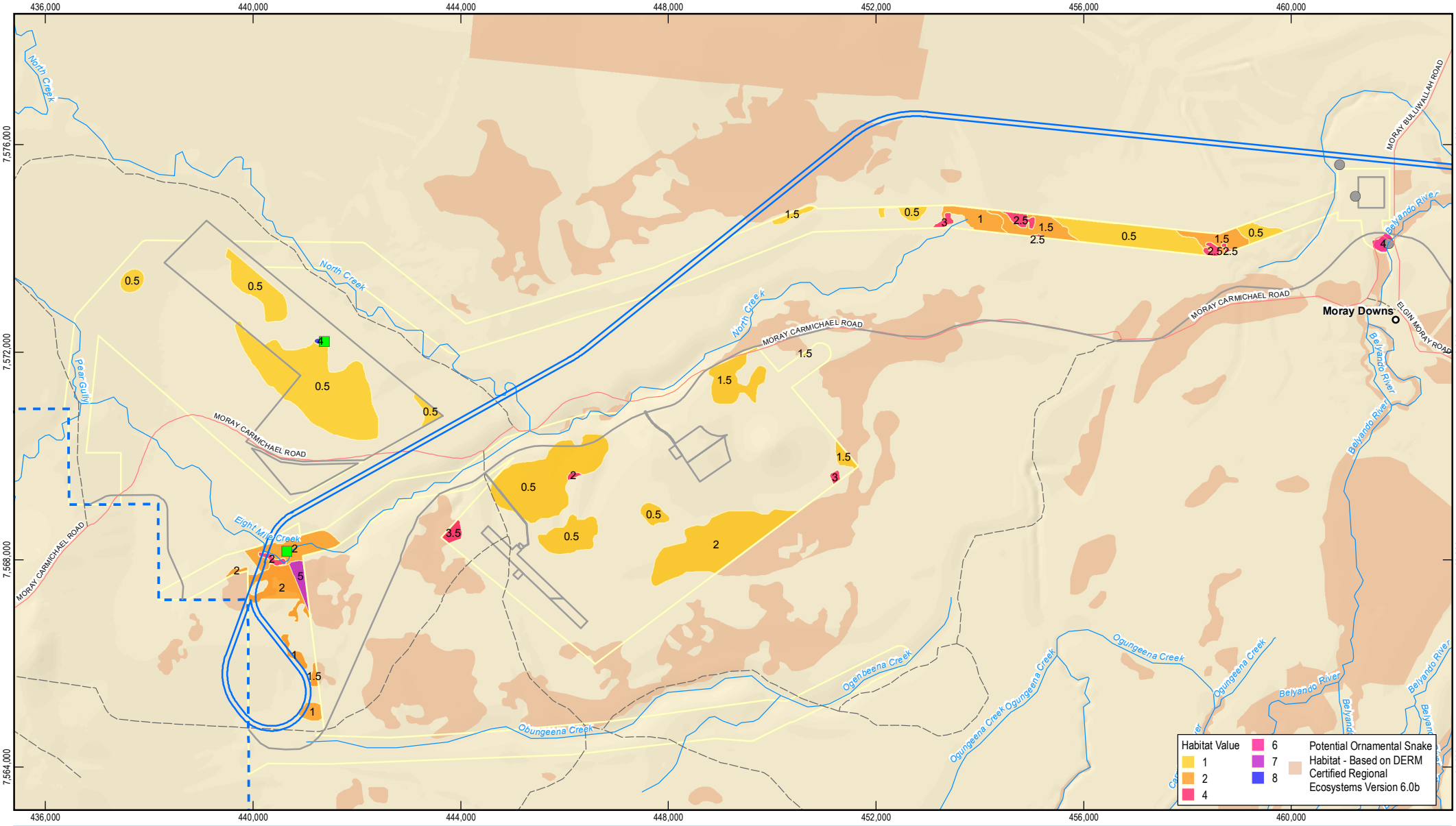
Habitat for this subspecies occurs mainly in grassy woodlands and open forests dominated by eucalypts, particularly those near water (DSEWPaC, 2013). This species has also been recorded less frequently in disturbed habitats such as stockyards, railways, and settlements (DSEWPaC, 2013). The breeding season for the squatter pigeon (southern) typically extends from late winter months through to summer, although if conditions are suitable birds are said to be able to breed throughout most of the year (DSEWPaC, 2013). The diet of the squatter pigeon (southern) generally consists of grass seeds, legumes, herbs and forbs, as well as insects and ticks (DSEWPaC, 2013). Three main threats to the squatter pigeon (southern) exist:

- Loss of habitat due to clearing for agricultural or industrial purposes
- Degradation of habitat by grazing herbivores
- Excessive predation, particularly by foxes and cats (DSEWPaC, 2013)

Squatter pigeons in the Study Area

In the current survey, targeted surveys for the squatter pigeon comprised 320 km of driving surveys, 2,016 hours of remote camera observations (with cameras set at 14 waterbodies), 44 hours of water-body watches and 15 hours of bird surveys undertaken at 40 locations.

Two squatter pigeons were heard calling within riparian fringing woodland at Site H9. Another two squatter pigeons were observed on the Moray-Carmichael Road, immediately south of the Study Area. The species is relatively ubiquitous throughout the local landscape and could conceivably occur anywhere within the Study Area. Despite this, the squatter pigeon is more likely to occur in and adjacent to areas of woodland and areas with a lower density of buffel grass, since these areas tend to have higher resource availability for the species (DSEWPaC, 2013). Habitat modelling for the species (undertaken for the EIS) identified 87.1 ha of potential habitat within the Study Area, with 2.5 ha within the Offsite footprint.



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0 2 4

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Confirmed Location of Ornamental Snake
- Local Road
- Track
- Watercourse
- Study Area
- Rail Corridor
- Project Area
- Mine (Offsite)
- Mine (Offsite)

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Distribution of Potential Habitat for the Ornamental Snake within the Study Area

Job Number	41-26422
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Figure 11

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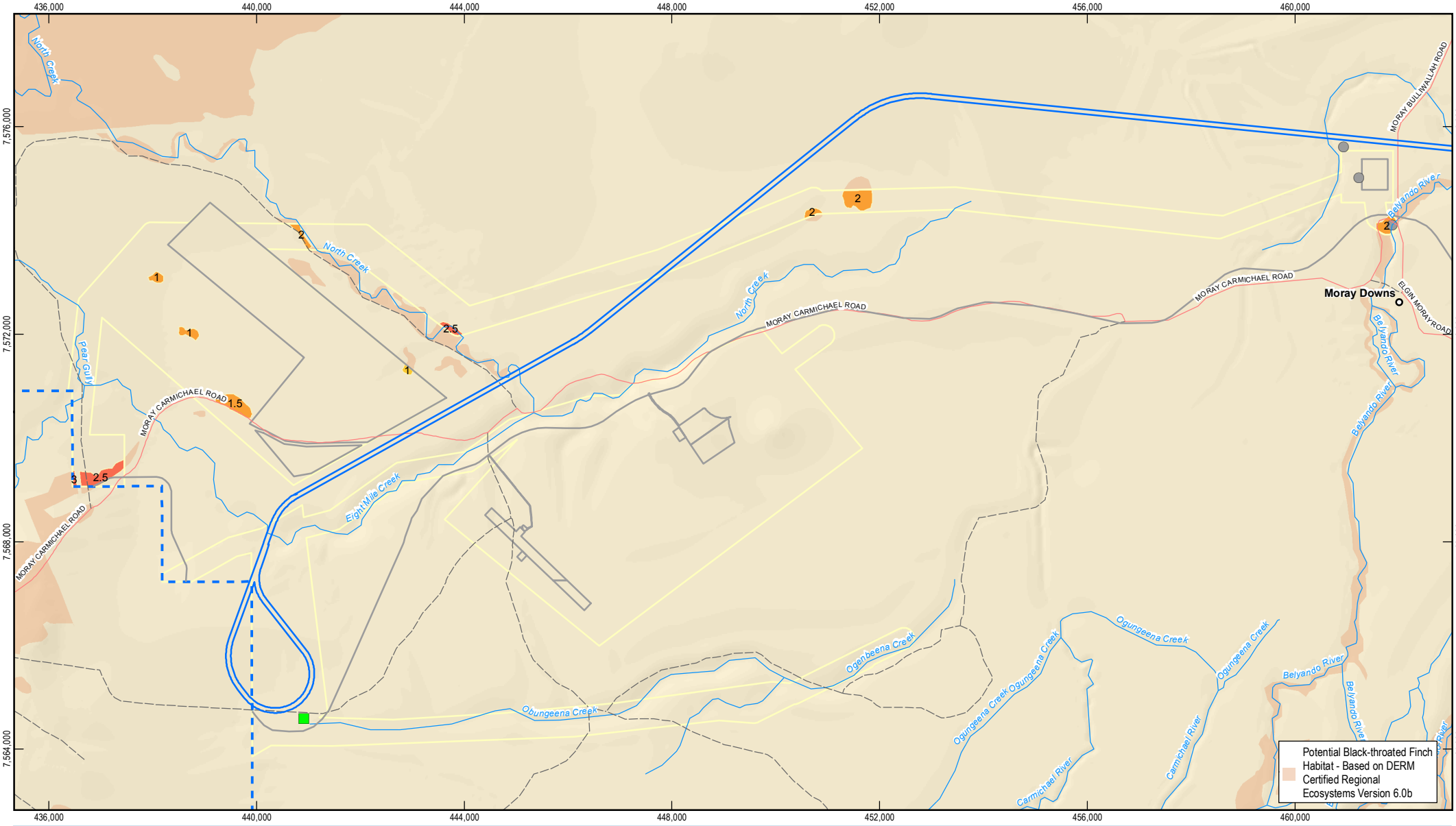

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0 2 4

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Confirmed Location of Black-throated Finch
- Local Road
- Track
- Watercourse
- Study Area

Habitat Value
1
2
3

- Rail Corridor
- Project Area
- Mine (Offsite)
- Mine (Offsite)

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Distribution of Potential Habitat for the Black-throated Finch within the Study Area

Job Number 41-26422
Revision 1
Date 15-10-2013

Figure 12

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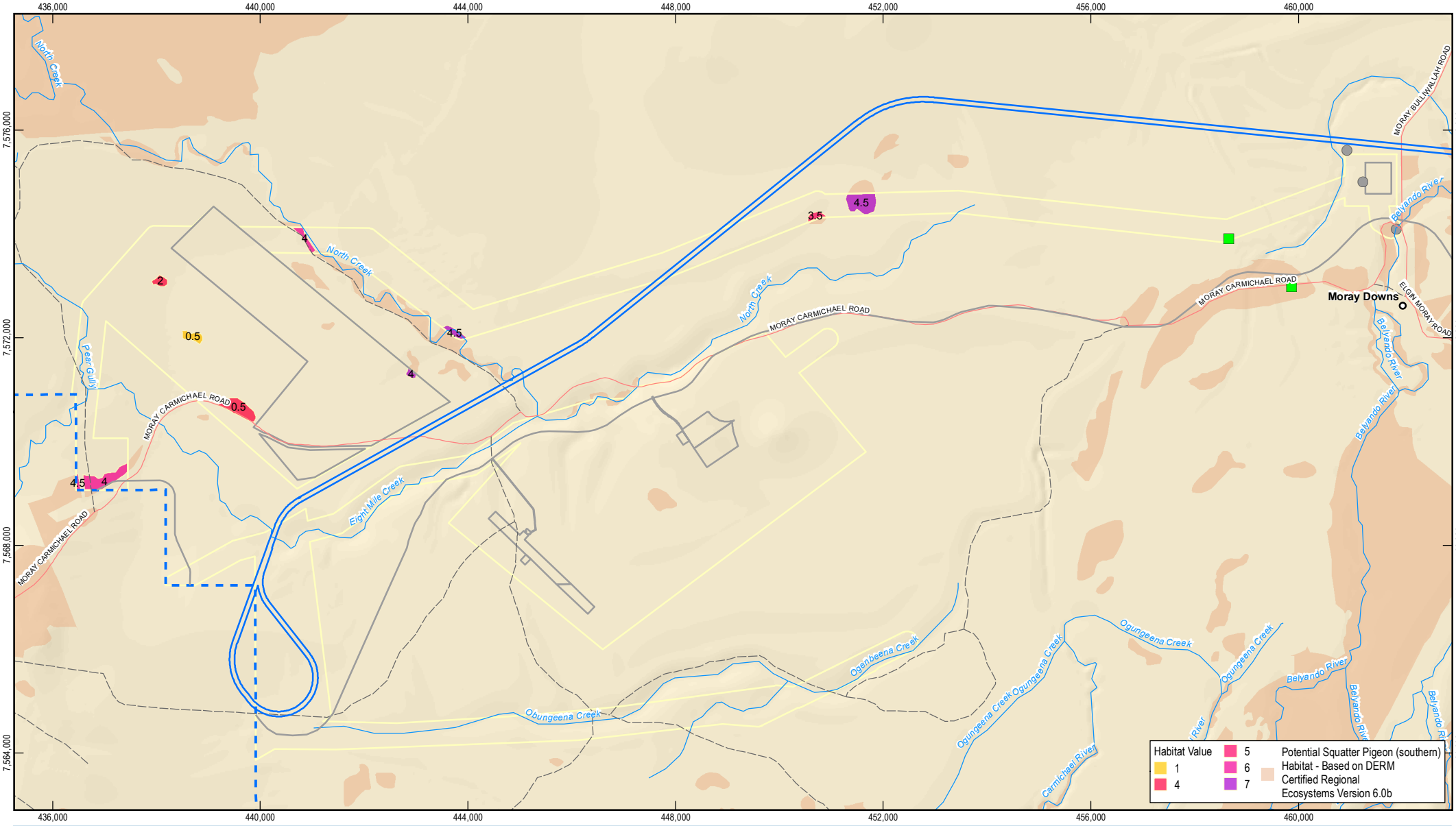

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0 2 4

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Confirmed Location of Squatter Pigeon (southern)
- Local Road
- Track
- Watercourse
- Study Area
- Rail Corridor
- Project Area
- Mine (Offsite)
- Mine (Offsite)

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Distribution of Potential Habitat for the Squatter Pigeon (southern) within the Study Area

Job Number 41-26422
Revision 1
Date 15-10-2013

Figure 13

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Koala – likely to occur

The koala (combined populations of QLD, NSW and ACT) is listed as vulnerable under the EPBC Act, and special least concern under the NC Act. The koala is a tree-dwelling marsupial that has a widespread distribution in both coastal and inland environments (DSEWPaC, 2012b). The koala's diet is typically restricted to foliage of *Eucalyptus spp*. or related genera. However, the diet of individual koalas is usually limited to obtaining most of their nutrition from one or a few tree species present at a site. Species-level preferences may also vary between regions or seasons (DSEWPaC, 2012b). Female koalas can potentially produce up to one offspring a year, giving birth between October and May, however research indicates that breeding averages are more likely to range between 0.3-0.8/year (DSEWPaC, 2012b).

Koalas occupy a range of habitats including temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated eucalypt species (DSEWPaC, 2012b). In central Queensland, the species occurs in scattered populations within eucalypt woodlands generally along watercourses. Koalas in the Brigalow Belt bioregion also typically occur in low densities, estimated at 0.005 koalas/ha and have large home ranges (DSEWPaC, 2012b). Over a 20 year period from 1990, estimated koala populations within the Brigalow Belt bioregion have declined 30 to 40 percent.

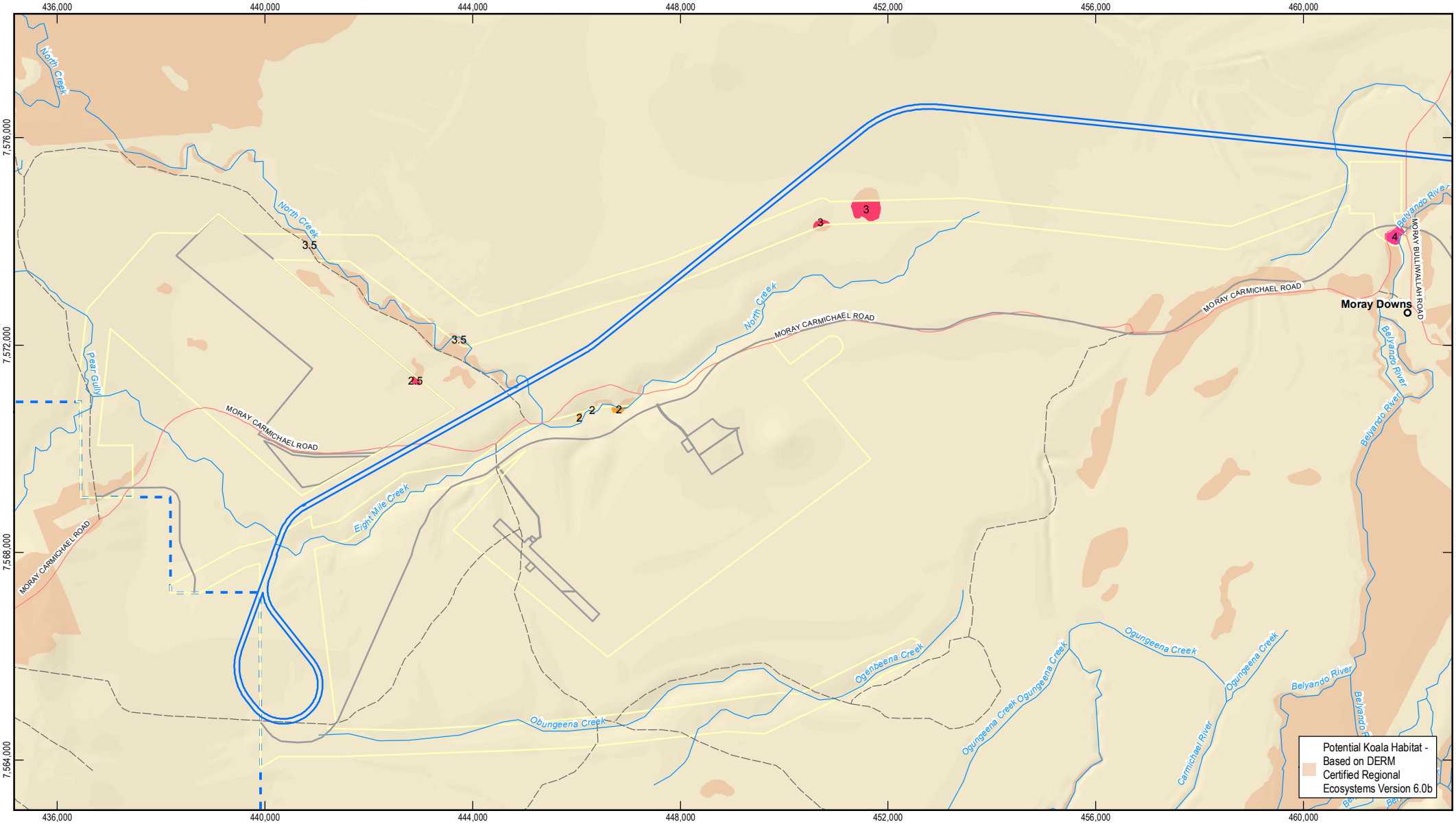
Generally, the home ranges of individual koalas can extensively overlap; however, these can be quite variable depending on the quality of the habitat and the location. Research undertaken at Blair Athol in central Queensland, approximately 140 km south-east of the Study Area, estimated home ranges at 135 ha for an individual male and 101 ha for females.

Koalas in the Study Area

Targeted searches for koala traces (i.e. pellets and scratches) were undertaken within the Study Area. No evidence of koalas was recorded in the current survey. However, the species has been previously recorded locally. One koala was recorded on EPC1690 during Spring 2011 surveys for the EIS.

Habitats within the Study Area have been extensively fragmented by past land clearing. Many patches of potentially suitable woodland are unlikely to hold any substantial value for the species, given their small size and relative isolation from other patches of suitable habitat. Within this context, areas of greatest potential habitat for koalas are likely to occur along the watercourses of North Creek, Eight Mile Creek and the Belyando River. Habitat value is expected to be low. Koalas are expected to occur in very low densities within this landscape and would move along areas of riparian fringing woodland. Potential habitat is likely to include open eucalypt woodland and open eucalypt forest vegetation fringing watercourses. Areas of potential habitat were mapped in Figure 14.

A total of 52.8 ha of potential koala habitat occurs within the Study Area, with 2.5 ha within the Offsite footprint. However, many of these areas have low value, due to their small size and fragmented nature.



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0 2 4

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Local Road
- Track
- Watercourse
- Study Area
- Habitat Value: 2, 4, 6
- Rail Corridor
- Project Area
- Mine (Offsite)
- Mine (Offsite)

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Distribution of Potential Habitat for the Koala within the Study Area

Job Number 41-26422
Revision 1
Date 15-10-2013

Figure 14

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Adani: Alignment Opt11 Rev 2 (SP1 and 2)(2013), Offsite Infrastructure (2013). Created by: AJ.

Yakka skink – likely to occur

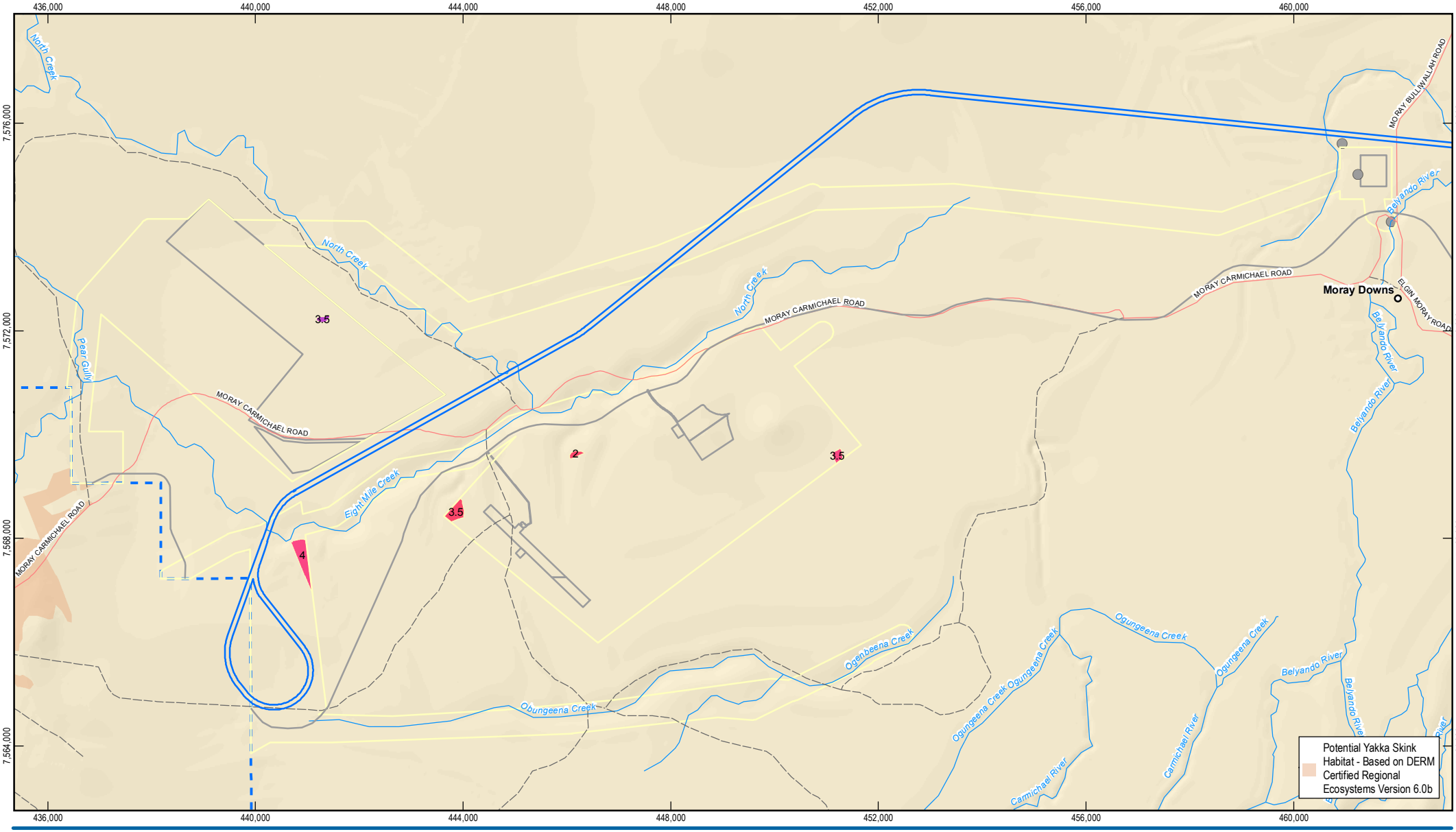
The yakka skink is listed as endangered under the EPBC Act. The yakka skink is a large highly cryptic skink species that is rarely encountered in surveys. The yakka skink is found in a wide variety of habitats including open dry sclerophyll forest, woodland and scrub associated with Brigalow (*Acacia harpophylla*), Mulga (*A. aneura*), Bendee (*A. catenulata*), Lancewood (*A. shirleyi*), Belah (*Casuarina cristata*), Poplar Box (*Eucalyptus populnea*), Ironbark (*Eucalyptus spp*.) and White Cypress Pine (*Callitris glaucophylla*) (Brigalow Belt Reptiles Workshop 2010; Cogger 2000). The species is typically associated with structurally complex microhabitats such as large hollow logs, burrow complexes or disused rabbit warrens (Brigalow Belt Reptiles Workshop 2010). The yakka skink is a communal species, with numerous adults and juveniles occupying the same burrow complex. The species displays strong site fidelity, rarely venturing far from the burrow complex.

The yakka skink is associated with brigalow vegetation communities. Consequently, much of its habitat has been extensively cleared for agriculture or progressively degraded through decades of exposure to cattle grazing. Threatening processes for this species include habitat reduction and degradation through agricultural and urban development (Cogger et al., 1993).

Yakka skinks in the Study Area

Targeted searches for yakka skink were undertaken within the Study Area. No evidence of this species was recorded in the current survey. The species is highly cryptic and can be easily overlooked in a rapid survey. Most vegetation with the Study Area has been extensively degraded by cattle grazing and therefore holds little potential value as habitat for this species. However a number of patches of remnant vegetation retain structural complexity that could potentially represent suitable habitat for the yakka skink. These were located in one small patch of least concern RE 10.4.5, near the proposed industrial area and in four small isolated patches of RE in the area between Eight Mile Creek and Obungeena Creek. Areas of potential habitat have been mapped in Figure 15.

A total of 34.5 ha of potential yakka skink habitat occurs within the Study Area, with 2.5 ha of potential habitat within the Offsite footprint.



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0 2 4

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Local Road
- Track
- Watercourse
- Study Area
- Habitat Value: 4, 5, 7
- Rail Corridor
- Project Area
- Mine (Offsite)
- Mine (Offsite)

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Distribution of Potential Habitat for the Yakka Skink within the Study Area

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Date 15-10-2013

Figure 15

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3.2.7 Listed migratory species

Two EPBC Act listed migratory birds were confirmed present during field surveys:

- Eastern great egret (*Ardea modesta*)
- White-bellied sea-eagle (*Haliaeetus leucogaster*)

A likelihood of occurrence assessment for EPBC Act listed threatened fauna was undertaken and an additional 12 migratory birds were ranked likely to occur:

- Common sandpiper (*Actitis hypoleucos*)
- Fork-tailed swift (*Apus pacificus*)
- Curlew sandpiper (*Calidris ferruginea*)
- Latham's snipe (*Gallinago hardwickii*)
- White-throated needletail (*Hirundapus caudacutus*)
- Caspian tern (*Hydroprogne caspia*)
- Black-tailed godwit (*Limosa limosa*)
- Rainbow bee-eater (*Merops ornatus*)
- Satin flycatcher (*Myiagra cyanoleuca*)
- Glossy ibis (*Plegadis falcinellus*)
- Common greenshank (*Tringa nebularia*)
- Marsh sandpiper (*Tringa stagnatilis*)

These species are common and widespread, and suitable habitat is likely to occur over much of the surrounding landscape. As such, the Study Area was not considered 'important habitat' defined in the Significant Impact Guidelines (DEWHA, 2009c).

3.2.8 Listed marine species

The following 15 EPBC Act listed marine species were recorded during field surveys in the Study Area:

- Australian pelican (*Pelecanus conspicillatus*)
- Black-eared cuckoo (*Chrysococcyx osculans*)
- Black-faced cuckoo-shrike (*Coracina novaehollandiae*)
- Black-winged stilt (*Himantopus himantopus*)
- Eastern great egret (*Ardea modesta*)
- Horsfield's bronze cuckoo (*Chalcites basalis*)
- Intermediate egret (*Ardea intermedia*)
- Nankeen kestrel (*Falco cenchroides*)
- Pallid cuckoo (*Cacomantis pallidus*)
- Silvereye (*Zosterops lateralis*)

- Southern boobook (*Ninox boobook*)
- Straw-necked ibis (*Threskiornis spinicollis*)
- Tree martin (*Petrochelidon nigricans*)
- Whistling kite (*Haliastur sphenurus*)
- White-bellied sea-eagle (*Haliaeetus leucogaster*)

These species included the two EPBC Act listed migratory species confirmed present during field surveys. Another 15 EPBC listed marine bird species are considered likely to occur within the Study Area. (Appendix F). These EPBC Act listed marine birds are widespread, common woodland and/or wetland species, and are likely to occur across the surrounding landscape wherever suitable habitat is available. As such, the Study Area was not considered 'important habitat' defined in the Significant Impact Guidelines (DEWHA, 2009c).

3.3 State matters of conservation significance

3.3.1 Regional ecosystems

A total of 36 REs were field verified within the Study Area. All are classified by the VM Act as being least concern with the exception of:

- RE 10.7.4, RE 11.3.3 and RE 11.4.6 – of concern
- RE 11.3.1, RE 11.4.8 and RE 11.4.9 – endangered

The occurrence and extent of REs within the Study Area is described in Section 2.3.1 and mapped in Figure 6.

3.3.2 Environmentally sensitive areas

There are no Category A ESAs within the Study Area. Three REs with an endangered biodiversity status, which are classified as Category B ESAs are present within the Study Area from field verification (11.3.1, 11.4.5 and 11.4.9).

Section 3.3.1 details each RE within the Study Area including those with an endangered biodiversity status classified as Category B ESAs.

3.3.3 Mapped regrowth vegetation

The Study Area includes four patches of regulated, non-remnant regrowth vegetation, covering an area of approximately 45 ha. The regrowth is mapped as least concern regrowth REs 11.3.28a and 11.3.6a. Mapped regrowth is discussed in further detail in Section. The regrowth mapping is provided as Figure 5.

3.3.4 Essential habitat

No DNRM essential habitat is mapped within the Study Area. Essential habitat for nine NC Act listed species occurs within 50 km of the Study Area. Potential habitat for threatened species is discussed in Section 3.3.6.

3.3.5 Listed threatened flora

The desktop assessment indicated that 11 NC Act listed threatened flora species have been previously recorded or are predicted to occur within the desktop search extent encompassing the Study Area and a further six NC Act listed threatened flora species were identified in the Project terms of reference for consideration in this assessment. Of these, none were confirmed present during field surveys in the Study Area.

3.3.6 Listed threatened fauna

The desktop assessment indicated that 19 NC Act listed threatened fauna species have been previously recorded or are predicted to occur within the desktop search extent encompassing the Study Area. Of these, four were confirmed present during field surveys in the Study Area:

- Black-throated finch (southern)
- Squatter pigeon (southern)
- Black-necked stork
- Cotton pygmy-goose

A likelihood of occurrence assessment for NC Act listed threatened fauna species was undertaken and an additional three species are considered likely to occur within the Study Area:

- Square-tailed kite (*Lophoictinia isura*)
- Black-chinned honeyeater (*Melithreptus gularis*)
- Brigalow scaly-foot (*Paradelma orientalis*)

These species have the potential to occur in remnant open woodland vegetation at the Study Area (i.e. *Ironbark-box grassy woodlands and open woodlands on grey sand plains*). Riparian and floodplain vegetation associated with the Carmichael River are likely to represent particularly ideal habitat for the square-tailed kite and black-chinned honeyeater.

Information regarding these species and their habitat availability within the Study Area is provided in Appendix F.

An additional NC Act listed threatened fauna species (greater long-eared bat (*Nyctophilus timoriensis*)) was identified in the Project ToR for consideration in this assessment. This species was not identified through the desktop assessment (i.e. predicted to occur or previously recorded in desktop search extent), nor was it confirmed present during field investigations.

EPBC listed migratory species are also considered special least concern under the NC Act. Three EPBC Act listed migratory birds were recorded in the Study Area, and an additional 11 migratory birds were considered likely to occur (refer to Sections3.2.7 and 3.2.8).

3.3.7 Protected areas

The following State listed protected areas occur within the vicinity of the Offsite footprint and have been described within the Carmichael Coal Mine and Rail Volume 4 Appendix N1 Mine Terrestrial Ecology Report:

- Bygana West Nature Refuge
- Epping Forest National Park (Scientific)

- Doongmabulla Springs Nature Refuge
- Bygana Nature Refuge
- East Top Nature Refuge
- Wilandspey Conservation Park

3.4 Regional matters of conservation significance

3.4.1 Burdekin Natural Resource Management region priority taxa

The Burdekin NRM 'Back on Track Actions for Biodiversity' report (the 'Back on Track report') (DERM, 2010a) identifies priority species in the Burdekin NRM region, details the regional threatening processes impacting upon these species, and proposes a range of actions to address regional threats. Priority taxa are identified through the DEHP Back on Track species prioritisation framework, in consultation with a range of stakeholders from the region. The document seeks to guide priority species conservation in the region over the next five years.

No flora species listed under the Back on Track priority taxa were confirmed present within the Study Area. One species, the waxy cabbage palm (*Livistonia languinosa*) 'may occur' within the Study Area. Two fauna species listed under the Back on Track priority taxa were confirmed present within the Study Area:

- Ornamental snake
- Black-throated finch (southern)

Another species, the yakka skink is considered likely to occur and two species, the red goshawk (*Erythriotriorchis radiatus*) and Australian painted snipe (*Rostratula australis*) 'may occur' (Appendix F).

4. Potential impacts and mitigation – construction phase

4.1 Introduction

This impact assessment has been structured to address impacts associated with the construction activities listed below. Full details about the construction phase of the Project are provided in the Project Description (refer to Volume 2, Section 2) of the EIS.

The construction phase of the Project (Offsite) will involve development of the following activities:

- Worker accommodation village and airport (126.8 ha)
- Industrial precinct and rail siding (964.8 ha)
- An off-stream storage and pump station near Belyando River (0.04 ha)
- 5 GL storage dam (51 ha)
- Moray-Carmichael Road (130.9 ha)

The locations of offsite infrastructure are presented in Figure 1.

In terms of construction activities that may impact on the environment, it is understood that:

- All water leaving construction areas will pass through a sediment control (if required) prior to discharge and/or reuse
- Water required for construction will be sourced from Belyando River flood harvesting
- Sanitation for construction crews will be treated to A standard and recycled onsite/removed from site for disposal at an authorised sewage treatment facility

The potential construction phase impacts on terrestrial and aquatic ecological values have been considered, and appropriate management and mitigation measures proposed, to ameliorate identified impacts, as set out below:

- Vegetation clearing
  - Loss of vegetation and fauna habitat (including loss of roosting, foraging and breeding areas)
  - Fauna mortality
  - Habitat fragmentation
  - Habitat degradation through erosion of topsoils, dust deposition on plants and water resources
- Loss of habitat and water resources for terrestrial species
- Loss of aquatic and riparian habitat
- Degradation of water quality and aquatic habitat
- Introduction or exacerbation of feral animal and weed species

  - Competition with native species, predation of native species, and habitat degradation (presence and prevalence of pest and weed species)
- Wildlife disturbance
  - Disturbance to breeding, roosting and foraging behaviours

4.2 Vegetation clearing

4.2.1 Overview

The majority (99.6 percent) of the Offsite footprint occurs in cleared areas of non-remnant vegetation. Approximately 7.2 ha of the Offsite footprint occurs in areas with remnant vegetation. Field studies within the Study Area indicated that cleared land had relatively low ecological value, and supported a lower diversity of flora and fauna species than more complex habitats associated with remnant vegetation. Cleared areas were generally lacking a suite of habitat resources that would support conservation significant values (i.e. threatened species, migratory species, TECs). However, one species, the ornamental snake, has the potential to occur in areas of non-remnant vegetation where cracking clay soil is present.

Notwithstanding the limited value of cleared land for many species, such areas do support some common plant and animal species, and, as such, clearing of land in these areas, and especially more complex areas of remnant vegetation, should be managed to minimise impacts to local flora and fauna. Such management should also seek to minimise impacts to adjacent and downstream habitats (i.e. waterbodies that may provide habitat for terrestrial fauna species including drinking resources for threatened species). Impacts that may occur as a result of land clearing during the construction phase include:

- Loss of vegetation and fauna habitat (including roosting, foraging and breeding areas)
- Fauna mortality
- Habitat fragmentation
- Erosion of surface soils

4.3 Vegetation clearing - loss of vegetation and fauna habitat

4.3.1 Overview

Loss of vegetation and associated fauna habitat is typically a substantial impact resulting from construction activities in greenfield sites. However, the direct loss of vegetation and associated fauna habitat is expected to be relatively minimal for the Project (Offsite). Environmental values have been considered in the site selection and layout of the Offsite footprint. The Offsite footprint occurs predominantly in areas of non-remnant vegetation that offer relatively low value for native fauna. Nevertheless, some loss of vegetation and habitat will be required.

4.3.2 Potential impacts

Remnant and non-remnant vegetation is proposed to be cleared during the Project construction phase. Approximately 7.2 ha of remnant vegetation and 1,151 ha of non-remnant vegetation is proposed to be cleared for construction of the Offsite footprint. Additional areas of officially mapped RE (36.9 ha) and non-remnant vegetation (78.7 ha) are mapped within the Moray-Carmichael Road corridor.

Regional ecosystems

The mapped remnant vegetation located within the Offsite footprint to be impacted by construction comprises a number of heterogeneous polygon REs within the Desert Uplands bioregion and the Brigalow Belt bioregion. REs located within the Study Area have been field verified. Construction of the Offsite footprint will involve the clearance of 7.2 ha of least concern RE. The proposed clearing extent of each RE within the Offsite footprint is provided in Table 16.

Table 16 REs impacted during construction of offsite infrastructure

RE	VM Act Status	Biodiversity Status	Short Description	Area of Impact
Desert Uplands				
10.3.6	Least concern	No concern at present	*Eucalyptus brownii* open woodland on alluvial plains	2.9 ha
10.3.28	Least concern	No concern at present	*Eucalyptus melanophloia* or *E. crebra* open woodland on sandy alluvial fans	1.3 ha
10.4.5	Least concern	Of concern	*Acacia cambagei* low woodland on Cainozoic lake beds	2.5 ha
10.5.5	Least concern	No concern at present	*Eucalyptus melanophloia* open woodland on sand plains	0.2 ha
Brigalow Belt				
11.3.25	Least concern	Of concern	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	0.16 ha
11.3.37	Least concern	No concern at present	*Eucalyptus coolabah* fringing woodland on alluvial plains	0.1 ha
Total remnant				7.2 ha
Non-remnant				1,151ha

Certified regional ecosystems in Moray-Carmichael Road footprint

An additional 36.9 of officially mapped RE occurs within the proposed footprint for upgrade works along Moray-Carmichael Road. This comprises:

- 1.6 ha of endangered REs
- 13.9 ha of of concern REs
- 21.5 ha of least concern REs
- 78.7 ha of non-remnant vegetation

This area was added to the Offsite footprint after surveys were completed. Consequently REs within the Moray-Carmichael Road footprint were not assessed in the field surveys. Further surveys are recommended to verify these REs and assess their BioCondition. Table 17 below provides a summary of the existing certified REs potentially impacted within that footprint.

Table 17 Certified REs within the Carmichael Road footprint

RE	VM Act Status	Biodiversity Status	Short Description	Area of Impact
Desert Uplands				
10.3.6	Least concern	No concern at present	*Eucalyptus brownii* open woodland on alluvial plains	0.1 ha
10.5.5	Least concern	No concern at present	*Eucalyptus melanophloia* open woodland on sand plains	0.1 ha
Brigalow Belt				
11.4.5	Of concern	Endangered	*Acacia argyrodendron* and scattered small trees including *A. argyrodendron, Terminalia oblongata, Owenia acidula, Lysiphyllum carroni* and *Eremophila mitchellii* on Caionozoic plains.	0.77 ha
11.4.9	Endangered	Endangered	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains	1.5 ha
11.3.1	Endangered	Endangered	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	0.1 ha
11.4.11	Of concern	Of concern	*Dichanthium sericeum, Astrebla spp*. and patchy *Acacia harpophylla, Eucalyptus coolabah* on Cainozoic clay plains	13.1 ha
11.3.3	Of concern	Of concern	*Eucalyptus coolabah* woodland on alluvial plains	0.1 ha
11.3.7	Least concern	Of concern	*Corymbia spp*. woodland on alluvial plains. Sandy soils	16.6 ha
11.3.10	Least concern	No concern at present	Eucalyptus brownii woodland on alluvial plains	3.8 ha
11.3.25	Least concern	Of concern	Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines	0.8 ha
11.3.37	Least concern	No concern at present	Eucalyptus coolabah fringing woodland on alluvial plains	0.1 ha
Total remnant				**36.9 ha**
Non-remnant				**78.7 ha**

High Value Regrowth

Approximately 0.02 ha of high value regrowth vegetation that is mapped within the Study Area will be impacted by clearing for the construction phase of the Project.

Terrestrial fauna habitat

Remnant vegetation to be cleared for construction of the Offsite footprint is categorised into the following four vegetation communities / fauna habitat types:

- 1,151 ha of non-remnant areas, lacking native vegetative cover
- 0.05 ha of previously cleared regrowth vegetation
- 4.35 ha of ironbark-box grassy woodlands and open woodlands on grey sand plains – within the Offsite footprint (airport)
- 2.5 ha of gidgee and/or brigalow shrubby woodland and low woodland, sometimes with Dawson's gum emergents, on clay and clay loam plains – within Offsite footprint (industrial precinct)
- 0.2 ha of open forest and woodland fringing watercourses and relict stream channels, and alluvial plains subject to flooding – within Offsite footprint (water supply infrastructure)

Clearing of remnant vegetation for the construction phase will result in the loss of areas of potentially suitable habitat for the following conservation significant species that have been confirmed present or are considered likely to occur within the Study Area:

- Black-throated finch (southern) (confirmed present at Study Area) – loss of approximately 2.5 ha of potential habitat within the Offsite footprint
- Squatter pigeon (southern) (confirmed present at Study Area) – loss of approximately 2.5 ha of potential habitat within the Offsite footprint
- Ornamental snake (confirmed present in the Study Area) – loss of approximately 313.8 ha of potential habitat within the Offsite footprint. This includes areas of low quality potential habitat within non-remnant vegetation that contain gilgais that represent suitable microhabitat for the species
- Koala (likely to occur in the Study Area) – loss of approximately 2.7 ha of potential habitat within the Offsite footprint
- Yakka skink (likely to occur at Study Area) – loss of approximately 2.5 ha of potential habitat within the Offsite footprint
- Little pied bat (likely to occur at Study Area) – loss of approximately 2.5 ha of potential habitat within the Offsite footprint
- Black-necked stork (confirmed present at Study Area) – no loss potential habitat within the Offsite footprint
- Cotton pygmy-goose (confirmed present at Study Area) – no loss of potential habitat within the Offsite footprint
- Brigalow scaly-foot (likely to occur at Study Area) – loss of approximately 3.6 ha of potential habitat within the Offsite footprint
- Square-tailed kite (likely to occur at Study Area) – no loss of potential habitat within the Offsite footprint
- Black-chinned honeyeater (likely to occur at Study Area) – no loss of potential habitat within the Offsite footprint

- Echidna (confirmed present at Study Area) – loss of approximately 2.5 ha of potential habitat within the Offsite footprint
- Rainbow bee-eater (likely to occur within the Study Area) – loss of approximately 285.9 ha of potential habitat within the Offsite footprint
- The eastern great egret and the white-bellied sea-eagle confirmed present at Study Area) and nine additional migratory species (considered likely to occur within the Study Area) have no potential habitat impacted by the clearing of vegetation for the Offsite footprint.

Potential habitat for two predominantly aerial migratory birds that are likely to occur exists within the construction phase footprint:

- Fork-tailed swift (likely to occur at Study Area) – loss of approximately 285.9 ha within the Offsite footprint
- White-throated needletail (likely to occur at Study Area) – loss of approximately 285.9 ha within the Offsite footprint

Assessment of the significance of impact on EPBC listed species has been undertaken and is presented in SEIS Appendix H Matters of National Environmental Significance.

Habitat loss for offsite infrastructure will occur predominantly in the construction phase. This will have localised impacts on an already fragmented landscape. The loss of riparian habitats associated with the construction of pump sites in the riparian zone of Belyando River will have highly localised impacts. Construction areas for water supply infrastructure, including laydown areas and stockpiles, will be located within the pipeline corridor, where possible, to minimise vegetation clearing related impacts. This habitat loss is unlikely to represent a major impediment to movement of terrestrial fauna along the riparian corridors along the affected waterway.

In addition to conservation significant species, these vegetation communities provide habitat features for a variety of common woodland bird, reptile and mammal species. These habitat types and vegetation communities are prevalent within the wider landscape.

Aquatic fauna habitat

Additionally, riparian vegetation and macrophytes provide protection for aquatic fauna (particularly fish and turtles) from predatory birds. The organic matter that is shed from riparian vegetation also provides an important food and habitat resource for a number of aquatic taxa. The riparian zone also has a well-recognised role in acting as a buffer between the terrestrial and aquatic environment. The removal of riparian vegetation typically results in increased sediment and nutrient loads in waterways as nutrient cycling patterns are disrupted, the sediments from adjacent lands are washed directly into waterways during rainfall events, and the bank integrity is diminished with the removal of stabilising vegetation, resulting in the scouring, erosion and increased sediment loads.

Clearing of non-remnant vegetation on previously cleared land will reduce the localised extent of habitat for some animals including a range of common ground-dwelling reptiles, macropods and cleared land birds. The reduction in the extent of this habitat is considered to be of negligible significance due to its prevalence in the wider landscape as well as its low habitat value and extensive modification. Nevertheless, clearing should be minimised to the areas required for

construction to minimise impacts on animals in this habitat, as well as to maintain a buffer between construction areas and areas of more significant habitat where possible.

4.3.3 Management and mitigation

Where land clearing is required during construction, the following management and mitigation measures are recommended:

- The extent of land clearing is to be restricted to the minimal amount necessary for the construction of the offsite infrastructure and wherever possible, existing cleared areas are to be utilised. Where infrastructure must cross watercourses, locations where riparian vegetation is already disturbed should be preferentially selected, or, if not possible, the construction footprint in these areas should be minimised and large habitat trees should be retained
- The extent of vegetation clearing must be clearly identified on construction plans and in the field. Areas that must not be cleared or damaged are to also be clearly identified on construction plans and in the field. Clearing extents are to be communicated to construction supervisors
- Pre-clearance surveys will be undertaken in areas identified as potential habitat for threatened species, prior to commencement of clearing. In areas where these surveys indicate the presence of habitat features observed to (or with the potential to) provide habitat for these species, a fauna-spotter catcher will be engaged to accompany clearing crews
- Any additional construction areas, such as site offices, construction stockpile locations, machinery/equipment laydown areas and storages are to be located where possible within existing cleared or disturbed areas
- As soon as possible after cleared areas such as laydown areas and site offices are no longer required, rehabilitation will commence. This rehabilitation will involve vegetating disturbed areas to a state consistent with the adjacent landscape, in consideration of limitations associated with buffers relating to fire management. As these temporary construction disturbance areas will be sited in existing cleared areas (i.e. pasture), rehabilitation will involve revegetating using species that characterise the surrounding pasture
- Unavoidable loss of vegetation and fauna habitat will be offset in accordance with relevant Queensland and Commonwealth policies, as detailed in the Project Offset Strategy. As some vegetation loss will be off-lease, offsetting requirements under the VM Act will be triggered

4.3.4 Summary

Clearing of land during the construction phase of the Project is proposed to result in a loss of approximately 7.2 ha of field verified remnant vegetation and approximately 1,151ha of non-remnant vegetation. Additional areas of officially mapped RE (36.9 ha) and non-remnant vegetation (78.7 ha) are mapped within the Moray-Carmichael Road corridor. Most areas of non-remnant vegetation will have only low habitat value for native fauna. The loss of these areas is unlikely to have a significant impact on native fauna diversity. Approximately 313.8 ha

of RE and non-remnant vegetation represents potentially suitable (albeit low quality) habitat for the ornamental snake. These areas occur in association with cracking clay soils and gilgais.

4.4 Vegetation clearing – fauna mortality

4.4.1 Overview

Vegetation clearing for the Project (Offsite) has the potential to cause direct mortality of native fauna, either through direct collision with clearing machinery or through entrapment in construction areas. This can impact both terrestrial and aquatic fauna. The risks of causing fauna mortality have been minimised by predominantly locating the Offsite footprint within areas of non-remnant vegetation.

4.4.2 Potential impacts

Vehicles and machinery used to undertake land clearing have the potential to lead to direct mortality of terrestrial fauna in the event that individuals are struck. Those animals that are unable to disperse away from areas under active clearing are also particularly susceptible to injury or death. This includes amphibians, reptiles, small ground-dwelling mammals, arboreal mammals and nocturnal species that are inactive during daylight hours. Other potential causes of mortality include animals becoming trapped in excavations, and carrion eaters (some raptors) being struck when feeding on road kill.

Construction within riparian zones may also result in both direct and indirect mortality of aquatic fauna. For example, direct mortality will occur in the event that an individual is struck by machinery or a falling object.

Indirect mortality may occur in the event that a waterway is drained or diverted, or if there are significant and sudden changes in water quality and fish and other aquatic animals are unable to escape. Vegetation within and alongside waterways provides protection from sun, heat and wind. The removal of the riparian zone will reduce shading over the waterway. This will potentially result in an increase in surface water temperatures, a subsequent reduction in dissolved oxygen (as warmer water has reduced oxygen holding capacity) and death of aquatic biota due to hypoxic conditions.

Fauna mortality will result in a local reduction in the abundance of some less mobile species. Species present in the habitat types that will be affected by construction phase activities, including those that will be cleared, are predominantly common, widespread species, with potential for a small number of conservation significant species to also utilise these habitats. Given the landscape context in which the Project occurs, and in particular, the availability of similar habitat types in the local region, this loss is not considered likely to adversely affect the biodiversity values of this landscape.

The management and mitigation measures outlined below will seek to reduce fauna mortality to the greatest extent possible.

4.4.3 Management and mitigation

Management and mitigation measures to reduce the potential for fauna mortality as a result of land clearing activities include:

- Pre-clearance surveys will be undertaken in areas identified as potential habitat for threatened species, prior to commencement of clearing. In areas where these surveys indicate the presence of habitat features observed to (or with the potential to) provide habitat for these species, a fauna-spotter catcher will be engaged to accompany clearing crews. Pre-demarcated habitat features identified during the pre-clearance survey will be thoroughly checked by the fauna spotter-catcher prior to clearing. Provision for the relocation of fauna will be made prior to the commencement of clearing
- To avoid potential mortality of aquatic fauna during construction within riparian zones and within the bed and banks of ephemeral creeks, construction activities will ideally be undertaken during dry or controlled conditions. Timing of construction in and adjacent to watercourses during dry conditions will assist in minimising potential indirect impacts to aquatic ecosystems at construction sites and downstream
- Vegetation clearing will be undertaken in a sequential manner to allow more mobile fauna species the opportunity to disperse away from clearing areas
- Procedures in the event that an animal is injured will be developed. Given the distance to the nearest veterinary practitioner, this will most likely involve euthanasia so as to avoid unnecessary suffering. Adani will have a suitably authorised and trained practitioner present on site to assess, and where necessary, euthanize injured animals
- Vehicles will be required to stay on pre-determined routes
- All vehicles and plant will adhere to site rules relating to speed limits. Speed limits will be clearly signposted so as to minimise the potential for road kill
- Any road kill will be dragged to the edge of the road immediately and subsequently removed as quickly as practicable to reduce potential for scavengers to be struck
- Where practical, temporary fencing will be erected around excavations to exclude mobile animals from vegetation clearing areas
- Work areas will be checked for fauna that may have become trapped before work commences each day
- In instances where an animal has entered active construction areas, the site Environmental Manager will be immediately informed. An assessment of whether the animal is at risk of harm and/or poses a threat to construction personnel will be made by the Environmental Manager (or their delegate). Where possible, the animal will be encouraged to disperse out of/away from the construction area. Where the animal is not able to disperse away, a professional fauna spotter-catcher will be engaged
- If any pits/trenches are to remain open after daily site works have been completed, they will be securely covered by an impenetrable barrier, if possible, or fauna ramps (e.g. log ramps or wooden planks) will be put in place to provide a potential means of escape for trapped fauna
- Site inductions are to include education regarding the local fauna of the site and protocols to be implemented if fauna are encountered

4.4.4 Summary

Fauna mortality may occur during the construction phase; however, given the habitat types that will be affected and its availability in the surrounding landscape, this localised loss of animals is not considered to represent an adverse impact to the region's biodiversity values. Direct mortality of fauna, and in particular conservation significant species, during the construction phase of the Project, is expected to be reduced should the protocols outlined above be implemented.

4.5 Vegetation clearing - habitat fragmentation

4.5.1 Overview

Fragmentation of native habitats can have adverse impacts on native fauna by stranding wildlife within isolated remnants of habitat and restricting their access to resources. However, since the Project (Offsite) occurs in an environment that has already been highly fragmented, most animals that occur are already tolerant of fragmentation and are unlikely to be impacted by loss of large areas of non-remnant vegetation.

4.5.2 Potential impacts

The Offsite footprint is located in an extensively fragmented landscape. Vegetation clearing may reduce the capacity for less mobile fauna to move between habitats (including between areas of non-remnant vegetation). This is particularly relevant for small, ground-dwelling fauna such as amphibians, reptiles and small mammals. Given that the construction of these facilities will occur in discrete footprints, and not represent a lengthy (linear) barrier between habitats, it is not considered likely that fauna movement at a landscape (regional) scale will be significantly affected.

4.5.3 Management and mitigation

Management and mitigation measures to reduce the impact of habitat fragmentation to local fauna populations include:

- Landscape permeability will be retained where possible. Where fencing is required around cleared areas, it will be designed such that fauna can move through it (excluding those instances where fenced areas seek to protect fauna from threats such as trenches). Consideration will be given to avoiding the use of barbed wire on the top strand of wire fences
- Vegetation clearing will be undertaken in a sequential manner to allow more mobile fauna species the opportunity to disperse away from clearing areas

4.5.4 Summary

Habitat fragmentation associated with construction of offsite infrastructure will be localised and will largely affect common animals that utilise this modified habitat. The area is already fragmented as a result of historic land clearing associated with the current land use of cattle grazing.

4.6 Vegetation clearing - habitat degradation

4.6.1 Overview

Construction activities have the potential to degrade adjacent habitats through exposure to dust, run-off and sedimentation. These impacts can be particularly damaging following rainfall, when sedimentation and erosion are exacerbated.

4.6.2 Potential impacts

Vegetation clearing has the potential to facilitate erosion (water and wind). This can have a localised impact on species and habitat suitability by reducing the quality and abundance of refuges, microhabitats and food availability through the smothering of native vegetation with sediment.

Earthworks will result in dust emissions. Excessive dust settling on vegetation could also suppress vegetation growth by limiting the photosynthesis potential of plants in close proximity to the construction area (Nanos and Ilias, 2007). Plants with dust on leaves may also be less palatable as a food source for animals. Dust deposition associated with earthwork activities will generally occur relatively close to areas of disturbance and hence, plants within 50 m – 100 m of construction activities may be affected by dust. As construction activities are temporary, effects will be short lived, and rainfall will generally remove dust from plants. Dust suppression will be used to control dust and this will reduce the extent of vegetation affected by dust.

Dust can settle within the waterways or in the terrestrial environments, where runoff can mobilise settled dust to waterways. Indirect deposition in waterways can occur when dust settles in the terrestrial environment. During precipitation events, the associated runoff transports dust from the terrestrial environment into nearby waterways. Dust generated during the construction phase, has the potential to have a negative impact on the water quality of North, Obungeena and Eight Mile Creeks and Pear Gully.

Given that, in many cases, the construction phase activities will occur in a local landscape that has already been fragmented and disturbed, edge effects are not expected to significantly detract from the value of habitats characterised by remnant vegetation that will be cleared.

Where vegetation clearing occurs on floodplains and near drainage lines, erosion may affect water quality, cause sedimentation of waterways, potentially degrading downstream aquatic and riparian habitats (see GHD, 2012b).

4.6.3 Management and mitigation

Management of erosion and sedimentation in and adjacent to cleared areas will be undertaken in accordance with erosion and sediment controls set out in the Mine Environmental Management Plan (EMP) and EMP (Offsite infrastructure) (GHD 2012c; GHD 2012d)). This plan will identify all practices to be implemented prior to, during, and post-construction. The management approach to erosion and sediment control actions will include:

- Diversion of clean stormwater around disturbed areas, with scour protection as required to address any associated modifications in drainage paths
- Drainage , erodion and sediment controls, in particular in areas near earthworks, watercourses and key stormwater flow paths, will be installed and maintained

- All soil or mulch stockpiles will be located away from watercourses and key stormwater flow paths to limit potential for transport of these substances into the watercourses via runoff
- Design of stockpiles will consider soil properties to ensure side-slope stability and minimise susceptibility to failure due to erosion risk
- Dust suppression activities will be undertaken where appropriate and managed in accordance with the recommendations outlined in the Mine Air Quality Report (GHD, 2012e)
- Areas will be stabilised as soon as practicable after disturbance
- Stormwater control works to be installed as soon as practicable in the construction of onsite and offsite infrastructure

Further details relating to the management of erosion is presented in the Mine Land Chapter (EIS Volume 2, Chapter 4). Further details relating to management of dust is presented in the Mine Air Quality Report (EIS Volume 4, Appendix S).

4.6.4 Summary

Controls are available for management of erosion and dust and these will be implemented at all stages of the construction phase. Given the suite of management actions that will be undertaken, the impacts of erosion on vegetation and fauna habitats within, adjacent to and downstream of the footprints of the construction phase infrastructure, are expected to be low.

4.7 Loss of habitat and water resources for terrestrial species

4.7.1 Overview

Watercourses represent areas of high ecological value for native terrestrial fauna. Watercourses are typically vulnerable to impact from construction related activities, particularly run-off and sedimentation. However, wherever possible, aquatic habitats have been avoided in the location of Offsite footprint.

4.7.2 Potential impacts

Aquatic environmental values have been considered in the site selection and design of water supply for offsite infrastructure. As such, most aquatic and riparian habitats, including existing farm dams will not be directly impacted. However, construction phase activities may result in indirect and temporary impacts on aquatic systems. Disruption to aquatic habitats has the potential to impact terrestrial ecological values through the localised reduction in availability and quality of drinking resources and foraging habitat, and potentially changes to riparian habitats in downstream watercourses due to changes in water quality and flow regimes. In particular, impacts realised from disturbance of water resources may include:

- Change in/loss of aquatic habitat utilised by terrestrial species – specifically waterbirds and species using waterbodies as a drinking resource
- Degradation/alteration of water quality resulting in in-situ and downstream impacts to riparian habitats (refer to Mine Water Quality Report (EIS Volume 4, Appendix Q))

- Loss or reduction of the riparian zone, reducing habitat for birds and restricting fauna movement

4.7.3 Management and mitigation

Where unavoidable loss of the riparian zone for the construction phase will occur, erosion and sediment control measures will be implemented. The design and layout of the offsite water supply infrastructure will minimise the width of disturbance to the riparian zone. Sensitive areas in the vicinity of all construction will be clearly demarcated prior to construction to avoid accidental clearing or disturbance. A suitably qualified ecologist will be required to provide advice on the location of sensitive areas for demarcation.

These measures will be incorporated into the Mine and Offsite EMPs to be prepared prior to any construction at the site. The management and mitigation of the potential impacts related to erosion and sediment transport are described in Section4.6.3.

Mitigation strategies will include:

- Duration of in-stream works to be minimised through prior planning such that all equipment and materials are available to allow works to be completed as quickly as possible
- Sediment control measures to be installed where in-stream disturbance must be undertaken during flow conditions.
- Minimisation of disturbance area within streams and riparian areas. Equipment parking and laydown areas will be located outside these areas. The area of disturbance within streams and riparian zones will be the minimum area required for safe working and the area of disturbance for infrastructure installation clearly marked
- Prompt stabilisation of disturbed areas to prevent flow-related scouring of bed and banks of stream. Stabilisation is to use “soft” engineering solutions rather than concrete or similar

4.7.4 Summary

Impacts on aquatic habitats have been minimised through careful site selection for the Offsite footprint. Enforcement of erosion and sediment controls and other management measures within the Project EMP (GHD, 2012d) will minimise impact on aquatic habitats.

4.8 Loss of aquatic and riparian habitat

4.8.1 Overview

Wherever possible, the water supply for offsite infrastructure has avoided areas of riparian habitat, referrable wetlands and gilgais. A key source of water supply to the mine will be a flood water harvester on the Belyando River. The extraction system will pump water from the river into an off-site storage then supply water to the mine via a trunk main pipeline within the Project (Rail) corridor. Opportunities to reduce impact on riparian habitats have been found in the detailed design phase.

Potential impacts arising from construction activities on aquatic ecology values are discussed in the EIS Mine Aquatic Ecology Report (GHD, 2012b).

4.8.2 Potential impacts

Construction of the pump station in the riparian zone of Belyando River will have localised impacts on aquatic and riparian habitat. Construction of the offsite water supply infrastructure will result in temporary disturbance of aquatic habitats, including barriers to flow, temporary diversions, the disconnection of the floodplain and changes to surface flows.

Barriers to flow

A loss of connectivity can result from decreasing water quality. If the hydrology and geomorphology of the stream bed is not restored to previous conditions there is potential for localised internal ponding to develop with subsequent changes in water quality. Ponding of flowing waterbodies creates favourable conditions for algal growth and settling of sediments.

Temporary diversions

Should construction occur during wet periods it has the potential to present a barrier to hydrologic connectivity between areas upstream and downstream of the construction. This has the potential to change freshwater flow paths and consequently velocities depending on the location of the barrier.

Floodplain connectivity

The construction of the industrial precinct, airport, workers accommodation and linear infrastrature may also cause the floodplain to become disconnected from the waterways. The ability of biota, water and materials to move from one distinct ecosystem to another, for example from a floodplain to a river, is referred to as lateral connectivity (DEHP, 2012). The duration and timing of periods of lateral connection can be very important to allow opportunities for spawning, dispersal and migration. Species that migrate between ecosystems as part of their life cycles, such as diadromous fish, are particularly susceptible to a loss of lateral connectivity. This lateral connectivity also promotes the flow of genes between otherwise disconnected populations. For example, an aquatic community living in an off-channel farm dam may depend on seasonal connectivity to the floodplain for both the augmentation of surface waters, and for gene flow to maintain the existing genetic diversity. When a community becomes isolated, losses in genetic diversity may occur, and subsequently the community may not be able to adapt to environmental or biological challenges (Allendorf, 1983).

The lateral connectivity between a floodplain and a river largely determines the ability of organic and inorganic matter, aquatic flora and fauna and water to move between ecosystems (DEHP, 2012). Aquatic fauna can be highly reliant on the seasonal connectivity to floodplains for the purposes of feeding and breeding, but also in seeking refuge from fast flows (Bayley 1995; Humphries et al*.,* 1999; King et al*.,* 2003). In Australia, many fish species will move out onto the inundated, highly productive floodplains, even if the periods of inundation are short, unpredictable and infrequent (Humphries et al*.,* 1999; King et al*.*, 2003; Arthington et al*.,* 2005).

Surface flows and geomorphology

The construction phase will result in a change to the current open grazing land with relatively permeable soils to compacted developed areas within the offsite infrastructure footprint. The

resultant land use will have a relatively increased potential for runoff of rainfall to occur as the permeability of the soils is reduced within the offsite infrastructure footprint. As discussed in GHD 2012f, given the relatively small area of the catchment to be disturbed, it is unlikely that this increase in catchment permeability will substantially change runoff flow volume to the downstream catchment. Minor changes to topography will also occur as a result of construction which in turn may mean that flow paths change. Again, the magnitude of change in the context of the catchment is unlikely to result in any significant changes to stream flows.

Riparian habitat

The riparian zone of the Belyando River is characterised by a relatively consistent corridor of open forest and woodland dominated by *Eucalyptus coolabah* (coolabah) and *E. camaldulensis* (river red gum) canopy trees.

Disturbance of riparian vegetation has the potential to lead to increased erosion and sediment transport to downstream habitats during flood and high flow runoff periods, which can impact on water quality. The removal of a section of the riparian zone also exposes adjacent riparian communities to weed invasion. Discussion on the impacts of weed and pest species is in Section 4.10.

Removal of riparian habitat and the disturbance of the stream bed will potentially impact of North and Obungeena Creeks. North Creek and Obungeena Creek are ephemeral second order creek systems that play an important role in providing seasonal connectivity for aquatic fauna upstream and downstream in times of flow. This connectivity is important in maintaining gene flow and genetic diversity between periodically isolated populations. Additionally, these connecting waterways provide for recolonisation and/or population supplementation in the event of a population extinction or bottleneck.

Construction areas for water supply infrastructure, including laydown areas and stockpiles will be located within the pipeline corridor, where possible to minimise vegetation clearing related impacts.

4.8.3 Management and mitigation

As outlined in Section 4.7.2, the design and layout of water supply for offsite infrastructure has considered areas of aquatic environmental value. Wherever possible, direct construction impacts on aquatic and riparian habitat have been avoided. Where construction is required, mitigation strategies will be based on compliance with the DEHP Guidelines for carrying out activities in a watercourse, lake or spring associated with a resource activity or mining operation, and will be undertaken in accordance with requirements for development approvals.

Mitigation strategies will include:

- Duration of in-stream works to be minimised through prior planning such that all equipment and materials are available to allow works to be completed as quickly as possible
- Erosion and sediment control measures to be installed where in-stream disturbance must be undertaken during flow conditions.
- Minimisation of disturbance area within streams and riparian areas. Equipment parking and laydown areas will be located outside these areas. The area of disturbance within

streams and riparian zones will be the minimum area required for safe working and the area of disturbance for infrastructure installation clearly marked

- Prompt stabilisation of disturbed areas to prevent flow-related scouring of bed and banks of stream. Stabilisation is to use “soft” engineering solutions rather than concrete or similar

An application under the *Fisheries Act 1994* will be required where construction occurs in a waterway.

Post construction, the removal of any temporary barriers is required to reinstate full passage for fish, and the waterway bed and banks must be returned to their original profile and stability so that long-term fish passage at the site is not compromised.

If temporary in-stream barriers are used during construction, they may require a development approval. Adani will install temporary waterway barrier works in accordance with the Code for Self Assessable Development – Temporary Waterway Barrier Works (April 2013) (DAFF, 2013).

In order to ensure the continued lateral connectivity between the floodplain and the waterways construction should be outside the floodplain area where possible. Wherever possible, the natural drainage pathways and connectivity with the floodplain needs to be maintained.

4.8.4 Summary

No aquatic habitat will be permanently lost as a result of the workers accommodation village or industrial precinct and airport. Impacts to aquatic habitat as a result of offsite water supply infrastructure may be temporary or permanent in nature depending on the design and construction method.

Removal of riparian vegetation has the potential to lead to degradation of aquatic habitats. By minimising the disturbance width required for the construction of offsite water supply infrastructure, implementing erosion and sediment control measures and weed management measures, any impact to riparian vegetation and aquatic habitats from activities in the riparian zone will be reduced.

4.9 Degradation of water quality and aquatic habitat

4.9.1 Overview

Material, whether it is sediment or other contaminants (including nutrients and metals), has the potential to mobilise directly into the waterways via runoff. Vegetation clearing has the potential to expose surfaces to runoff and erosion. By locating the Offsite footprint away from natural watercourses and aquatic habitats, this impact has been reduced. Nevertheless, the construction activities occur in an environment that can be subject to heavy flooding with high potential for runoff.

4.9.2 Potential impact

Any areas receiving runoff flows from areas of land cleared for the workers accommodation village, industrial precinct and airport are likely to be impacted.

Physical changes in water quality have the potential to reduce the suitability of the aquatic environment for some aquatic flora and fauna species. The surface water quality of the Study

Area is described in the Mine Water Quality Report (GHD, 2012g). The main sources of water quality changes are related to the mobilisation of sediments and pollutants.

In aquatic ecosystems, increased suspended sediment loads can reduce light penetration, clog fish and invertebrate gills, decrease water temperature, lead to a reduction in dissolved oxygen concentrations and introduce sediment-bound contaminants into the water (Dunlop et al. 2005). Increased turbidity can also reduce photosynthesis in submerged macrophytes and benthic and planktonic algae. Increased sediment loads can also reduce the capture rates of visual predators (*e.g.* raptors and fish) that rely on their prey being visible. When sediment settles out it may bury habitat and smother sedentary organisms.

Sediment load is also likely to increase around roads and other hard surfaces. These impacts will be largely managed through appropriate sediment and erosion controls during construction phases, including the use of sediment ponds.

Land clearing at the workers accommodation village, industrial precinct and airport will result in a local increase in exposed earth surfaces. The source of most suspended particulates (and in turn increase in turbidity), nutrients and other contaminants attached to particulates in waterways is mobilisation of soils through surface runoff, stream bank erosion and dust. Although construction activities within or adjacent to watercourses for the offsite water supply infrastructure will disturb bed and bank substrates, considering the local topography and distance to waterways from these facilities, erosion ans sedimentation is a low risk.

Turbidity in disturbed catchments is closely connected with rainfall and surface runoff with spikes in turbidity typically occurring after rain events, and then reduced turbidity levels as flows reduce and sediment is able to settle. The surface water quality assessment for the project identified that turbidity results were recorded above the nominated water quality objectives (WQO) on a number of occasions (GHD, 2012g). Although aquatic ecosystems in highly ephemeral systems are likely to be adapted to peaks in high turbidity during some periods, an increase in the magnitude or the frequency of these peaks of turbidity has the potential to have a detrimental effect on aquatic ecosystems.

Sediment movement can also mobilise nutrients and pollutants to aquatic habitats. Soils from the exposed areas, and potential pollutants, will be readily mobilised into local drainage lines and waterbodies via erosion processes. The potential for mobilisation of soils and potential pollutants will be maximised after rain events and during high winds. Nutrient pollution has the potential to impact upon a system via the stimulation of growth of nuisance plants and cyanobacteria (ANZECC and ARMCANZ, 2000). Growth of these plants can lead to changes in the biological community composition as well as flow on affects to habitat suitability and aspects of water quality such as dissolved oxygen concentration which can impact upon aquatic fauna communities.

Within the Study Area concentrations of nutrients were generally higher in the still waterbodies than in the Carmichael River. In the Carmichael River nutrient water quality sampling results were also detected to be linked to rainfall and surface runoff. Nutrient concentrations recorded higher (above WQOs) at the end of the wet season followed by a decrease during drier months and a gradual increase back to values above WQOs in September when wet season conditions begin. As with turbidity, aquatic ecosystems are adaptive to the existing seasonal variation in nutrients however increases in magnitude and frequency of peaks in this variable may have the potential to adversely impact ecosystems.

Oils, fuel, lubricants and other substances containing chemicals will be required to operate construction machinery. Accidental spills or leaks anywhere within the catchment, including within the workers accommodation village, industrial precinct and airport have the potential to result in contaminants being transported to the aquatic environment via rainfall runoff. Commonly used substances contain elements that, at high concentrations, can be toxic to aquatic organisms.

If introduced, these compounds can result in both short- and long-term degradation of water quality. Any introduction of contaminants has the potential to influence both the local surface water quality at the point source as well as downstream.

4.9.3 Management and mitigation

Potential impacts on aquatic habitats as a result of land based activities such as clearing, can be largely avoided or mitigated through the implementation of construction specific management measures.

Mitigation measures detailed in the Mine and Offsite EMPs, include erosion and sediment control requirements to be implemented and monitored throughout the construction phase of the Project.

To limit the degradation of downstream aquatic habitat during construction activities, mitigation and management will focus on reducing the potential mobilisation of sediments or pollutants, diversion of stormwater flows from disturbed areas and limiting sediment transport from exposed areas.

Controlling site runoff from all areas disturbed during construction and minimising bank disturbance will be important in limiting the degradation of habitats downstream of the construction footprints. The management and mitigation of the mobilisation of sediment and pollutants during construction is described in GHD 2012g and these measures will assist in limiting the degradation of aquatic habitats. The measures identified include (but are not limited to):

- Avoiding clearing of vegetation and major earthworks during overland flow events
- Installing stormwater diversion and collection systems as early as possible in the construction period
- Developing and implementing erosion and sediment control plans. Further details on erosion and sediment control are provided in the Mine and Offsite EMPs
- Maximising retention of surface cover by clearly delineating clearing areas and restricting activities to these areas
- Locating soil or mulch stockpiles away from watercourses and key stormwater flow paths to limit potential for transport of these substances into the watercourses via runoff
- Dust suppression activities to be undertaken where appropriate. Stabilisation of disturbed areas as soon as practicable after disturbance
- Wherever possible, staging the clearing of vegetation as construction progresses and minimising the disturbance footprint at all times
- Undertaking revegetation according to Rehabilitation Plan requirements

- Development of emergency response protocols and procedures for implementation in the event of a contaminant spill or leak and provision of spill response equipment
- Storage of fuels, chemicals, wastes and other potentially environmentally hazardous substances in bunded or otherwise contained areas away from watercourses
- Refuelling and in areas away from watercourses
- Regularly checking vehicles and equipment for oil leaks

The design of the workers accommodation village, industrial precinct and airport will incorporate stormwater management infrastructure and mechanisms to manage runoff. This may include holding tanks and/or gross pollutant traps (GPT) or other stormwater management techniques. Stormwater management mechanisms and monitoring requirements will be developed prior to any construction activities and incorporated in the Mine and Offsite EMPs.

Monitoring will include:

- Regular checks of fuel, chemical and waste storage areas for leaks or improper storage
- Regular checks, including checks prior to forecast rain events, of erosion and sediment control devices to make sure these are in good working order
- Pre-rain checks of erosion and sediment control devices
- Inspections of streams for scouring and sediment deposition
- Ongoing water quality monitoring (refer GHD 2012g; GHD 2012h)

4.9.4 Summary

Construction activities have the potential to impact aquatic habitats by changing both chemical and physical characteristics of the water quality and aquatic habitats within and downstream of the construction footprints. Potential impacts are relatively minor given both the scale of disturbance in the context of the catchments, and the relatively low aquatic ecosystem and habitat values present. It is unlikely there will be a change in runoff flow volume such that it may impact aquatic habitats and with management of the potential impacts on impact to water quality, the impact to aquatic habitats can be limited. During the construction period it is expected that the aquatic ecology impacts associated with offsite water supply infrastructure will be localised and temporary.

Impacts can be effectively managed through the implementation of management measures to minimise erosion and prevent the mobilisation and transport of sediments and to prevent other potential water quality contaminants that may arise from spills and leaks of fuel and chemicals.

Additionally, design measures have been adopted to condense and minimise the footprint of disturbance in the riparian zones.

Monitoring requirements will be included in the Offsite EMP for both effectiveness of the management measures and the water quality conditions.

4.10 EIS, Introduction and proliferation of weeds and feral species

4.10.1 Overview

Pest and feral species may disrupt ecosystems by outcompeting and replacing native species and increasing predation pressures, thus altering ecosystem diversity and potentially disrupting ecosystem function. A total of 28 introduced flora taxa were recorded from the Study Area, four of which are declared as WoNS and declared weeds under the LP Act. Six introduced fauna species comprising five mammals and one amphibian were also recorded during field studies.

4.10.2 Potential impacts

Terrestrial pests and weeds

Food waste produced by human settlements may provide additional resources for feral animals such as pigs, rats, mice, cats and dogs. These animals, confirmed present within the Study Area, may increase in abundance if food and water become more accessible. An increase in pest fauna species may lead to increased competition for resources, increased predation and increased habitat degradation (eg. erosion caused by rabbits and damage to riparian areas by pigs). There is also potential for pest animals such as ants to be introduced to sites through importation of vehicles, equipment, soils and similar media.

Increased movement of people, vehicles, machinery, vegetation waste and soil may facilitate the spread of weeds at and near the Study Area. Despite the fact that 28 introduced plant species were recorded, weeds were not abundant across much of the Study Area. Increasing the prevalence of weeds at the Study Area (and potentially beyond to the surrounding landscape), may reduce the quality of habitats for some flora and fauna species, particularly by replacing native plants.

Most weeds typically have the capacity for rapid seed germination and plant growth. Soil disturbance associated with construction earthworks can allow seeds present in soil to germinate. Germination and plant growth for weeds is typically faster than for native species and this can lead to increased weed levels in disturbed areas and affect the ability for native vegetation to re-establish.

There is also significant potential for weeds, either as seeds or other plant propagules, to be introduced to sites attached to dirty vehicles and equipment or to be contained in soil or seed mixes brought to the site. This can lead to increased levels of weeds already present on the site, or infestation by new weeds. Areas particularly susceptible to weed and pest outbreaks include roadside verges and riparian habitats.

Aquatic pests and weeds

Terrestrial weeds can invade riparian zones and aquatic habitats, whereby reducing aquatic habitat quality, diversity and availability. Pest animals, such as pigs, can have detrimental effects to watercourses by rooting ‘ploughs’ up to 20 m around a water body (DEEDI, 2010). As an omnivorous animal, pigs will also consume aquatic fauna (*e.g.* freshwater mussels and crayfish) and aquatic flora within and adjacent to waterways. Additional impacts occur as a result of wallowing in surface water and mud, as pigs disturb the benthic zone (and benthos), suspend sediments and introduce nutrients to the water (through urination and defecation). This

disturbance can lead to degradation of downstream water quality and habitat for aquatic species by creating erosion (DEEDI, 2010) destroying in-stream habitat and allowing opportunity for weed establishment rather than native riparian communities.

A number of pest fish species occur within the Burdekin basin. Although no aquatic pest species were recorded within the Study Area, the disturbance caused by construction activities makes local aquatic habitats susceptible to aquatic pest invasion. Aquatic pest species often flourish in disturbed habitats and in the event species are introduced (via translocation or stocking) have the potential to become prevalent closer to the Study Area. The introduction of these species can adversely impact native fish communities through direct competition for resources (food and habitat), predation, habitat alteration and the introduction of diseases or parasites (DEEDI, 2011).

Aquatic weeds can also affect native communities by shading out native plants, reducing the quality of habitat for aquatic fauna communities and degrading water quality (DERM, 2011). Both weed and pest fauna species can be introduced when the numbers of people are visiting the area is increased. Weeds and weed seeds can be introduced in material (e.g. earth fill), water for water supply and vehicle (e.g. water trucks) vectors brought to the site during construction.

4.10.3 Management and mitigation

Pest and feral species spread, and the potential for introduction of new feral species, will require management during the construction phase of the Project. An integrated suite of actions should be developed to manage pest species, including:

- Waste management measures incorporated into EMPs should include containment of food scraps in securely sealed containers
- Vegetation and soil waste should not be moved to areas of lower weed infestation
- Pest animal occurrence will be monitored during construction. If increased densities of pest animals are observed, or new pest animals are identified, humane pest controls will be implemented to manage numbers
- Weed mapping will be undertaken prior to commencement of construction. Mapping will cover the whole site but be particularly focused at high risk locations, such as areas of black soil so that weed hotspots can be identified. Baseline field surveys of identified hotspots within and near construction areas will be undertaken prior to commencement of construction. Weed control will be undertaken in areas that are very heavily infested or where WoNS or Class 1 or 2 weeds declared under the LP Act are present prior to disturbance
- Weed levels will be monitored in areas adjacent to construction activities and any areas that are rehabilitated after construction. Monitoring will be undertaken annually during construction, with results to be considered in terms of baseline information (collected prior to construction) and with reference to appropriate control (reference) sites. If significant infestations of any weeds occur, or if WoNS or Class 1 or 2 weeds declared under the LP Act, weed control measures will be implemented. Weed control measures will be based on Queensland Department of Agriculture, Forestry and Fisheries and Isaac Regional Council advice. Ongoing monitoring of weed infestation associated with construction activities will occur through the operational weed management program

- All vehicles, equipment and materials brought onto site will be certified as free of weeds and weed seeds and carry a weed hygiene declaration. Records are to be kept of compliance with this requirement. Adani will install a weed wash down facility that is readily accessible for regular weed wash down of plant and machinery.
- Soil stripped and stockpiled from areas containing known weed infestations will be stored separately and are not to be moved to areas free of weeds
- Construction staff will not bring domestic animals to the Project Area

4.10.4 Summary

Implementation of the proposed mitigation strategies will minimise the potential for pest plants and animals to increase in abundance at and near the Project Area or for new pest plants and animals to be introduced. Regular, standardised monitoring is proposed to be a core component of the successful implementation of these measures, with weed or pest control to be undertaken at the earliest opportunity if monitoring reveals a new pest plant or animal introduction or a significant increase in abundance.

4.11 Wildlife disturbance

4.11.1 Overview

Habitat degradation and behavioural disruption may arise as a result of increased vehicular activity and a change in disturbance types at the Project Area. Habitat degradation and associated behavioural disruption may result from increased dust mobilisation and increased exposure to noise, light and vibration.

4.11.2 Potential impacts

Construction activity at and near the construction zone associated with the Offsite footprint may disrupt local fauna roosting, breeding and foraging activities, largely as a result of increased exposure to light, noise, dust, vehicles and people. Animals may also become more vulnerable to predation, because of increased light making it easier for predators to locate prey or noise levels making it harder for prey to detect approaching predators.

There is limited native habitat (i.e. remnant vegetation) in and around construction areas for native animals, and most animals occurring in the Offsite footprint construction zones are common and generally tolerant to some disturbance. Furthermore, threatened species such as the black-throated finch (southern) and squatter pigeon (southern) are known to inhabit areas exposed to anthropogenic disturbance (peri-urban Townsville including directly adjacent to military training areas in the case of the former; numerous towns in central Queensland for the latter). Animals may exhibit initial fright behaviour, and will either adapt to the disturbance levels, or move away from the areas of activity into similar habitat that is extensively available in the adjacent landscape. Breeding activity is less likely to be associated with non-remnant vegetation; however, remnant areas will need to be checked as part of pre-clearing surveys.

4.11.3 Management and mitigation

Management and mitigation measures to reduce disruption to fauna behaviour during construction activities include:

- Pre-clearing surveys for active breeding sites

- Use of directional lighting where possible
- Restriction of movement of vehicles and humans to construction areas
- Dust suppression as discussed in Section 4.6 – dust impacts will be managed in accordance with the recommendations outlined in the EIS Mine Air Quality Report (GHD, 2012e)

4.11.4 Summary

Noise, light and general construction activity will disturb animals in the vicinity of construction areas, and animals will either habituate or move away. Dust may also affect quality of plant health and palatability. Construction activities generally do not take place close to sensitive habitats and impacts on significant biodiversity values are not expected. Implementation of the mitigation measures listed above will seek to prevent/reduce exposure to these potentially disruptive activities.

5. Potential impacts and mitigation measures – operation phase

5.1 Introduction

This impact assessment has been structured to address impacts associated with the operation phase activities within the offsite infrastructure activities listed below:

- Operational activities within the industrial precinct
  - Administration offices
  - Warehouse storage
  - Fabrication and repairs workshops
  - Bulk fuel storage
  - Rail siding
- Airport activities (i.e. daily incoming and outgoing flights Code E aircraft i.e. B737 or equivalent)
- Accommodation camp for up to 4000 workers
- An off-stream storage and pump station near Belyando River

Potential operation phase impacts on terrestrial and aquatic ecological values have been considered, and appropriate management and mitigation measures proposed, to ameliorate the following identified impacts:

- Habitat degradation and edge effects
  - Dust pollution
  - Run-off and sedimentation
  - Waste and effluent pollution
- Wildlife mortality attributed to:
  - Collision with vehicles and aircraft
  - Collisions with fencing and other stationary infrastructure
- Barrier effects and reduced fauna movement
- Wildlife disturbance
  - Noise disturbance
  - Light pollution
- Degradation water quality and aquatic habitats
  - Barriers to flow
  - Floodplain connectivity
- Proliferation of weeds and feral animal species
- Altered groundwater regime

5.2 Habitat degradation

5.2.1 Overview

Increased vehicle movements and activities within the Offsite footprint have the potential to increase dust emissions and sedimentation and the use of hardened surfaces (i.e. bitumen or concrete surfaces) associated with the industrial precinct, airport and accommodation village have the capacity to increase stormwater run-off and erosion. These factors have the capacity to result in the localised degradation of habitats adjacent to offsite infrastructure.

5.2.2 Potential impacts

Dust impacts

Dust emissions within the Study Area are expected to be relatively minor compared with those experienced within the Project Area (Mine). Nevertheless, localised increases in dust emissions are anticipated in response to the increase in vehicle movements along Moray-Carmichael Road and maintenance tracks and within the vicinity of rail sidings. Dust pollution can result in significant localised impacts on flora and fauna. By settling on vegetation, dust can suppress vegetation growth by limiting the plants' photosynthetic potential (Nanos and Ilias, 2007). Plants covered with dust are also likely to be less palatable to native animals. Dust deposition is generally localised, only extending up to 100 m from unsealed road verges. Roadside verges within the Study Area are already subject to moderate levels of dust degradation. The increased volumes of vehicular traffic during the Project's operational phase could exacerbate this existing dust impact. Mitigation is required to protect the integrity of habitats from dust deposition where possible.

Dust can settle within the waterways or in the terrestrial environments, where runoff can mobilise settled dust to waterways. Indirect deposition in waterways can occur when dust settles in the terrestrial environment. During precipitation events, the associated runoff transports dust from the terrestrial environment into nearby waterways. Dust generated during the construction phase, has the potential to have a negative impact on the water quality of North, Obungeena and Eight Mile Creeks and Pear Gully.

Run-off and sedimentation impacts

Stormwater run-off and sedimentation typically increases in areas adjacent to man-made infrastructure where hardened surfaces (i.e. bitumen, steel and concrete) encourage run-off and afford no potential for natural permeationof rainwater into underlying substrates. The accommodation camp, industrial precinct and airport have a combined surface area of 1,091.6 ha. These areas will accumulate increased levels of local stormwater run-off. This has the potential to cause localised sedimentation and erosion and impact on water quality (See Section 5.6).

5.2.3 Management and mitigation

Measures to mitigate impacts of dust, sedimentation and erosion have been incorporated into the EMP for the Mine and Offsite footprint (GHD, 2012c; GHD, 2012d).

Mitigation measures detailed in the Mine and Offsite EMPs, include erosion and sediment control requirements to be implemented and monitored throughout the operation phase of the Project.

Key measures include:

- Ongoing monitoring of dust emissions at designated dust monitoring stations at key locations within the Study Area
- Dust suppression activities will be undertaken where appropriate and managed in accordance with the recommendations outlined in the Mine Air Quality Report (GHD, 2012e).
- Ongoing monitoring of erosion and sedimentation throughout the Study Area, particularly before and after significant rainfall events
- Diversion of clean stormwater around disturbed areas, with scour protection as required to address any associated modifications in drainage paths
- Drainage, erosion and sediment control devices will be installed and maintained adjacent to watercourses and key stormwater flow paths

5.2.4 Summary

While increased activity associated with the Project's operation phase has the potential to cause local degradation of habitat through dust emissions, runoff and sedimentation, the environments adjacent to the Project (Offsite) are in most cases, already disturbed to some extent and subject to periods of dust and sedimentation. These potential impacts will be monitored as part of the ongoing environmental management for the Project outlined in the EMP for the Project (GHD, 2012d).

5.3 Wildlife mortality

5.3.1 Overview

Operation of the offsite infrastructure presents a potential increase in mortality risk to native wildlife through direct collision with vehicles, aircraft and with in situ infrastructure such as fences and buildings.

5.3.2 Potential impacts

Under existing conditions, native animals are likely to be subject to low levels of human-induced mortality within the Study Area. Existing human-induced wildlife mortality would be attributed to occasional collision with vehicles and barbed wire fences. The mortality risks to native wildlife are expected to increase within the Study Area during the Project's operational phase. A number of factors could increase the incidence of human-induced wildlife mortality.

Higher volumes of vehicular traffic along the Moray-Carmichael Road increase the potential for wildlife roadkill during the Project's operation phase. The increase in fencing and built infrastructure also inevitablyincreases the potential for wildlife mortality through collision with fences and windows. Operation of the airport also introduces a new mortality threat to local wildlife through the potential for collision with aircraft. The proposed location for the airport is situated away from any substantial wetland that would attract large numbers of birds. As such, bird-strike is likely to represent a low-level mortality threat for native wildlife within the Study Area. However, given the potential risks to human health and safety, a dedicated study would be recommended to further assess the risks. In general the risks of wildlife mortality during the Project;'s operation phase are relatively low within the Study Area.

5.3.3 Management and mitigation

Measures to mitigate the risk of wildlife mortality during the Operation phase have been incorporated in the EMP for the Mine and Offsite footprint (GHD, 2012c; GHD, 2012d). Key measures to reduce wildlife mortality include:

- Establish and enforce local speed restrictions and other road rules
- Establish a protocol to record the incidence and location of all wildlife roadkill
- Provide lighting in potential high risk areas
- Enforce curfews to minimise night-time vehicle movements
- Restrict the use of barbed wire fencing or incorporate fencing with a non-barbed top wire

5.3.4 Summary

The increased vehicle activity associated with the Project (Offsite) has the potential to increase the incidence of wildlife mortality. These impacts are however considered to have a relatively low incidence, with adverse impacts for individual animals. In order to protect wildlife and the health and safety of workers, roadkill information will be monitored as part of the EMP (refer and adaptive management measures applied to reduce this incidence).

5.4 Barrier effects and reduced fauna movement

5.4.1 Overview

Although the existing environment within the Study Area is highly fragmented, wide-roaming terrestrial species that can tolerate open grassland landscapes currently have few impediments to movement. Buildings within the accommodation camp, industrial precinct and road and rail infrastructure represent potential barriers to the local movement of some wildlife species.

5.4.2 Potential impacts

Built infrastructure (i.e. accommodation camp, industrial precinct) and linear infrastructure (roads and rail) represent potential barriers to the movement of local fauna within the Study Area. Species likely to be adversely affected would be ground-dwelling species that can utilise areas of open grassland (i.e. macropods, small ground mammals, reptiles and amphibians). These can restrict the capacity for animals to access resources and may increase the isolation of populations, making individual animals more dependent on local resources.

Importantly, the offsite infrastructure has been located away from the creeklines. For many wildlife, these creeks represent important habitat linkages in the local landscape that provide opportunities for local movement. Given the fragmented nature of the existing environment and the location of infrastructure, away from creeklines, the barrier effects anticipated within the Study Area are expected to have minimal impact on native fauna. Nevertheless, mitigation measures are required to reduce the barrier effects and encourage local movement of native wildlife.

5.4.3 Management and mitigation

Measures to minimise barrier effects on native fauna include:

- Where appropriate (i.e. where fencing is not intended to exclude wildlife from areas of danger), use fencing that is permeable to ground fauna and avoid the use of barbed wire
- Construction of any infrastructure crossing waterways should allow opportunities for ongoing movement of fauna along the riparian zone and stream banks

5.4.4 Summary

The Project (Offsite) is located predominantly in an open landscape of non-remnant vegetation, where wildlife typically have the capacity for movement over open rangelands. Consequently the barrier effects associated with the Project (Offsite) are expected to be relatively minimal.

5.5 Wildlife disturbance

5.5.1 Overview

Operational activities associated with offsite infrastructure will result in localised increases in light, noise and vibration. Without mitigation measures, these factors have the potential to adversely affect local fauna by disrupting their normal behavioural activities and potentially compromising their foraging, breeding, sleeping and nesting efficiency.

5.5.2 Potential impacts

Noise and vibration impacts

The existing environment within the Study Area currently supports pastoral land uses and is therefore currently exposed to low levels of noise and vibration. The operation of the industrial precinct, rail siding and airport and increased vehicular traffic along the Moray-Carmichael Road will increase local noise emissions.

The airport will receive a maximum of 13 incoming and outgoing Boeing 737 flights per week. This will cause intermittent high-level noise disturbance. More frequent, lower intensity noise is expected along the Moray-Carmichael Road, where there is anticipated to be an increase in vehicular traffic during the Project's operational phase. Chronic low-to-moderate level noise is anticipated within the vicinity of the industrial precinct and rail siding. These areas will be subject to ongoing noise related to maintenance and loading activities. These increases in noise emission may have adverse impacts on local wildlife.

Noise can have a range of adverse impacts on native fauna. Noise can adversely affect wildlife by interfering with communication, masking the sounds of predators and prey and causing stress or avoidance reactions that may increase the risk of injury or reduce the efficiency of normal behaviours (i.e. feeding, breeding, nesting, sleeping) (Fletcher and Busnel, 1978). Noise exposure can have physiological and behavioural impacts on fauna. The nature and intensity of these impacts can vary between species and between individuals of a given species depending on the individuals' age, sex and prior exposure to noise (Fletcher and Busnel, 1978).

Noise impacts on wildlife will also vary depending on the nature and frequency of the noise. Studies have shown that some animals can habituate to loud noises that do not have a direct adverse outcome for the individual (Larkin, 1996). Attempts at using noise to deliberately scare birds away from an area, for example to protect farming crops, have been shown to grow less effective over time as birds habituate to the noise. Larkin suggests that keeping the noise as consistent as possible both in the sound produced and the frequency with which it occurs may

also help mitigate its effects on birds. Algers et. al. (1978) shows that birds tend to adapt to steady state noise levels, even of a relatively high level (in the order of 70 dB(A)).

Most noises within the Study Area will be below this level and are therefore unlikely to have substantial impact on native fauna. Noise sources emitting from the industrial precinct, rail siding and Moray-Carmichael Road are expected to be relatively frequent, lower-level noises to which wildlife generally have a greater capacity to habituate. The airport is likely to present a more infrequent source of relatively high-level noise. Although wildlife would have a reduced capacity to habituate to this type of noise emission, the impacts on wildlife are expected to be low, given the airport is located away from any substantial wetlands or other habitat features.

Light impacts

The Project will operate 24 hours a day. As such, there will be substantial artificial lighting within the vicinity of the industrial precinct, accommodation village and rail siding. Artificial light sources can have adverse impacts on native fauna by disrupting their capacity to forage, breed, nest and sleep, interrupting circadian rhythms and altering normal predator-prey relationships (Rich and Longcore, 2006). Light sources can create an artificial foraging source for birds, amphibians and microbats, by attracting large concentrations of insects (Rich and Loncore, 2006). Species that benefit from these types of artificial feeding sources are typically opportunistic, generalist species which are generally widespread and abundant (Lockwood and McKinney, 1999).

Impacts of light pollution can be particularly significant where they occur adjacent to communal nesting or breeding grounds, such as wetland bird rookeries and flying fox colonies (Rich and Longcore, 2006). However, the offsite infrastructure has been located away from any substantial wetland that could represent a communal breeding habitat. As such, impacts from light are expected to be relatively localised. Nevertheless mitigation measures are recommended to reduce the disruption to the normal behaviour and ecology of local fauna.

5.5.3 Management and mitigation

The EMP for the Mine and Offsite Infrastructure (GHD, 2012c; GHD, 2012d) has incorporated mitigation measures to reduce the impact of noise and light on local wildlife behaviour. Key measures include:

- Establishment and ongoing monitoring of noise emission monitoring stations located at key locations within the Study Area
- Regular maintenance of machinery within the industrial precinct and rail siding to minimise noise emissions
- Use of directional lighting to minimise light spill
- Use of long wavelength light with red or yellow tinting wherever this can be applied

5.5.4 Summary

Light, noise and vibration have the potential to disrupt the behaviour of some native fauna. However, these impacts are likely to be localised and concentrated in areas of non-remnant vegetation where there are relatively low habitat values.

5.6 Degradation of water quality and aquatic habitats

5.6.1 Overview

Water quality and aquatic habitats can potentially be impacted by increased runoff and altered flows resulting from the presence of built infrastructure within the Project (Offsite). Increased surface area associated with infrastructure has the potential to increase levels of runoff and linear infrastructure may alter flow with adverse effects for aquatic habitats.

5.6.2 Potential impacts

The workers accommodation village, industrial precinct and airport will result in a local increase in exposed earth surfaces. The source of most suspended particulates (and in turn increase in turbidity), nutrients and other contaminants attached to particulates in waterways is mobilisation of soils through surface runoff, stream bank erosion and dust.

Barriers to flow

Construction of A loss of connectivity can result from decreasing water quality. If the hydrology and geomorphology of the stream bed is not restored to previous conditions there is potential for localised internal ponding to develop with subsequent changes in water quality. Ponding of flowing waterbodies creates favourable conditions for algal growth and settling of sediments.

Floodplain connectivity

The presence of built infrastructure associated with the industrial precinct, airport, workers accommodation and linear infrastrature may also cause the floodplain to become disconnected from the waterways. The ability of biota, water and materials to move from one distinct ecosystem to another, for example from a floodplain to a river, is referred to as lateral connectivity (DEHP, 2012). The duration and timing of periods of lateral connection can be very important to allow opportunities for spawning, dispersal and migration. Species that migrate between ecosystems as part of their life cycles, such as diadromous fish, are particularly susceptible to a loss of lateral connectivity. This lateral connectivity also promotes the flow of genes between otherwise disconnected populations. For example, an aquatic community living in an off-channel farm dam may depend on seasonal connectivity to the floodplain for both the augmentation of surface waters, and for gene flow to maintain the existing genetic diversity. When a community becomes isolated, losses in genetic diversity may occur, and subsequently the community may not be able to adapt to environmental or biological challenges (Allendorf, 1983).

Aquatic fauna can be highly reliant on the seasonal connectivity to floodplains for the purposes of feeding and breeding, but also in seeking refuge from fast flows (Bayley, 1995; Humphries et al*.*, 1999; King et al*.*, 2003). In Australia, many fish species will move out onto the inundated, highly productive floodplains, even if the periods of inundation are short, unpredictable and infrequent (Humphries et al*.*, 1999; King et al*.*, 2003; Arthington et al*.*, 2005).

Surface flows and geomorphology

The increased surface area attributed to the presence of hardened surfaces associated with built infrastructure within the Offsite footprint will result in an increased potential for stormwater run-off. Without mitigation, this has the capcity to increase localised surface water flows that may concentrate erosion in localised areas.

5.6.3 Management and mitigation

Mitigation measures detailed in the Mine and Offsite EMPs, include erosion and sediment control requirements to be implemented and monitored throughout the operation phase of the Project.

To limit the degradation of downstream aquatic habitat during operation, mitigation and management will focus on reducing the potential mobilisation of sediments or pollutants, diversion of stormwater flows from disturbed areas and limiting sediment transport from exposed areas. The management and mitigation of the mobilisation of sediment and pollutants during construction is described in EIS Mine Water Quality Report (GHD, 2012g) and these measures will assist in limiting the degradation of aquatic habitats.

Scour and erosion can be managed through design treatments (for example, bank stabilisation) and ongoing management controls such as those that will be incorporated into the EMPs.

In order to ensure the continued lateral connectivity between the floodplain and the waterways construction should be outside the floodplain area where possible. Wherever possible, the natural drainage pathways and connectivity with the floodplain needs to be maintained.

5.6.4 Summary

Although the large Offsite footprint creates the potential for increased runoff and altered flows, the design of infrastructure will incorporate stormwater runoff measures that will minimise the adverse effects.

5.7 Proliferation of weeds and feral animals

5.7.1 Overview

Pest and feral species may disrupt ecosystems by outcompeting and replacing native species, thus altering ecosystem diversity and potentially disrupting ecosystem function. A total of 28 introduced flora taxa were recorded from the Study Area, four of which are declared as WoNS and declared weeds under the LP Act. Six introduced fauna species comprising five mammals and one amphibian were also recorded during field studies.

5.7.2 Potential impacts

The potential impacts of pest and feral species to terrestrial and aquatic habitats is described in Section 4.10. The potential impacts for the construction phase are consistent with those during operation activities though with a larger scale of land disturbance and activity in the area, the risk of introduction and spread of pest and feral species is proportionally increased. As discussed in Section 4.10, weed and pest species can compete with native species for resources and reduce the availability and quality of habitat at the site and in downstream environments. These impacts have the potential to reduce biodiversity in the local area and broader catchment.

Increased movement of people, vehicles, machinery, vegetation waste and soil may facilitate the spread of weeds at and near the Offsite footprint. Four WoNS that are also declared plants under the LP Act, parkinsonia (*Parkinsonia aculeata*), parthenium (*Parthenium hysterophorus*), prickly pear (*Opuntia stricta*) and velvety tree pear (*Opuntia tomentosa*) are known to occur at

the Study Area. Despite the fact that 28 introduced plant species were recorded, weeds were not abundant across much of the Study Area.

Increasing the prevalence of weeds at the Study Area (and potentially beyond to the surrounding landscape), may reduce the quality of habitats for some flora and fauna species, particularly by replacing native plants.

Food waste produced by human settlements may provide additional resources for feral animals such as pigs, rats, cats and dogs. These animals, confirmed as present within the Study Area, may increase in abundance should easier access to forage resources be provided. Increased availability of water due to sediment ponds and water storages is beneficial to pest animals.

An increase in the prevalence of these animals may adversely impact native fauna in that it may lead to:

- Increased competition for resources
- Increased predation of native species by introduced animals
- Habitat degradation including pig damage of riparian areas and rabbit burrows causing erosion

There is also potential for pest animals such as ants to be introduced to sites through importation of vehicles, equipment, soils and similar media.

5.7.3 Management and mitigation

An integrated suite of actions will be incorporated into the Mine and Offsite EMPs, and be implemented throughout the operational life of the Mine to manage weeds and pest species. These actions will include:

- Waste management measures incorporated into EMPs should include containment of food scraps in securely sealed containers
- Vegetation and soil waste will not be moved to areas of lower weed infestation
- Pest animal occurrence will be monitored at onsite and offsite habitat management areas. If increased density of pest animals is observed, or new pest animals are identified, humane pest controls will be implemented manage numbers
- Weed levels will be monitored in areas adjacent to offsite habitat management areas. Monitoring will be undertaken annually, with results to be considered in terms of baseline information (collected prior to construction) and with reference to appropriate control (reference) sites. If significant infestations of any weeds occur, or if WoNS or Class 1 or 2 weeds declared under the LP Act, weed control measures will be implemented. Weed control measures will be based on Queensland Department of Agriculture, Forestry and Fisheries and Isaac Regional Council advice
- All vehicles, equipment and materials brought on to the site will be certified as free of weeds and weed seeds and carry a weed hygiene declaration. Records are to be kept of compliance with this requirement
- Soil stripped and stockpiled from areas containing known weed infestations will be stored separately and are not to be moved to areas free of weeds
- Personnel will not bring domestic animals to the Project Area

5.7.4 Summary

Rigorous implementation of the proposed mitigation strategies should assist in minimising the potential for pest plants and animals to increase in abundance at and near the Project Area. Regular, standardised monitoring will be a core component of the successful implementation of these plans, with corrective actions (including targeted eradication) to be undertaken at the earliest opportunity after monitoring reveals a new pest plant or animal outbreak.

6. Conclusion

The Study Area occurs in an agricultural landscape, where historic and current land use practices associated with cattle grazing have altered the extent, connectivity and ecological integrity of vegetation communities and the fauna habitat values that they provide. Remnant vegetation occurs over only (approximately) 4.6 percent of the Study Area, comprising a total of 14 field verified REs (5 from the Desert Uplands and 9 from the Brigalow Belt bioregions).

The Study Area contains eight fauna habitat types that provide a variety of resources for native birds, reptiles, mammals and frogs. Open cleared land was the most abundant and widespread habitat type within the Study Area, providing habitat for (generally common) rangeland species that are adapted to open landscapes. Woodland remnants predominantly persisted along watercourses. These provide a higher diversity of resources and therefore support a greater abundance and variety of wildlife.

The DEHP BPA mapping indicated that most remnant vegetation within and surrounding the Study Area is of low or moderate value, in terms of ecosystem diversity and (ecosystem) context and connection.

The 14 REs that were verified within the Study Area comprised:

- 2 endangered REs (11.3.1, 11.4.9)
- 4 of concern REs (11.3.3, 11.4.11, 11.4.5, 11.4.6)'
- 8 least concern REs (10.3.28, 10.3.6, 10.5.5, 10.3.14, 10.3.25, 10.3.37, 10.4.5, 10.3.10)

No DNRM mapped essential habitat occurs at the Study Area, although a number of patches (for a variety of species) occur in the landscape around the Study Area.

The EPBC Act listed TEC, Brigalow (*Acacia harpophylla* dominant and co-dominant), was identified as present at the Study Area during field surveys. The presence of this TEC was recorded from the occurrence of REs 11.3.1 and 11.4.9 within the Study Area. Approximately 9.8 ha of these REs are present within the Study Area. However, none of this mapped TEC occurs within the Project (Offsite) footprint.

No threatened flora species, listed under either the EPBC Act or the NC Act, were recorded within the Study Area from field surveys. One EPBC Act listed threatened flora species, *Livingstona lanuginosa*, and one flora species listed under the Queensland NC Act, *Nesaea robertsii*, may occur at the Study Area (based on suitability of habitat, previous records from region, current known distribution).

The vast majority of fauna species recorded from the Study Area were common, widely distributed species. Six introduced fauna species were recorded and considered likely to occur in relatively low densities.

EPBC Act listed species recorded within the Study Area were black-throated finch (southern), squatter pigeon (southern) and ornamental snake. Two other EPBC listed fauna species are considered likely to occur within the Study Area: yakka skink and koala.

Only one black-throated finch was recorded during the field surveys. The Offsite footprint contains limited habitat for this species, compared with the adjacent Project Area (Mine). Other areas of potential habitat for EPBC listed species were generally isolated by fragmentation and

relatively degraded. The ornamental snake has the potential to occur in areas of non-remnant vegetation that retain cracking clay soils. As a result, the area of potential habitat for this species is larger than for others.

Two migratory species listed under the EPBC Act were recorded, the eastern great egret and white-bellied sea-eagle. Another 12 migratory species were considered likely to occur. Habitats within the Study Area are not considered likely to support important assemblages of migratory species. A total of 15 marine species listed under the EPBC Act were recorded within the Study Area. These are predominantly woodland bird species that are generally widespread and abundant in Queensland.

Two species listed under the NC Act were recorded during surveys, the cotton pygmy-goose and black-necked stork. Another threeNC Act listed species are considered likely to occur: the square-tailed kite, black-chinned honeyeater and brigalow scaly-foot.

Given the highly fragmented nature of remnant vegetation within the Study Area and consideration of the (generally) low environmental values in the location of the Offsite footprint, impacts associated with construction and operation of the Project (Offsite) are considered likely to be relatively minimal. Potential impacts associated with the construction phase include:

- Vegetation clearing
- Wildlife mortality during vegetation clearing
- Habitat fragmentation
- Degradation of water quality and aquatic habitats
- Introduction of pests and feral species
- Wildlife disturbance through light, noise, dust

Potential impacts associated with the operation phase include:

- Wildlife disturbance associated with light and noise
- Habitat degradation associated with dust and sedimentation
- Degradation of water quality and aquatic habitats
- Wildlife mortality
- Introduction of pests and feral species

The Offsite footprint will directly impact upon the following environmental values:

- 7.2 ha of least concern field verified RE (no endangered or of concern RE is to be cleared)
- Additional areas of officially mapped RE (38.9 ha) and non-remnant vegetation (66.9 ha) are mapped within the Moray-Carmichael Road footprint (refer Section 4.3.2)
- 2.5 ha of potential habitat for the black-throated finch (southern) (confirmed present)
- 313.8 ha of potential habitat for the ornamental snake (confirmed present), the vast majority of which is within non-remnant vegetation areas
- 2.7 ha of potential habitat for the koala (likely to occur)
- 2.5 ha of potential habitat for the yakka skink (likely to occur)

- 2.5 ha of potential habitat for the little pied bat (likely to occur)
- 3.7 ha of potential habitat for the brigalow scaly-foot (likely to occur)
- 2.5 ha of potential habitat for the echidna (likely to occur)
- 314.3 ha of potential habitat for the rainbow bee-eater (likely to occur)
- 314.3 ha of potential habitat for the fork-tailed swift (likely to occur)
- 314.3 ha of potential habitat for the white-throated needletail (likely to occur)

The approach to mitigating and managing construction and operational phase impacts will include a combination of prevention or reduction of all avoidable impacts (to the greatest extent possible), active management to maintain (and where possible enhance) habitats that will not be impacted during staged operations, and active management of areas that will be disturbed during staged operations, such that they retain their existing values until such time that they are disturbed. Unavoidable residual impacts (likely to be minimal) will be dealt with via the Project's offset strategy, with the overall objective of the mitigation, management and offsetting approach being the delivery of no net loss of regional biodiversity values.

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Appendices


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Appendix A – Survey effort and locations

Flora Survey Sites

Fauna Survey Sites and Trapping Effort


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Flora survey effort

Quaternary Assessment Site	Easting	Northing	Date of Survey
Q1	446709	7570763	30/04/2013
Q2	436545	7570869	01/05/2013
Q3	439701	7570525	01/05/2013
Q4	442128	7573748	01/05/2013
Q5	440100	7571529	02/05/2013
Q6	461809	7575219	02/05/2013
Q7	461831	7574157	02/05/2013
Q8	458488	7573816	02/05/2013
Q9	451712	7574630	02/05/2013
Q10	450834	7574328	02/05/2013
Q11	453415	7574686	02/05/2013
Q12	448140	7571211	03/05/2013
Q13	453452	7574530	03/05/2013
Q14	436745	7569203	03/05/2013
Q15	440748	7574054	03/05/2013
Q16	445306	7570459	03/05/2013
Q17	440260	7573407	04/05/2013
Q18	438109	7573148	04/05/2013
Q19	438773	7572038	04/05/2013
Q20	437738	7573582	04/05/2013
Q21	443875	7571982	04/05/2013
Q22	450645	7571990	05/05/2013
Q23	449392	7571835	05/05/2013
Q24	451156	7569896	05/05/2013
Q25	451232	7569607	05/05/2013
Q26	441389	7572255	05/05/2013
Q27	442939	7571336	06/05/2013
Q28	454668	7574559	06/05/2013
Q29	449780	7568210	01/05/2013

Q30	448945	7567953	01/05/2013
Q31	447185	7567144	01/05/2013
Q32	441108	7565019	01/05/2013
Q33	446458	7567282	02/05/2013
Q34	446382	7566174	02/05/2013
Q35	452695	7565895	02/05/2013
Q36	451021	7565239	02/05/2013
Q37	449187	7564896	02/05/2013
Q38	440483	7567966	04/05/2013
Q39	440738	7567675	04/05/2013
Q40	441280	7565822	04/05/2013
Q41	440924	7566044	04/05/2013
Q42	443506	7565406	04/05/2013
Q43	445990	7564800	04/05/2013
Q44	443871	7568603	05/05/2013
Q45	445621	7569270	05/05/2013
Q46	446260	7569600	05/05/2013
Q47	447716	7568882	05/05/2013
Q48	446411	7564622	05/05/2013

BioCondition Assessment Site	Easting	Northing	Date of Survey
Site 1	446709	7570763	30/04/2013
Site 3	439701	7570525	01/05/2013
Site 7	461831	7574157	02/05/2013
Site 9	451712	7574630	02/05/2013
Site 14	436745	7569203	03/05/2013
Site 15	440748	7574054	03/05/2013
Site 26	441389	7572255	05/05/2013
Site 27	442939	7571336	06/05/2013
Site 29	448695	7567907	02/05/2013
Site 34	446364	7566156	04/05/2013

Fauna survey effort

Site	Easting	Northing	Funnel Trap	Pit-fall trap	Cage Trap	Elliot trap	Anabat	Nocturnal Searches	Bird Surveys	Active reptile search
			No. of trap nights (no. of traps x no. of nights)				No. of nights	No of nights	Person hours	
Trap site 1	439653	7570578	32	16	40	80	2	1	1	1
Trap site 2	446787	7570725	32	16	40	80	1	1	1	1
H1	436674	7569293					2	1	0.5	0.5
H2	439726	7570512							0.5	0.5
H3	440735	7574035					1		0.5	0.5
H4	443851	7571966							0.5	0.5
H5	451721	7574626							0.5	0.5
H6	451742	7574549							0.5	0.5
H7	453456	7574565					1		0.5	0.5
H8	454821	7574502							0.5	0.5
H9	458497	7573926							0.5	0.5
H10	446983	7570847						1	0.5	0.5
H11	439684	7568032							0.5	0.5
H12	440551	7567996					1	1	0.5	0.5
H13	445322	7570454					2	1	0.5	0.5
H14	446787	7570725						1	0.5	0.5
H15	449396	7571785							0.5	0.5
H16	449677	7570989							0.5	0.5
H17	450634	7571977							0.5	0.5

H18	443871	7568603							0.5	0.5
H19	445621	7569270							0.5	0.5
H20	446289	7568510							0.5	0.5
H21	447391	7567225							0.5	0.5
H22	447313	7567220							0.5	0.5
H23	448945	7567942							0.5	0.5
H24	451447	7569788							0.5	0.5
H25	446389	7566159							0.5	0.5
H26	446411	7564622							0.5	0.5
H27	449187	7564896							0.5	0.5
H28	461781	7574122					1		0.5	0.5
H29	440260	7564896							0.5	0.5
H30	438115	7573140							0.5	0.5
H31	438760	7572058							0.5	0.5
H32	437731	7573581							0.5	0.5
H33	460457	7575093							0.5	0.5
H34	441413	7572234							0.5	0.5
H35	442954	7571343							0.5	0.5
H36	454664	7574557							0.5	0.5
H37	458559	7573981							0.5	0.5
H38	440166	7571554							0.5	0.5
Dam 6	446870	7570770						1	Waterbody watch	
Dam 8	440634	7568153						1	Waterbody watch	
Dam 9	449841	7568075							Waterbody watch	

Dam 10	446381	7567195							Waterbody watch	
Dam 11	440894	7564629						1	Waterbody watch	
Dam 12	443159	7564455						1	Waterbody watch	
Anabat 8	440649	7568175					1			

Trap locations

Trap ID	Easting	Northing	Trap Number	Easting	Northing
Trap Site 1			Trap Site 2		
Elliot trap 1	439690	7570465	Elliot trap 1	447057	7570909
Elliot trap 2	439689	7570472	Elliot trap 2	447041	7570901
Elliot trap 3	439678	7570486	Elliot trap 3	447016	7570894
Elliot trap 4	439659	7570500	Elliot trap 4	447008	7570889
Elliot trap 5	439687	7570502	Elliot trap 5	446998	7570878
Elliot trap 6	439683	7570513	Elliot trap 6	446947	7570832
Elliot trap 7	439683	7570522	Elliot trap 7	446944	7570843
Elliot trap 8	439680	7570533	Elliot trap 8	446913	7570860
Elliot trap 9	439677	7570543	Elliot trap 9	446900	7570857
Elliot trap 10	439677	7570554	Elliot trap 10	446889	7570851
Elliot trap 11	439669	7570569	Elliot trap 11	446884	7570851
Elliot trap 12	439666	7570581	Elliot trap 12	446864	7570842
Elliot trap 13	439670	7570597	Elliot trap 13	446853	7570838
Elliot trap 14	439669	7570608	Elliot trap 14	446841	7570835
Elliot trap 15	439667	7570622	Elliot trap 15	446806	7570837
Elliot trap 16	439664	7570637	Elliot trap 16	446819	7570818
Elliot trap 17	439661	7570646	Elliot trap 17	446934	7570852
Elliot trap 18	439657	7570657	Elliot trap 18	446950	7570812
Elliot trap 19	439653	7570669	Elliot trap 19	446961	7570802
Elliot trap 20	439644	7570679	Elliot trap 20	447031	7570904
Cage 1	439676	7570462	Cage 1	447064	7570906
Cage 2	439668	7570474	Cage 2	447012	7570892
Cage 3	439661	7570498	Cage 3	446656	7570921
Cage 4	439659	7570526	Cage 4	446951	7570839
Cage 5	439644	7570540	Cage 5	446930	7570836
Cage 6	439642	7570565	Cage 6	446895	7570842
Cage 7	439648	7570589	Cage 7	446861	7570832
Cage 8	439669	7570609	Cage 8	446813	7570806
Cage 9	439667	7570617	Cage 9	446794	7570758
Cage 10	439653	7570646	Cage 10	446787	7570729
Funnel line 1	439679	7570474	Funnel line 1	446967	7570801
Funnel line 2	439672	7570508	Funnel line 2	446930	7570852
Funnel line 3	439650	7570569	Funnel line 3	446840	7570829
Funnel line 4	439666	7570601	Funnel line 4	446788	7570725

Waterbody watch and remote cameras

Site	Easting	Northing	Person hours			No of nights
			Dawn watch	Midday watch	Dusk watch	Remote camera
Dam 1	436585	7570920	1	1	.75	6
Dam 2	442037	7573808		1	1	6
Dam 3	453549	7574576		1		6
Dam 4	460736	7575016	1			6
Dam 5	440166	7571554	1			
Dam 6	446870	7570770			.75	6
Dam 7	448065	7571371	1	1		6
Dam 8	440634	7568153	1			
Dam 9	449841	7568075	1			6
Dam 10	446381	7567195		1		6
Dam 11	440894	7564629			.75	6
Dam 12	443159	7564455		1		
Dam 13	452678	7565985		1		
Dam 14	438674	7572943	1			
Dam 15	458652	7573915	1			
Dam 16	461884	7574222		1		6
Dam 17	447391	7567225			.75	6
Dam 18	446506	7564625	1			6
Dam 19	450763	7565187		1		6
H28	461781	7574122		1		6


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Appendix B – Desktop database search results

DSEWPaC Protected Matters Search and Environmental Reporting Tool

DERM Wildlife Online

DERM HERBRECS Database

DERM Environmentally Sensitive Areas

Birds Australia Database

Queensland Museum Database


GHD
adani

10 July 2010 10:28

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.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

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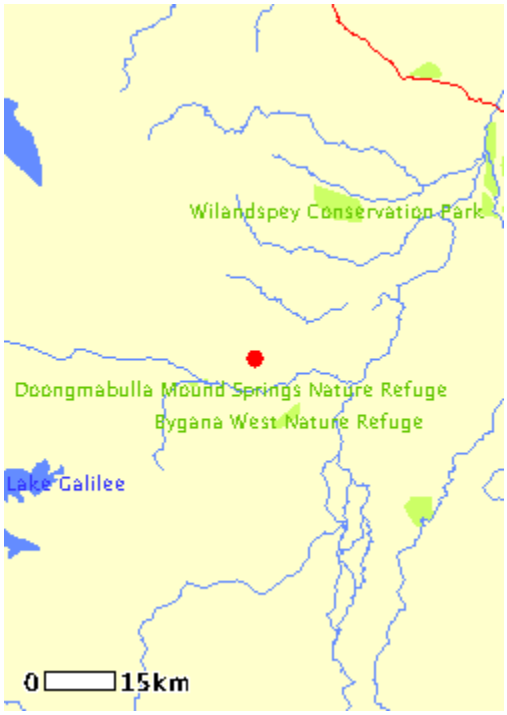

Search Type: Point

Buffer: 50 km

Coordinates: -22.041,146.364

Report Contents:

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 - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	1
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	2
Threatened Species:	11
Migratory Species:	12

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 and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

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. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Places on the RNE:	3
Listed Marine Species:	11
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	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:	2
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

Wetlands of International Significance [Dataset Information] (Ramsar Sites)		
COONGIE LAKES		Within same catchment as Ramsar site
Threatened Ecological Communities [Dataset Information]	Status	Type of Presence
Brigalow (*Acacia harpophylla* dominant and co-dominant)	Endangered	Community known to occur within area
The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin	Endangered	Community known to occur within area
Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Erythrotriorchis radiatus Red Goshawk	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta Squatter Pigeon (southern)	Vulnerable	Species or species habitat likely to occur within area
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern)	Endangered	Species or species habitat likely to occur within area
Poephila cincta cincta Black-throated Finch (southern)	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Mammals		
Lasiorhinus krefftii Northern Hairy-nosed Wombat, Yaminon	Endangered	Species or species habitat likely to occur within area
Reptiles		
Denisonia maculata Ornamental Snake	Vulnerable	Species or species habitat likely to occur within area
Furina dunmalli Dunmall's Snake	Vulnerable	Species or species habitat may occur within area

Plants		
Acacia ramiflora	Vulnerable	Species or species habitat likely to occur within area
Eriocaulon carsonii Salt Pipewort, Button Grass	Endangered	Species or species habitat likely to occur within area
Eryngium fontanum Blue Devil	Endangered	Species or species habitat likely to occur within area
Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher	Migratory	Species or species habitat likely to occur within area
Migratory Wetland Species		
Birds		
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat may occur within area
Nettapus coromandelianus albipennis Australian Cotton Pygmy-goose	Migratory	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Anseranas semipalmata Magpie Goose	Listed - overfly marine area	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher	Listed - overfly marine area	Species or species habitat likely to occur within area
Nettapus coromandelianus albipennis Australian Cotton Pygmy-goose	Listed - overfly	Species or species habitat may occur within area

	marine area	
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Natural

Epping Forest National Park (1978 Boundary) QLD

Lake Buchanan and Catchment QLD

Wilandspey Environmental Park QLD

Extra Information

State and Territory Reserves [Dataset Information]

Epping Forest National Park (Scientific), QLD

Wilandspey Conservation Park, QLD

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 Heritage and Register of National Estate properties, Wetlands of International 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 migratory and marine provisions of the Act have been mapped.

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.

Acknowledgments

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

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria

- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- 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
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Australian Government
Department of the Environment, Water, Heritage and the Arts

Environmental Reporting Tool

You are here: Environment Home > ERIN > ERT

16 November 2010 15:17

Database Report

This report includes places of national environmental significance that are registered in the Department of the Environment and Water Resources' databases, for the selected area. The information presented here has been provided by a range of groups across Australia, and the accuracy and resolution varies.

Search Type: Point
Buffer: 50 km
Coordinates: -22.041,146.364

Report Contents: Summary >> Details >> Caveat >> Acknowledgment

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Biodiversity

Threatened Species:	11
Migratory Species:	12
Listed Marine Species:	11
Invasive Species:	11
Whales and Other Cetaceans:	None
Threatened Ecological Communities:	2

Heritage

World Heritage Properties:	None
Australian Heritage Sites:	3

Wetlands

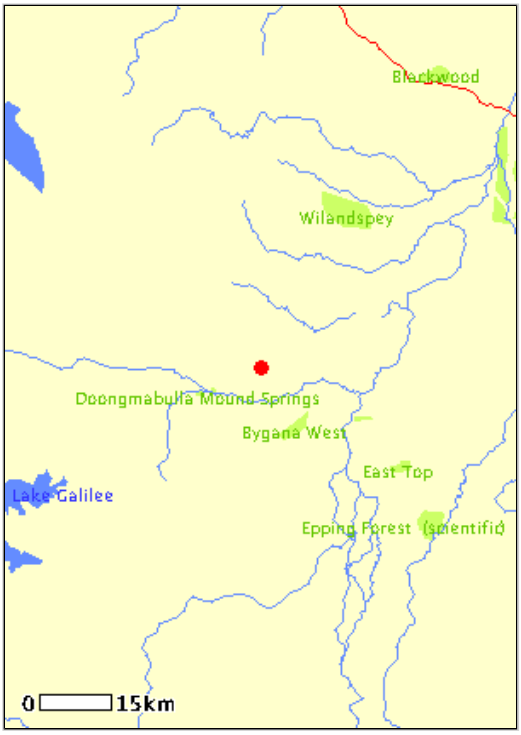
Ramsar sites: (Internationally important)	1
Nationally Important Wetlands:	2

National Pollutant Inventory

Reporting Facilities:	None
Airsheds:	None
Catchments:	None

Protected Areas

Reserves and Conservation Areas	2
Regional Forest Agreements:	None



Biodiversity

Threatened Species [Dataset Information]	Status	Comments
Birds		
Erythrotriorchis radiatus Red Goshawk	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta Squatter Pigeon (southern)	Vulnerable	Species or species habitat likely to occur within area
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern)	Endangered	Species or species habitat likely to occur within area
Poephila cincta cincta Black-throated Finch (southern)	Endangered	Species or species habitat likely to occur within area

Rostratula australis Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Mammals		
Lasiorhinus krefftii Northern Hairy-nosed Wombat, Yaminon	Endangered	Species or species habitat likely to occur within area
Reptiles		
Denisonia maculata Ornamental Snake	Vulnerable	Species or species habitat likely to occur within area
Furina dunmalli Dunmall's Snake	Vulnerable	Species or species habitat may occur within area
Plants		
Acacia ramiflora	Vulnerable	Species or species habitat likely to occur within area
Eriocaulon carsonii Salt Pipewort, Button Grass	Endangered	Species or species habitat likely to occur within area
Eryngium fontanum Blue Devil	Endangered	Species or species habitat likely to occur within area
Migratory Species [Dataset Information]	Status	Comments
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher	Migratory	Species or species habitat likely to occur within area
Migratory Wetland Species		
Birds		
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat may occur within area
Nettapus coromandelianus albipennis Australian Cotton Pygmy-goose	Migratory	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Listed Marine Species [Dataset Information]	Status	Comments
Birds		
Anseranas semipalmata Magpie Goose	Listed - overfly marine area	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift	Listed - overfly	Species or species habitat may occur within area

	marine area	
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher	Listed - overfly marine area	Species or species habitat likely to occur within area
Nettapus coromandelianus albipennis Australian Cotton Pygmy-goose	Listed - overfly marine area	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Invasive Species [Dataset Information]	Status	Comments
Selected Invasive Species: 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.		
Frogs		
Bufo marinus Cane Toad	Feral	Species or species habitat likely to occur within area
Mammals		
Capra hircus Goat	Feral	Species or species habitat may occur within area
Felis catus Cat, House Cat, Domestic Cat	Feral	Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit	Feral	Species or species habitat likely to occur within area
Sus scrofa Pig	Feral	Species or species habitat may occur within area
Vulpes vulpes Red Fox, Fox	Feral	Species or species habitat may occur within area
Plants		
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda	WoNS	Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass	WoNS	Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-	WoNS	Species or species habitat may occur within area

leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage		
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean	WoNS	Species or species habitat may occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed	WoNS	Species or species habitat likely to occur within area
Threatened Ecological Communities [Dataset Information]	Status	Comments
Brigalow (*Acacia harpophylla* dominant and co-dominant)	Endangered	Community known to occur within area
The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin	Endangered	Community known to occur within area
Heritage		
Australian Heritage Sites [Dataset Information] Note that not all Indigenous sites may be listed.		
Natural		
Epping Forest National Park (1978 Boundary) QLD		
Lake Buchanan and Catchment QLD		
Wilandspey Environmental Park QLD		
Wetlands		
Wetlands of International Importance (Ramsar sites) [Dataset Information]		
COONGIE LAKES		Within same catchment as Ramsar site
Nationally Important Wetland Sites [Dataset Information]		
Doongmabulla Springs, QLD		
Lake Galilee, QLD		
Other		
Reserves and Conservation Areas [Dataset Information]		
Epping Forest National Park (Scientific), QLD		
Wilandspey Conservation Park, QLD		

Caveat

The information presented here has been drawn from a range of sources, compiled for a variety of purposes. Details of the coverage of each dataset are included in the metadata [Dataset Information] links above.

Acknowledgment

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- Australian National Wildlife Collection
- Natural history museums of Australia
- 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
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Queensland DERM Wildlife Online Database Search Results

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status
Animals				
Amphibians				
Bufonidae	*Rhinella marina*	cane toad	Introduced	
Hylidae	*Cyclorana alboguttata*	greenstripe frog		
Hylidae	*Cyclorana brevipes*	superb collared frog		
Hylidae	*Cyclorana novaehollandiae*	eastern snapping frog		
Hylidae	*Litoria caerulea*	common green treefrog		
Hylidae	*Litoria inermis*	bumpy rocketfrog		
Hylidae	*Litoria latopalmata*	broad palmed rocketfrog		
Hylidae	*Litoria nasuta*	striped rocketfrog		
Hylidae	*Litoria peronii*	emerald spotted treefrog		
Hylidae	*Litoria rothii*	northern laughing treefrog		
Hylidae	*Litoria rubella*	ruddy treefrog		
Limnodynastidae	*Limnodynastes tasmaniensis*	spotted grassfrog		
Limnodynastidae	*Neobatrachus sudelli*	meeowing frog		
Limnodynastidae	*Notaden bennettii*	holy cross frog		
Limnodynastidae	*Platyplectrum ornatum*	ornate burrowing frog		
Myobatrachidae	*Crinia deserticola*	chirping froglet		
Myobatrachidae	*Uperoleia littlejohni*	Einasleigh gungan		
Reptiles				
Agamidae	*Amphibolurus burnsi*			
Agamidae	*Amphibolurus gilberti*	Gilbert's dragon		
Agamidae	*Amphibolurus nobbi*			
Agamidae	*Chlamydosaurus kingii*	frilled lizard		
Agamidae	*Ctenophorus nuchalis*	central netted dragon		
Agamidae	*Diporiphora australis*			
Agamidae	*Pogona barbata*	bearded dragon		
Boidae	*Antaresia maculosa*	spotted python		
Boidae	*Aspidites melanocephalus*	black-headed python		
Boidae	*Morelia spilota*	carpet python		
Chelidae	*Chelodina longicollis*	eastern snake-necked turtle		
Colubridae	*Boiga irregularis*	brown tree snake		
Colubridae	*Dendrelaphis punctulata*	common tree snake		
Colubridae	*Tropidonophis mairii*	freshwater snake		
Elapidae	*Acanthophis praelongus*	northern death adder		
Elapidae	*Demansia papuensis*	Papuan whip snake		
Elapidae	*Demansia psammophis*	yellow-faced whip snake		
Elapidae	*Demansia rimicola*			
Elapidae	*Denisonia maculata*	ornamental snake	Vulnerable	Vulnerable
Elapidae	*Furina diadema*	red-naped snake		
Elapidae	*Pseudonaja nuchalis*	western brown snake		
Elapidae	*Pseudonaja textilis*	eastern brown snake		
Elapidae	*Rhinoplocephalus boschmai*	Carpentaria whip snake		
Elapidae	*Simoselaps australis*	coral snake		
Elapidae	*Suta suta*	myall snake		
Elapidae	*Vermicella annulata*	bandy-bandy		
Gekkonidae	*Diplodactylus conspicillatus*	fat-tailed diplodactylus		
Gekkonidae	*Diplodactylus vittatus*	wood gecko		
Gekkonidae	*Gehyra catenata*			
Gekkonidae	*Gehyra dubia*			
Gekkonidae	*Gehyra variegata*	tree dtella		
Gekkonidae	*Heteronotia binoei*	Bynoe's gecko		
Gekkonidae	*Lucasium steindachneri*	Steindachner's gecko		
Gekkonidae	*Lucasium stenodactylum*	crowned gecko		
Gekkonidae	*Nephrurus asper*	spiny knob-tailed gecko		
Gekkonidae	*Oedura castelnaui*	northern velvet gecko		
Gekkonidae	*Oedura marmorata*	marbled velvet gecko		
Gekkonidae	*Oedura monilis*			
Gekkonidae	*Oedura rhombifer*	zig-zag gecko		
Gekkonidae	*Rhynchoedura ornata*	beaked gecko		
Gekkonidae	*Strophurus williamsi*	soft-spined gecko		
Pygopodidae	*Lialis burtonis*	Burton's legless lizard		
Pygopodidae	*Paradelma orientalis*	brigalow scaly-foot	Vulnerable	Vulnerable
Pygopodidae	*Pygopus schraderi*			
Scincidae	*Carlia munda*			

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status
Scincidae	*Carlia pectoralis*			
Scincidae	*Carlia schmeltzii*			
Scincidae	*Cryptoblepharus metallicus*	metallic snake-eyed skink		
Scincidae	*Cryptoblepharus pannosus*	ragged snake-eyed skink		
Scincidae	*Cryptoblepharus plagiocephalus sensu lato*			
Scincidae	*Cryptoblepharus virgatus sensu lato*			
Scincidae	*Ctenotus capricorni*		Near threatened	
Scincidae	*Ctenotus hebetior*			
Scincidae	*Ctenotus ingrami*			
Scincidae	*Ctenotus leonhardii*			
Scincidae	*Ctenotus pantherinus*			
Scincidae	*Ctenotus robustus*			
Scincidae	*Ctenotus strauchii*			
Scincidae	*Egernia rugosa*	yakka skink	Vulnerable	Vulnerable
Scincidae	*Egernia striolata*	tree skink		
Scincidae	*Eremiascincus fasciolatus*	narrow-banded sand swimmer		
Scincidae	*Eulamprus sokosoma*			
Scincidae	*Lerista fragilis*			
Scincidae	*Lerista punctatovittata*			
Scincidae	*Lerista timida*			
Scincidae	*Menetia greyii*			
Scincidae	*Menetia maini*			
Scincidae	*Menetia timlowi*			
Scincidae	*Morethia boulengeri*			
Scincidae	*Morethia taeniopleura*	fire-tailed skink		
Scincidae	*Proablepharus tenuis*			
Scincidae	*Tiliqua multifasciata*	Centralian blue-tongued lizard		
Scincidae	*Tiliqua scincoides*	eastern blue-tongued lizard		
Typhlopidae	*Ramphotyphlops ligatus*			
Varanidae	*Varanus gouldii*	sand monitor		
Varanidae	*Varanus mertensi*	Mertens' water monitor		
Varanidae	*Varanus panoptes*	yellow-spotted monitor		
Varanidae	*Varanus tristis*	black-tailed monitor		
Birds				
Acanthizidae	*Acanthiza apicalis*	inland thornbill		
Acanthizidae	*Acanthiza chrysorrhoa*	yellow-rumped thornbill		
Acanthizidae	*Acanthiza nana*	yellow thornbill		
Acanthizidae	*Acanthiza reguloides*	buff-rumped thornbill		
Acanthizidae	*Acanthiza uropygialis*	chestnut-rumped thornbill		
Acanthizidae	*Gerygone albogularis*	white-throated gerygone		
Acanthizidae	*Gerygone fusca*	western gerygone		
Acanthizidae	*Smicrornis brevirostris*	weebill		
Accipitridae	*Accipiter cirrocephalus*	collared sparrowhawk		
Accipitridae	*Accipiter fasciatus*	brown goshawk		Marine
Accipitridae	*Aquila audax*	wedge-tailed eagle		
Accipitridae	*Aviceda subcristata*	Pacific baza		
Accipitridae	*Circus assimilis*	spotted harrier		
Accipitridae	*Elanus axillaris*	black-shouldered kite		
Accipitridae	*Haliaeetus leucogaster*	white-bellied sea-eagle		Marine; Migratory (CAMBA)
Accipitridae	*Haliastur sphenurus*	whistling kite		Marine
Accipitridae	*Hamirostra melanosternon*	black-breasted buzzard		
Accipitridae	*Hieraaetus morphnoides*	little eagle		
Accipitridae	*Milvus migrans*	black kite		
Accipitridae	*Lophoictinia isura*	square-tailed kite	Near threatened	
Acrocephalidae	*Acrocephalus australis*	Australian reed-warbler		
Aegothelidae	*Aegotheles cristatus*	Australian owlet-nightjar		
Alaudidae	*Mirafra javanica*	Horsfield's bushlark		
Anatidae	*Anas gracilis*	grey teal		
Anatidae	*Anas rhynchotis*	Australasian shoveler		
Anatidae	*Anas superciliosa*	Pacific black duck		
Anatidae	*Aythya australis*	hardhead		
Anatidae	*Chenonetta jubata*	Australian wood duck		
Anatidae	*Cygnus atratus*	black swan		
Anatidae	*Dendrocygna arcuata*	wandering whistling-duck		Marine
Anatidae	*Dendrocygna eytoni*	plumed whistling-duck		

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status
Anatidae	*Malacorhynchus membranaceus*	pink-eared duck		
Anhingidae	*Anhinga novaehollandiae*	Australasian darter		
Apodidae	*Apus pacificus*	fork-tailed swift		Marine; Migratory (CAMBA; JAMBA, ROKAMBA)
Apodidae	*Hirundapus caudacutus*	white-throated needletail		Marine; Migratory (CAMBA; JAMBA, ROKAMBA)
Ardeidae	*Ardea intermedia*	intermediate egret		Marine
Ardeidae	*Ardea modesta*	eastern great egret		Marine; Migratory (CAMBA; JAMBA, ROKAMBA)
Ardeidae	*Ardea pacifica*	white-necked heron		
Ardeidae	*Egretta garzetta*	little egret		Marine
Ardeidae	*Egretta novaehollandiae*	white-faced heron		
Ardeidae	*Ixobrychus flavicollis*	black bittern		
Ardeidae	*Nycticorax caledonicus*	nankeen night-heron		Marine
Artamidae	*Artamus cinereus*	black-faced woodswallow		
Artamidae	*Artamus cyanopterus*	dusky woodswallow		
Artamidae	*Artamus leucorynchus*	white-breasted woodswallow		
Artamidae	*Artamus minor*	little woodswallow		
Artamidae	*Artamus personatus*	masked woodswallow		
Artamidae	*Artamus superciliosus*	white-browed woodswallow		
Artamidae	*Cracticus nigrogularis*	pied butcherbird		
Artamidae	*Cracticus tibicen*	Australian magpie		
Artamidae	*Cracticus torquatus*	grey butcherbird		
Artamidae	*Strepera graculina*	pied currawong		
Burhinidae	*Burhinus grallarius*	bush stone-curlew		
Cacatuidae	*Cacatua galerita*	sulphur-crested cockatoo		
Cacatuidae	*Cacatua pastinator*	western corella		
Cacatuidae	*Cacatua sanguinea*	little corella		
Cacatuidae	*Calyptorhynchus banksii*	red-tailed black-cockatoo		
Cacatuidae	*Calyptorhynchus funereus*	yellow-tailed black-cockatoo		
Cacatuidae	*Eolophus roseicapillus*	galah		
Cacatuidae	*Nymphicus hollandicus*	cockatiel		
Campephagidae	*Coracina maxima*	ground cuckoo-shrike		
Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		Marine
Campephagidae	*Coracina papuensis*	white-bellied cuckoo-shrike		Marine
Campephagidae	*Coracina tenuirostris*	cicadabird		Marine
Campephagidae	*Lalage leucomela*	varied triller		
Campephagidae	*Lalage sueurii*	white-winged triller		
Casuariidae	*Dromaius novaehollandiae*	emu		
Charadriidae	*Charadrius ruficapillus*	red-capped plover		Marine
Charadriidae	*Elseyornis melanops*	black-fronted dotterel		
Charadriidae	*Erythrogonys cinctus*	red-kneed dotterel		
Charadriidae	*Vanellus miles*	masked lapwing		
Charadriidae	*Vanellus miles miles*	masked lapwing (northern subspecies)		
Charadriidae	*Vanellus miles novaehollandiae*	masked lapwing (southern subspecies)		
Ciconiidae	*Ephippiorhynchus asiaticus*	black-necked stork	Near threatened	
Cisticolidae	*Cisticola exilis*	golden-headed cisticola		
Climacteridae	*Climacteris affinis*	white-browed treecreeper		
Climacteridae	*Climacteris picumnus*	brown treecreeper		
Columbidae	*Geopelia cuneata*	diamond dove		
Columbidae	*Geopelia humeralis*	bar-shouldered dove		
Columbidae	*Geopelia striata*	peaceful dove		
Columbidae	*Ocyphaps lophotes*	crested pigeon		
Columbidae	*Phaps chalcoptera*	common bronzewing		
Columbidae	*Geophaps scripta scripta*	squatter pigeon (southern subspecies)	Vulnerable	Vulnerable
Coraciidae	*Eurystomus orientalis*	dollarbird		Marine
Corcoracidae	*Corcorax melanorhamphos*	white-winged chough		
Corcoracidae	*Struthidea cinerea*	apostlebird		
Corvidae	*Corvus bennetti*	little crow		
Corvidae	*Corvus coronoides*	Australian raven		
Corvidae	*Corvus orru*	Torresian crow		
Cuculidae	*Cacomantis flabelliformis*	fan-tailed cuckoo		Marine
Cuculidae	*Cacomantis pallidus*	pallid cuckoo		Marine
Cuculidae	*Cacomantis variolosus*	brush cuckoo		

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status
Cuculidae	*Centropus phasianinus*	pheasant coucal		
Cuculidae	*Chalcites basalis*	Horsfield's bronze-cuckoo		Marine
Cuculidae	*Chalcites lucidus*	shining bronze-cuckoo		Marine
Cuculidae	*Chalcites osculans*	black-eared cuckoo		Marine
Cuculidae	*Eudynamys orientalis*	eastern koel		
Cuculidae	*Scythrops novaehollandiae*	channel-billed cuckoo		Marine
Dicruridae	*Dicrurus bracteatus*	spangled drongo		Marine
Estrildidae	*Neochmia modesta*	plum-headed finch		
Estrildidae	*Taeniopygia bichenovii*	double-barred finch		
Estrildidae	*Taeniopygia guttata*	zebra finch		
Estrildidae	*Poephila cincta cincta*	black-throated finch (white-rumped subspecies)	Endangered	Endangered
Eurostopodidae	*Eurostopodus argus*	spotted nightjar		Marine
Eurostopodidae	*Eurostopodus mystacalis*	white-throated nightjar		Marine
Falconidae	*Falco berigora*	brown falcon		
Falconidae	*Falco cenchroides*	nankeen kestrel		Marine
Falconidae	*Falco longipennis*	Australian hobby		
Falconidae	*Falco peregrinus*	peregrine falcon		
Falconidae	*Falco subniger*	black falcon		
Gruidae	*Grus rubicunda*	brolga		
Halcyonidae	*Dacelo leachii*	blue-winged kookaburra		
Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra		
Halcyonidae	*Todiramphus macleayii*	forest kingfisher		Marine
Halcyonidae	*Todiramphus pyrrhopygius*	red-backed kingfisher		
Halcyonidae	*Todiramphus sanctus*	sacred kingfisher		Marine
Hirundinidae	*Hirundo neoxena*	welcome swallow		
Hirundinidae	*Petrochelidon ariel*	fairy martin		
Hirundinidae	*Petrochelidon nigricans*	tree martin		Marine
Laridae	*Chlidonias hybrida*	whiskered tern		Marine
Laridae	*Chroicocephalus novaehollandiae*	silver gull		Marine
Laridae	*Gelochelidon nilotica*	gull-billed tern		Marine
Laridae	*Hydroprogne caspia*	Caspian tern		Marine; Migratory (CAMBA; JAMBA)
Maluridae	*Malurus lamberti*	variegated fairy-wren		
Maluridae	*Malurus melanocephalus*	red-backed fairy-wren		
Megaluridae	*Cincloramphus cruralis*	brown songlark		
Megaluridae	*Cincloramphus mathewsi*	rufous songlark		
Megaluridae	*Eremiornis carteri*	spinifexbird		
Megapodiidae	*Alectura lathami*	Australian brush-turkey		
Meliphagidae	*Acanthagenys rufogularis*	spiny-cheeked honeyeater		
Meliphagidae	*Conopophila rufogularis*	rufous-throated honeyeater		
Meliphagidae	*Entomyzon cyanotis*	blue-faced honeyeater		
Meliphagidae	*Epthianura tricolor*	crimson chat		
Meliphagidae	*Lichenostomus penicillatus*	white-plumed honeyeater		
Meliphagidae	*Lichenostomus plumulus*	grey-fronted honeyeater		
Meliphagidae	*Lichenostomus virescens*	singing honeyeater		
Meliphagidae	*Lichmera indistincta*	brown honeyeater		
Meliphagidae	*Manorina flavigula*	yellow-throated miner		
Meliphagidae	*Manorina melanocephala*	noisy miner		
Meliphagidae	*Melithreptus albogularis*	white-throated honeyeater		
Meliphagidae	*Philemon citreogularis*	little friarbird		
Meliphagidae	*Philemon corniculatus*	noisy friarbird		
Meliphagidae	*Plectorhyncha lanceolata*	striped honeyeater		
Meliphagidae	*Ramsayornis fasciatus*	bar-breasted honeyeater		
Meliphagidae	*Melithreptus gularis*	black-chinned honeyeater	Near threatened	
Meropidae	*Merops ornatus*	rainbow bee-eater		Marine; Migratory (JAMBA)
Monarchidae	*Grallina cyanoleuca*	magpie-lark		
Monarchidae	*Myiagra inquieta*	restless flycatcher		
Monarchidae	*Myiagra rubecula*	leaden flycatcher		
Motacillidae	*Anthus novaeseelandiae*	Australasian pipit		Marine
Nectariniidae	*Dicaeum hirundinaceum*	mistletoebird		
Neosittidae	*Daphoenositta chrysoptera*	varied sittella		
Oriolidae	*Oriolus sagittatus*	olive-backed oriole		
Oriolidae	*Sphecotheres vieilloti*	Australasian figbird		
Otididae	*Ardeotis australis*	Australian bustard		
Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush		
Pachycephalidae	*Oreoica gutturalis*	crested bellbird		
Pachycephalidae	*Pachycephala pectoralis*	golden whistler		
Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status
Pardalotidae	*Pardalotus striatus*	striated pardalote		
Passeridae	*Passer domesticus*	house sparrow	Introduced	
Pelecanidae	*Pelecanus conspicillatus*	Australian pelican		Marine
Petroicidae	*Eopsaltria australis*	eastern yellow robin		
Petroicidae	*Melanodryas cucullata*	hooded robin		
Petroicidae	*Microeca fascinans*	jacky winter		
Petroicidae	*Petroica goodenovii*	red-capped robin		
Phalacrocoracidae	*Microcarbo melanoleucos*	little pied cormorant		
Phalacrocoracidae	*Phalacrocorax carbo*	great cormorant		
Phalacrocoracidae	*Phalacrocorax sulcirostris*	little black cormorant		
Phasianidae	*Coturnix pectoralis*	stubble quail		Marine
Phasianidae	*Coturnix ypsilophora*	brown quail		
Podargidae	*Podargus strigoides*	tawny frogmouth		
Podicipedidae	*Podiceps cristatus*	great crested grebe		
Podicipedidae	*Tachybaptus novaehollandiae*	Australasian grebe		
Pomatostomidae	*Pomatostomus temporalis*	grey-crowned babbler		
Psittacidae	*Aprosmictus erythropterus*	red-winged parrot		
Psittacidae	*Glossopsitta pusilla*	little lorikeet		
Psittacidae	*Melopsittacus undulatus*	budgerigar		
Psittacidae	*Platycercus adscitus*	pale-headed rosella		
Psittacidae	*Trichoglossus haematodus moluccanus*	rainbow lorikeet		
Psittacidae	*Psephotus pulcherrimus*	paradise parrot	Extinct	Extinct
Ptilonorhynchidae	*Ptilonorhynchus maculatus*	spotted bowerbird		
Rallidae	*Fulica atra*	Eurasian coot		
Rallidae	*Gallinula tenebrosa*	dusky moorhen		
Rallidae	*Porphyrio porphyrio*	purple swamphen		
Rallidae	*Tribonyx ventralis*	black-tailed native-hen		
Recurvirostridae	*Himantopus himantopus*	black-winged stilt		Marine
Recurvirostridae	*Recurvirostra novaehollandiae*	red-necked avocet		Marine
Rhipiduridae	*Rhipidura albiscapa*	grey fantail		
Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		
Scolopacidae	*Actitis hypoleucos*	common sandpiper		Marine; Migratory (Bonn; CAMBA; JAMBA; ROKAMBA)
Scolopacidae	*Calidris acuminata*	sharp-tailed sandpiper		Marine; Migratory (Bonn; CAMBA; JAMBA; ROKAMBA)
Scolopacidae	*Calidris ferruginea*	curlew sandpiper		Marine; Migratory (Bonn; CAMBA; JAMBA; ROKAMBA)
Scolopacidae	*Gallinago hardwickii*	Latham's snipe		Marine; Migratory (Bonn; CAMBA; JAMBA; ROKAMBA)
Scolopacidae	*Limosa limosa*	black-tailed godwit		Marine; Migratory (Bonn; CAMBA; JAMBA; ROKAMBA)
Scolopacidae	*Tringa nebularia*	common greenshank		Marine; Migratory (Bonn; CAMBA; JAMBA; ROKAMBA)
Scolopacidae	*Tringa stagnatilis*	marsh sandpiper		Marine; Migratory (Bonn; CAMBA; JAMBA; ROKAMBA)
Strigidae	*Ninox boobook*	southern boobook		Marine
Threskiornithidae	*Platalea flavipes*	yellow-billed spoonbill		
Threskiornithidae	*Platalea regia*	royal spoonbill		
Threskiornithidae	*Plegadis falcinellus*	glossy ibis		Marine; Migratory (Bonn; CAMBA)
Threskiornithidae	*Threskiornis molucca*	Australian white ibis		Marine
Threskiornithidae	*Threskiornis spinicollis*	straw-necked ibis		Marine
Timaliidae	*Zosterops lateralis*	silvereye		Marine
Turnicidae	*Turnix pyrrhothorax*	red-chested button-quail		
Turnicidae	*Turnix velox*	little button-quail		
Tytonidae	*Tyto javanica*	eastern barn owl		

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status
Mammals				
Bovidae	*Bos taurus*	European cattle	Introduced	
Canidae	*Canis familiaris*	dog	Introduced	
Canidae	*Canis lupus dingo*	dingo	Introduced	
Canidae	*Vulpes vulpes*	red fox	Introduced	
Dasyuridae	*Planigale maculata*	common planigale		
Dasyuridae	*Planigale tenuirostris*	narrow-nosed planigale		
Dasyuridae	*Sminthopsis macroura*	stripe-faced dunnart		
Dasyuridae	*Sminthopsis murina*	common dunnart		
Emballonuridae	*Saccolaimus flaviventris*	yellow-bellied sheathtail bat		
Equidae	*Equus caballus*	horse	Introduced	
Felidae	*Felis catus*	cat	Introduced	
Leporidae	*Oryctolagus cuniculus*	rabbit	Introduced	
Macropodidae	*Lagorchestes conspicillatus*	spectacled hare-wallaby		
Macropodidae	*Macropus dorsalis*	black-striped wallaby		
Macropodidae	*Macropus giganteus*	eastern grey kangaroo		
Macropodidae	*Macropus robustus*	common wallaroo		
Macropodidae	*Macropus rufogriseus*	red-necked wallaby		
Macropodidae	*Macropus rufus*	red kangaroo		
Macropodidae	*Wallabia bicolor*	swamp wallaby		
Molossidae	*Chaerephon jobensis*	northern freetail bat		
Molossidae	*Mormopterus beccarii*	Beccari's freetail bat		
Molossidae	*Mormopterus planiceps*	southern freetail bat		
Molossidae	*Tadarida australis*	white-striped freetail bat		
Muridae	*Leggadina lakedownensis*	Lakeland Downs mouse		
Muridae	*Pseudomys delicatulus*	delicate mouse		
Muridae	*Pseudomys desertor*	desert mouse		
Muridae	*Pseudomys gracilicaudatus*	eastern chestnut mouse		
Muridae	*Pseudomys patrius*	eastern pebble-mound mouse		
Muridae	*Mus musculus*	house mouse	Introduced	
Peramelidae	*Isoodon macrourus*	northern brown bandicoot		
Peramelidae	*Macrotis lagotis*	greater bilby	Endangered	Vulnerable
Petauridae	*Petaurus breviceps*	sugar glider		
Petauridae	*Petaurus norfolcensis*	squirrel glider		
Phalangeridae	*Trichosurus vulpecula*	common brushtail possum		
Phascolarctidae	*Phascolarctos cinereus*	koala		
Potoroidae	*Aepyprymnus rufescens*	rufous bettong		
Pseudocheiridae	*Petauroides volans*	greater glider		
Pteropodidae	*Pteropus scapulatus*	little red flying-fox		
Suidae	*Sus scrofa*	pig	Introduced	
Tachyglossidae	*Tachyglossus aculeatus*	short-beaked echidna		
Vespertilionidae	*Chalinolobus gouldii*	Gould's wattled bat		
Vespertilionidae	*Chalinolobus morio*	chocolate wattled bat		
Vespertilionidae	*Chalinolobus nigrogriseus*	hoary wattled bat		
Vespertilionidae	*Nyctophilus geoffroyi*	lesser long-eared bat		
Vespertilionidae	*Scotorepens balstoni*	inland broad-nosed bat		
Vespertilionidae	*Scotorepens greyii*	little broad-nosed bat		
Vespertilionidae	*Scotorepens sanborni*	northern broad-nosed bat		
Vespertilionidae	*Vespadelus baverstocki*	inland forest bat		
Vespertilionidae	*Vespadelus finlaysoni*	Finlayson's cave bat		
Vespertilionidae	*Vespadelus troughtoni*	eastern cave bat		
Vespertilionidae	*Chalinolobus picatus*	little pied bat	Near threatened	
Vombatidae	*Lasiorhinus krefftii*	northern hairy-nosed wombat	Endangered	Endangered
Plants				
Ferns				
Adiantaceae	*Cheilanthes distans*	bristly cloak fern		
Adiantaceae	*Cheilanthes nudiuscula*			
Adiantaceae	*Cheilanthes sieberi*			
Azollaceae	*Azolla pinnata*	ferny azolla		
Marsileaceae	*Marsilea*			
Marsileaceae	*Marsilea hirsuta*	hairy nardoo		
Marsileaceae	*Marsilea mutica*	shiny nardoo		
Parkeriaceae	*Ceratopteris thalictroides*			
Polypodiaceae	*Lecanopteris sinuosa*			
Thelypteridaceae	*Cyclosorus interruptus*			
Higher Dicots				
Acanthaceae	*Brunoniella australis*	blue trumpet		
Acanthaceae	*Dipteracanthus australasicus*			

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Acanthaceae	*Dipteracanthus australasicus subsp. australasicus*			
Acanthaceae	*Dipteracanthus australasicus subsp. corynothecus*			
Acanthaceae	*Nelsonia campestris*			
Acanthaceae	*Pseuderanthemum tenellum*			
Acanthaceae	*Rostellularia adscendens*			
Acanthaceae	*Rostellularia adscendens var. clementii*			
Aizoaceae	*Trianthema sp. (Coorabulka R.W.Purdie 1404)*			
Aizoaceae	*Trianthema triquetra*	red spinach		
Aizoaceae	*Zaleya galericulata*			
Aizoaceae	*Zaleya galericulata subsp. galericulata*			
Amaranthaceae	*Achyranthes aspera*			
Amaranthaceae	*Alternanthera*			
Amaranthaceae	*Alternanthera angustifolia*			
Amaranthaceae	*Alternanthera denticulata var. micrantha*			
Amaranthaceae	*Alternanthera nana*	hairy joyweed		
Amaranthaceae	*Alternanthera nodiflora*	joyweed		
Amaranthaceae	*Alternanthera pungens*	khaki weed	Introduced	
Amaranthaceae	*Amaranthus*			
Amaranthaceae	*Amaranthus interruptus*			
Amaranthaceae	*Amaranthus mitchellii*	Boggabri weed		
Amaranthaceae	*Gomphrena*			
Amaranthaceae	*Gomphrena celosioides*	gomphrena weed	Introduced	
Amaranthaceae	*Gomphrena lanata*			
Amaranthaceae	*Gomphrena sp. (Doongmabulla E.J.Thompson+ GAL137)*			
Amaranthaceae	*Nyssanthes erecta*			
Amaranthaceae	*Ptilotus nobilis*			
Amaranthaceae	*Ptilotus nobilis subsp. nobilis*			
Amaranthaceae	*Ptilotus nobilis subsp. semilanatus*			
Amaranthaceae	*Ptilotus polystachyus*			
Apiaceae	*Eryngium fontanum*		Endangered	Endangered
Apiaceae	*Eryngium plantagineum*	long eryngium		
Apiaceae	*Platysace valida*			
Apocynaceae	*Alstonia constricta*	bitterbark		
Apocynaceae	*Carissa lanceolata*			
Apocynaceae	*Carissa ovata*	currantbush		
Apocynaceae	*Marsdenia viridiflora*			
Apocynaceae	*Marsdenia viridiflora subsp. viridiflora*			
Apocynaceae	*Parsonsia*			
Apocynaceae	*Parsonsia eucalyptophylla*	gargaloo		
Apocynaceae	*Parsonsia lanceolata*	northern silkpod		
Apocynaceae	*Parsonsia leichhardtii*	black silkpod		
Apocynaceae	*Sarcostemma viminale subsp. brunonianum*			
Apocynaceae	*Secamone elliptica*			
Araliaceae	*Hydrocotyle acutiloba*			
Araliaceae	*Hydrocotyle dipleura*		Vulnerable	
Asclepiadaceae	*Sarcostemma*			
Asteraceae	*Acanthospermum hispidum*	star burr	Introduced	
Asteraceae	*Acmella grandiflora var. brachyglossa*			
Asteraceae	*Aster subulatus*	wild aster	Introduced	
Asteraceae	*Asteraceae*			
Asteraceae	*Blumea mollis*			
Asteraceae	*Brachyscome*			
Asteraceae	*Calotis*			
Asteraceae	*Calotis sp. (Lake Buchanan J.Kemp+ 3384H)*			
Asteraceae	*Calotis xanthosioidea*			
Asteraceae	*Camptacra barbata*			
Asteraceae	*Centipeda*			
Asteraceae	*Centipeda minima*			

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Asteraceae	*Centipeda nidiformis*			
Asteraceae	*Chrysocephalum apiculatum*	yellow buttons		
Asteraceae	*Coronidium glutinosum*			
Asteraceae	*Cyanthillium cinereum*			
Asteraceae	*Eclipta platyglossa*			
Asteraceae	*Emilia sonchifolia var. sonchifolia*		Introduced	
Asteraceae	*Epaltes australis*	spreading nutheads		
Asteraceae	*Flaveria trinervia*		Introduced	
Asteraceae	*Minuria*			
Asteraceae	*Minuria integerrima*	smooth minuria		
Asteraceae	*Parthenium hysterophorus*	parthenium weed	Introduced	
Asteraceae	*Peripleura arida*			
Asteraceae	*Peripleura hispidula var. setosa*			
Asteraceae	*Peripleura scabra*		Near threatened	
Asteraceae	*Pluchea baccharoides*	narrow-leaved plains bush		
Asteraceae	*Pluchea dentex*	bowl daisy		
Asteraceae	*Pluchea dioscoridis*			
Asteraceae	*Pluchea ferdinandi-muelleri*			
Asteraceae	*Pluchea rubelliflora*			
Asteraceae	*Pterocaulon serrulatum*			
Asteraceae	*Pterocaulon serrulatum var. serrulatum*			
Asteraceae	*Pterocaulon sp. (Yarrowmere Station E.J.Thompson + BUC340)*			
Asteraceae	*Pterocaulon sphacelatum*	applebush		
Asteraceae	*Senecio depressicola*			
Asteraceae	*Sphaeranthus indicus*			
Asteraceae	*Streptoglossa*			
Asteraceae	*Streptoglossa adscendens*	desert daisy		
Asteraceae	*Streptoglossa bubakii*			
Asteraceae	*Streptoglossa odora*			
Asteraceae	*Verbesina encelioides*	crownbeard	Introduced	
Asteraceae	*Vittadinia*			
Asteraceae	*Vittadinia cuneata*			
Asteraceae	*Vittadinia pustulata*			
Asteraceae	*Wedelia spilanthoides*			
Asteraceae	*Xanthium occidentale*		Introduced	
Bignoniaceae	*Pandorea pandorana*	wonga vine		
Boraginaceae	*Ehretia membranifolia*	weeping koda		
Boraginaceae	*Ehretia saligna*			
Boraginaceae	*Heliotropium cunninghamii*			
Boraginaceae	*Heliotropium curassavicum*	smooth heliotrope	Introduced	
Boraginaceae	*Heliotropium geocharis*			
Boraginaceae	*Heliotropium moorei*			
Boraginaceae	*Heliotropium ovalifolium*			
Boraginaceae	*Heliotropium peninsulare*			
Boraginaceae	*Heliotropium tenuifolium*			
Boraginaceae	*Trichodesma zeylanicum*			
Boraginaceae	*Trichodesma zeylanicum var. zeylanicum*			
Byttneriaceae	*Keraudrenia collina*			
Byttneriaceae	*Keraudrenia hookeriana*			
Byttneriaceae	*Keraudrenia integrifolia*			
Byttneriaceae	*Keraudrenia nephrosperma*			
Byttneriaceae	*Seringia corollata*			
Byttneriaceae	*Waltheria indica*			
Cactaceae	*Harrisia martini*		Introduced	
Cactaceae	*Opuntia*			
Cactaceae	*Opuntia tomentosa*	velvety tree pear	Introduced	
Caesalpiniaceae	*Cassia brewsteri*			
Caesalpiniaceae	*Chamaecrista absus*		Introduced	
Caesalpiniaceae	*Chamaecrista absus var. absus*			
Caesalpiniaceae	*Chamaecrista mimosoides*	dwarf cassia		
Caesalpiniaceae	*Chamaecrista nomame var. nomame*			
Caesalpiniaceae	*Labichea rupestris*			
Caesalpiniaceae	*Lysiphyllum*			

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Caesalpiniaceae	*Lysiphyllum carronii*	ebony tree		
Caesalpiniaceae	*Lysiphyllum hookeri*	Queensland ebony		
Caesalpiniaceae	*Petalostylis labicheoides*			
Caesalpiniaceae	*Senna*			
Caesalpiniaceae	*Senna artemisioides*			
Caesalpiniaceae	*Senna artemisioides subsp. artemisioides*			
Caesalpiniaceae	*Senna artemisioides subsp. coriacea*			
Caesalpiniaceae	*Senna artemisioides subsp. filifolia*			
Caesalpiniaceae	*Senna artemisioides subsp. oligophylla*			
Caesalpiniaceae	*Senna artemisioides subsp. sturtii*			
Caesalpiniaceae	*Senna artemisioides subsp. zygophylla*			
Caesalpiniaceae	*Senna circinnata*			
Caesalpiniaceae	*Senna costata*			
Caesalpiniaceae	*Senna notabilis*			
Caesalpiniaceae	*Senna planitiicola*			
Campanulaceae	*Isotoma*			
Campanulaceae	*Wahlenbergia*			
Campanulaceae	*Wahlenbergia queenslandica*			
Campanulaceae	*Wahlenbergia tumidifructa*			
Capparaceae	*Apophyllum anomalum*	broom bush		
Capparaceae	*Capparis canescens*			
Capparaceae	*Capparis lasiantha*	nipan		
Capparaceae	*Capparis loranthifolia*			
Capparaceae	*Capparis mitchellii*			
Capparaceae	*Capparis umbonata*			
Caryophyllaceae	*Polycarpaea corymbosa*			
Caryophyllaceae	*Polycarpaea multicaulis*			
Caryophyllaceae	*Polycarpaea spirostylis subsp. compacta*			
Casuarinaceae	*Casuarina cristata*	belah		
Celastraceae	*Denhamia oleaster*			
Celastraceae	*Elaeodendron australe var. integrifolium*			
Celastraceae	*Maytenus cunninghamii*	yellow berry bush		
Chenopodiaceae	*Atriplex*			
Chenopodiaceae	*Atriplex lindleyi*			
Chenopodiaceae	*Atriplex lindleyi subsp. lindleyi*			
Chenopodiaceae	*Atriplex muelleri*	lagoon saltbush		
Chenopodiaceae	*Atriplex sp. (Doongmabulla Homestead E.J.Thompson+ GAL20)*			
Chenopodiaceae	*Chenopodium auricomum*			
Chenopodiaceae	*Chenopodium carinatum*	green crumbweed		
Chenopodiaceae	*Chenopodium cristatum*	crested goosefoot		
Chenopodiaceae	*Dissocarpus biflorus var. cephalocarpus*			
Chenopodiaceae	*Dissocarpus paradoxus*	cannonball burr		
Chenopodiaceae	*Dissocarpus sp. (Doongmabulla E.J.Thompson+ GAL21)*			
Chenopodiaceae	*Dysphania melanocarpa forma melanocarpa*			
Chenopodiaceae	*Dysphania plantaginella*			
Chenopodiaceae	*Einadia*			
Chenopodiaceae	*Einadia hastata*			
Chenopodiaceae	*Einadia nutans*			
Chenopodiaceae	*Einadia nutans subsp. linifolia*			
Chenopodiaceae	*Einadia nutans subsp. nutans*			
Chenopodiaceae	*Einadia trigonos*			
Chenopodiaceae	*Einadia trigonos subsp. stellulata*			
Chenopodiaceae	*Enchylaena tomentosa*			
Chenopodiaceae	*Eremophea spinosa*			
Chenopodiaceae	*Maireana*			
Chenopodiaceae	*Maireana coronata*			

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Chenopodiaceae	*Maireana dichoptera*			
Chenopodiaceae	*Maireana georgei*			
Chenopodiaceae	*Maireana microphylla*			
Chenopodiaceae	*Maireana villosa*			
Chenopodiaceae	*Rhagodia spinescens*	thorny saltbush		
Chenopodiaceae	*Salsola kali*			
Chenopodiaceae	*Sclerolaena*			
Chenopodiaceae	*Sclerolaena anisacanthoides*	yellow burr		
Chenopodiaceae	*Sclerolaena bicornis*			
Chenopodiaceae	*Sclerolaena bicornis var. bicornis*			
Chenopodiaceae	*Sclerolaena bicornis var. horrida*			
Chenopodiaceae	*Sclerolaena birchii*	galvanised burr		
Chenopodiaceae	*Sclerolaena calcarata*	red burr		
Chenopodiaceae	*Sclerolaena convexula*			
Chenopodiaceae	*Sclerolaena diacantha*	grey copper burr		
Chenopodiaceae	*Sclerolaena everistiana*			
Chenopodiaceae	*Sclerolaena glabra*			
Chenopodiaceae	*Sclerolaena lanicuspis*			
Chenopodiaceae	*Sclerolaena muricata*			
Chenopodiaceae	*Sclerolaena muricata var. muricata*			
Chenopodiaceae	*Sclerolaena ramulosa*			
Chenopodiaceae	*Sclerolaena tetracuspis*	brigalow burr		
Chenopodiaceae	*Sclerolaena tricuspis*	giant red burr		
Chenopodiaceae	*Tecticornia indica*			
Chenopodiaceae	*Tecticornia pergranulata*			
Chenopodiaceae	*Tecticornia pergranulata subsp. divaricata*			
Cleomaceae	*Cleome tetrandra var. tetrandra*			
Cleomaceae	*Cleome viscosa*	tick-weed		
Clusiaceae	*Hypericum gramineum*			
Combretaceae	*Terminalia*			
Combretaceae	*Terminalia oblongata*			
Convolvulaceae	*Bonamia media*			
Convolvulaceae	*Bonamia media var. media*			
Convolvulaceae	*Convolvulus graminetinus*			
Convolvulaceae	*Cressa*			
Convolvulaceae	*Cressa australis*			
Convolvulaceae	*Cressa cretica*			
Convolvulaceae	*Dichondra repens*	kidney weed		
Convolvulaceae	*Evolvulus alsinoides*			
Convolvulaceae	*Ipomoea*			
Convolvulaceae	*Ipomoea gracilis*			
Convolvulaceae	*Ipomoea gracilis var. sagittata*			
Convolvulaceae	*Ipomoea lonchophylla*			
Convolvulaceae	*Ipomoea plebeia*	bellvine		
Convolvulaceae	*Ipomoea polymorpha*			
Convolvulaceae	*Jacquemontia sp. (Fairview R.W.Johnson 4026)*			
Convolvulaceae	*Polymeria calycina*	pink bindweed		
Convolvulaceae	*Polymeria longifolia*	polymeria		
Convolvulaceae	*Polymeria marginata*			
Convolvulaceae	*Polymeria pusilla*			
Erythroxylaceae	*Erythroxylum australe*	cocaine tree		
Euphorbiaceae	*Beyeria viscosa*			
Euphorbiaceae	*Chamaesyce*			
Euphorbiaceae	*Chamaesyce coghlanii*			
Euphorbiaceae	*Chamaesyce dallachyana*	mat spurge		
Euphorbiaceae	*Chamaesyce drummondii*	caustic-weed		
Euphorbiaceae	*Chamaesyce mitchelliana*			
Euphorbiaceae	*Chamaesyce petala*			
Euphorbiaceae	*Euphorbia*			
Euphorbiaceae	*Euphorbia parvicaruncula*	rough-seeded spurge		
Euphorbiaceae	*Euphorbia stevenii*	bottle tree spurge		
Euphorbiaceae	*Euphorbia tannensis*			
Euphorbiaceae	*Euphorbia tannensis subsp. eremophila*			
Euphorbiaceae	*Microstachys chamaelea*			

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Fabaceae	*Aeschynomene indica*	budda pea		
Fabaceae	*Aphyllodium biarticulatum*			
Fabaceae	*Cajanus acutifolius*			
Fabaceae	*Cajanus marmoratus*			
Fabaceae	*Cajanus reticulatus var. reticulatus*			
Fabaceae	*Cajanus scarabaeoides*			
Fabaceae	*Cajanus scarabaeoides var. scarabaeoides*			
Fabaceae	*Crotalaria*			
Fabaceae	*Crotalaria dissitiflora*			
Fabaceae	*Crotalaria dissitiflora subsp. dissitiflora*			
Fabaceae	*Crotalaria medicaginea*	trefoil rattlepod		
Fabaceae	*Cullen cinereum*			
Fabaceae	*Desmodium campylocaulon*			
Fabaceae	*Desmodium filiforme*			
Fabaceae	*Desmodium muelleri*			
Fabaceae	*Gastrolobium grandiflorum*			
Fabaceae	*Glycine clandestina*			
Fabaceae	*Glycine falcata*			
Fabaceae	*Glycine tomentella*	woolly glycine		
Fabaceae	*Hovea lanceolata*			
Fabaceae	*Indigastrum parviflorum*			
Fabaceae	*Indigofera australis*			
Fabaceae	*Indigofera brevidens var. brevidens*			
Fabaceae	*Indigofera colutea*	sticky indigo		
Fabaceae	*Indigofera haplophylla*			
Fabaceae	*Indigofera linifolia*			
Fabaceae	*Indigofera linnaei*	Birdsville indigo		
Fabaceae	*Indigofera pratensis*			
Fabaceae	*Indigofera trita*			
Fabaceae	*Jacksonia ramosissima*			
Fabaceae	*Jacksonia rhadinoclona*	Miles dogwood		
Fabaceae	*Leptosema oxylobioides*			
Fabaceae	*Lotus cruentus*	red-flowered lotus		
Fabaceae	*Rhynchosia minima*			
Fabaceae	*Rhynchosia minima var. australis*			
Fabaceae	*Sesbania campylocarpa*			
Fabaceae	*Sesbania cannabina*			
Fabaceae	*Stylosanthes*			
Fabaceae	*Stylosanthes scabra*		Introduced	
Fabaceae	*Swainsona affinis*			
Fabaceae	*Swainsona swainsonioides*	downy swainsona		
Fabaceae	*Tephrosia barbatala*			
Fabaceae	*Tephrosia brachycarpa*			
Fabaceae	*Tephrosia brachyodon*			
Fabaceae	*Tephrosia filipes subsp. filipes*			
Fabaceae	*Tephrosia juncea*			
Fabaceae	*Tephrosia leptoclada*			
Fabaceae	*Tephrosia purpurea*			
Fabaceae	*Tephrosia purpurea var. sericea*			
Fabaceae	*Tephrosia sp. (Copperfield River P.I.Forster PIF14768)*			
Fabaceae	*Tephrosia sp. (Lake Buchanan E.J.Thompson+ BUC2128)*			
Fabaceae	*Tephrosia supina*			
Fabaceae	*Vigna lanceolata*			
Fabaceae	*Vigna luteola*	dalrymple vigna	Introduced	
Fabaceae	*Vigna vexillata var. angustifolia*			
Fabaceae	*Zornia adenophora*			
Fabaceae	*Zornia areolata*			
Fabaceae	*Zornia dyctiocarpa*			
Fabaceae	*Zornia muriculata*			
Gentianaceae	*Schenkia australis*			
Goodeniaceae	*Goodenia*			

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Goodeniaceae	*Goodenia byrnesii*			
Goodeniaceae	*Goodenia glabra*			
Goodeniaceae	*Goodenia gracilis*			
Goodeniaceae	*Goodenia grandiflora*			
Goodeniaceae	*Goodenia hederacea*			
Goodeniaceae	*Goodenia hirsuta*			
Goodeniaceae	*Goodenia lunata*			
Goodeniaceae	*Goodenia paniculata*			
Goodeniaceae	*Goodenia rosulata*			
Goodeniaceae	*Goodenia splendida*			
Goodeniaceae	*Goodenia strangfordii*			
Goodeniaceae	*Goodenia viridula*			
Goodeniaceae	*Scaevola spinescens*	prickly fan flower		
Haloragaceae	*Myriophyllum artesium*		Endangered	
Lamiaceae	*Basilicum polystachyon*			
Lamiaceae	*Clerodendrum floribundum*			
Lamiaceae	*Ocimum tenuiflorum*			
Lamiaceae	*Plectranthus parviflorus*			
Lamiaceae	*Prostanthera leichhardtii*			
Lamiaceae	*Prostanthera parvifolia*			
Lentibulariaceae	*Utricularia caerulea*	blue bladderwort		
Lentibulariaceae	*Utricularia dichotoma*	fairy aprons		
Lentibulariaceae	*Utricularia gibba*	floating bladderwort		
Loranthaceae	*Amyema maidenii subsp. angustifolia*			
Loranthaceae	*Amyema quandang*			
Loranthaceae	*Amyema quandang var. bancroftii*	broad-leaved grey mistletoe		
Loranthaceae	*Amyema quandang var. quandang*			
Loranthaceae	*Dendrophthoe glabrescens*			
Loranthaceae	*Diplatia grandibractea*			
Loranthaceae	*Lysiana spathulata subsp. parvifolia*			
Loranthaceae	*Lysiana subfalcata*			
Lythraceae	*Ammannia multiflora*	jerry-jerry		
Lythraceae	*Nesaea robertsii*		Endangered	
Malvaceae	*Abelmoschus ficulneus*	native rosella		
Malvaceae	*Abutilon*			
Malvaceae	*Abutilon arenarium*			
Malvaceae	*Abutilon calliphyllum*	velvet lanternflower		
Malvaceae	*Abutilon fraseri*	dwarf lantern flower		
Malvaceae	*Abutilon fraseri subsp. fraseri*			
Malvaceae	*Abutilon malvifolium*	bastard marshmallow		
Malvaceae	*Abutilon otocarpum*			
Malvaceae	*Abutilon oxycarpum*			
Malvaceae	*Abutilon oxycarpum var. subsagittatum*			
Malvaceae	*Gossypium australe*			
Malvaceae	*Herissantia crispa*			
Malvaceae	*Hibiscus brachychlaenus*			
Malvaceae	*Hibiscus brachysiphonius*			
Malvaceae	*Hibiscus krichauffianus*			
Malvaceae	*Hibiscus meraukensis*	Merauke hibiscus		
Malvaceae	*Hibiscus sturtii*			
Malvaceae	*Hibiscus sturtii var. campylochlamys*			
Malvaceae	*Hibiscus trionum*		Introduced	
Malvaceae	*Hibiscus trionum var. trionum*		Introduced	
Malvaceae	*Hibiscus trionum var. vesicarius*			
Malvaceae	*Lawrencia buchananensis*		Vulnerable	Vulnerable
Malvaceae	*Malvaceae*			
Malvaceae	*Malvastrum americanum*		Introduced	
Malvaceae	*Malvastrum americanum var. americanum*		Introduced	
Malvaceae	*Sida*			
Malvaceae	*Sida aprica*			
Malvaceae	*Sida aprica var. solanacea*			
Malvaceae	*Sida atherophora*			
Malvaceae	*Sida brachypoda*			

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Malvaceae	*Sida cordifolia*		Introduced	
Malvaceae	*Sida everistiana*			
Malvaceae	*Sida fibulifera*			
Malvaceae	*Sida filiformis*			
Malvaceae	*Sida goniocarpa*			
Malvaceae	*Sida rhombifolia*		Introduced	
Malvaceae	*Sida rohlenae*			
Malvaceae	*Sida rohlenae subsp. rohlenae*			
Malvaceae	*Sida sp. (Aramac E.J.Thompson+ JER192)*			
Malvaceae	*Sida sp. (Charters Towers E.J.THompson+ CHA456)*			
Malvaceae	*Sida sp. (Laglan Station L.S.Smith 10325)*			
Malvaceae	*Sida sp. (Musselbrook M.B.Thomas+ MRS437)*			
Malvaceae	*Sida spinosa*	spiny sida	Introduced	
Malvaceae	*Sida trichopoda*			
Malvaceae	*Sida trichopoda var. (Palardo S.T.Blake 7600)*			
Meliaceae	*Owenia acidula*	emu apple		
Mimosaceae	*Acacia*			
Mimosaceae	*Acacia adsurgens*			
Mimosaceae	*Acacia argyraea*			
Mimosaceae	*Acacia argyrodendron*			
Mimosaceae	*Acacia bancroftiorum*			
Mimosaceae	*Acacia bidwillii*			
Mimosaceae	*Acacia cambagei*	gidgee		
Mimosaceae	*Acacia catenulata*	bendee		
Mimosaceae	*Acacia coriacea*			
Mimosaceae	*Acacia cowleana*			
Mimosaceae	*Acacia decora*	pretty wattle		
Mimosaceae	*Acacia dietrichiana*			
Mimosaceae	*Acacia excelsa*			
Mimosaceae	*Acacia excelsa subsp. excelsa*			
Mimosaceae	*Acacia farnesiana*	mimosa bush	Introduced	
Mimosaceae	*Acacia flavescens*	toothed wattle		
Mimosaceae	*Acacia galioides*			
Mimosaceae	*Acacia harpophylla*	brigalow		
Mimosaceae	*Acacia holosericea*			
Mimosaceae	*Acacia holosericea var. holosericea*			
Mimosaceae	*Acacia hyaloneura*			
Mimosaceae	*Acacia laccata*			
Mimosaceae	*Acacia lazaridis*			
Mimosaceae	*Acacia leptostachya*	Townsville wattle		
Mimosaceae	*Acacia longispicata*			
Mimosaceae	*Acacia melleodora*			
Mimosaceae	*Acacia microcybe*			
Mimosaceae	*Acacia multisiliqua*			
Mimosaceae	*Acacia orthocarpa*			
Mimosaceae	*Acacia oswaldii*	miljee		
Mimosaceae	*Acacia platycarpa*			
Mimosaceae	*Acacia salicina*	doolan		
Mimosaceae	*Acacia sericophylla*			
Mimosaceae	*Acacia shirleyi*	lancewood		
Mimosaceae	*Acacia simsii*			
Mimosaceae	*Acacia sp. (Urandangie L.Pedley 2025)*			
Mimosaceae	*Acacia stenophylla*	belalie		
Mimosaceae	*Acacia stipuligera*			
Mimosaceae	*Acacia tenuissima*			
Mimosaceae	*Acacia torulosa*			
Mimosaceae	*Acacia victoriae*			
Mimosaceae	*Archidendropsis basaltica*	red lancewood		
Mimosaceae	*Neptunia dimorphantha*			
Mimosaceae	*Neptunia gracilis forma gracilis*			
Molluginaceae	*Glinus lotoides*	hairy carpet weed		

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status
Molluginaceae	*Mollugo cerviana*			
Moraceae	*Ficus microcarpa var. hillii*			
Myoporaceae	*Eremophila*			
Myoporaceae	*Eremophila bignoniiflora*	eurah		
Myoporaceae	*Eremophila deserti*			
Myoporaceae	*Eremophila latrobei*			
Myoporaceae	*Eremophila longifolia*	berrigan		
Myoporaceae	*Eremophila maculata*			
Myoporaceae	*Eremophila maculata subsp. maculata*			
Myoporaceae	*Eremophila mitchellii*			
Myoporaceae	*Eremophila polyclada*	flowering lignum		
Myoporaceae	*Myoporum*			
Myoporaceae	*Myoporum montanum*	boobialla		
Myrtaceae	*Calytrix microcoma*			
Myrtaceae	*Corymbia aparrerinja - C.dallachiana (Benth.)*			
Myrtaceae	*Corymbia brachycarpa*			
Myrtaceae	*Corymbia brachycarpa x C.plena*			
Myrtaceae	*Corymbia clarksoniana*			
Myrtaceae	*Corymbia dallachiana*			
Myrtaceae	*Corymbia erythrophloia*	variable-barked bloodwood		
Myrtaceae	*Corymbia lamprophylla*			
Myrtaceae	*Corymbia leichhardtii*	rustyjacket		
Myrtaceae	*Corymbia papuana*	ghost gum		
Myrtaceae	*Corymbia plena*			
Myrtaceae	*Corymbia setosa*			
Myrtaceae	*Corymbia setosa subsp. pedicellaris*			
Myrtaceae	*Corymbia terminalis*			
Myrtaceae	*Corymbia tessellaris*	Moreton Bay ash		
Myrtaceae	*Eucalyptus brownii*	Reid River box		
Myrtaceae	*Eucalyptus brownii - E.populnea*			
Myrtaceae	*Eucalyptus camaldulensis*			
Myrtaceae	*Eucalyptus camaldulensis subsp. acuta*			
Myrtaceae	*Eucalyptus cambageana*	Dawson gum		
Myrtaceae	*Eucalyptus coolabah*	coolabah		
Myrtaceae	*Eucalyptus crebra*	narrow-leaved red ironbark		
Myrtaceae	*Eucalyptus drepanophylla*			
Myrtaceae	*Eucalyptus melanophloia*			
Myrtaceae	*Eucalyptus melanophloia - E.whitei*			
Myrtaceae	*Eucalyptus microtheca*	coolibah		
Myrtaceae	*Eucalyptus persistens*			
Myrtaceae	*Eucalyptus populnea*	poplar box		
Myrtaceae	*Eucalyptus similis*	Queensland yellowjacket		
Myrtaceae	*Eucalyptus socialis subsp. eucentrica*			
Myrtaceae	*Eucalyptus thozetiana*			
Myrtaceae	*Eucalyptus whitei*	White's ironbark		
Myrtaceae	*Eucalyptus xanthoclada*	yellow-branched ironbark		
Myrtaceae	*Leptospermum lamellatum*			
Myrtaceae	*Lithomyrtus microphylla*			
Myrtaceae	*Melaleuca fluviatilis*			
Myrtaceae	*Melaleuca foliolosa*			
Myrtaceae	*Melaleuca leucadendra*	broad-leaved tea-tree		
Myrtaceae	*Melaleuca linariifolia*	snow-in summer		
Myrtaceae	*Melaleuca nervosa*			
Myrtaceae	*Melaleuca nervosa subsp. nervosa*			
Myrtaceae	*Melaleuca pallescens*			
Myrtaceae	*Melaleuca tamariscina*			
Myrtaceae	*Melaleuca uncinata*			
Myrtaceae	*Thryptomene parviflora*			
Nyctaginaceae	*Boerhavia burbidgeana*			
Nyctaginaceae	*Boerhavia coccinea*			
Nyctaginaceae	*Boerhavia diffusa*			
Nyctaginaceae	*Boerhavia dominii*			

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Nyctaginaceae	*Boerhavia paludosa*			
Nyctaginaceae	*Boerhavia pubescens*			
Oleaceae	*Jasminum didymum*			
Oleaceae	*Jasminum didymum subsp. didymum*			
Oleaceae	*Jasminum didymum subsp. racemosum*			
Oleaceae	*Jasminum simplicifolium subsp. australiense*			
Oleaceae	*Notelaea microcarpa*			
Oleaceae	*Notelaea microcarpa var. microcarpa*			
Onagraceae	*Ludwigia octovalvis*	willow primrose		
Onagraceae	*Ludwigia perennis*			
Oxalidaceae	*Oxalis corniculata*		Introduced	
Oxalidaceae	*Oxalis perennans*			
Oxalidaceae	*Oxalis radicosa*			
Pentapetaceae	*Melhania oblongifolia*			
Pentapetaceae	*Melhania ovata*			
Phyllanthaceae	*Breynia oblongifolia*			
Phyllanthaceae	*Flueggea leucopyrus*			
Phyllanthaceae	*Phyllanthus*			
Phyllanthaceae	*Phyllanthus carpentariae*			
Phyllanthaceae	*Phyllanthus fuernrohrii*			
Phyllanthaceae	*Phyllanthus maderaspatensis*			
Phyllanthaceae	*Phyllanthus virgatus*			
Phyllanthaceae	*Poranthera microphylla*	small poranthera		
Phyllanthaceae	*Sauropus elachophyllus*			
Phyllanthaceae	*Sauropus trachyspermus*			
Picrodendraceae	*Petalostigma banksii*			
Picrodendraceae	*Petalostigma pubescens*	quinine tree		
Pittosporaceae	*Bursaria incana*			
Pittosporaceae	*Pittosporum*			
Plumbaginaceae	*Plumbago zeylanica*	native plumbago		
Polygalaceae	*Comesperma pallidum*			
Polygalaceae	*Polygala isingii*			
Polygalaceae	*Polygala linariifolia*			
Polygalaceae	*Polygala sp. (Georgetown K.R.McDonald KRM673)*			
Polygalaceae	*Polygala sp. (White Mountains M.B.Thomas+ 1738)*			
Polygonaceae	*Muehlenbeckia florulenta*	lignum		
Polygonaceae	*Persicaria attenuata*			
Polygonaceae	*Persicaria decipiens*	slender knotweed		
Polygonaceae	*Persicaria lapathifolia*	pale knotweed		
Portulacaceae	*Calandrinia ptychosperma*			
Portulacaceae	*Portulaca australis*			
Portulacaceae	*Portulaca bicolor*			
Portulacaceae	*Portulaca filifolia*			
Portulacaceae	*Portulaca oleracea*	pigweed	Introduced	
Portulacaceae	*Portulaca oligosperma*			
Portulacaceae	*Portulaca pilosa*		Introduced	
Portulacaceae	*Portulaca pilosa subsp. pilosa*		Introduced	
Proteaceae	*Grevillea*			
Proteaceae	*Grevillea decora subsp. decora*			
Proteaceae	*Grevillea glauca*	bushy's clothes peg		
Proteaceae	*Grevillea parallela*			
Proteaceae	*Grevillea pteridifolia*	golden parrot tree		
Proteaceae	*Grevillea sessilis*			
Proteaceae	*Grevillea striata*	beefwood		
Proteaceae	*Hakea*			
Proteaceae	*Hakea leucoptera*			
Proteaceae	*Hakea leucoptera subsp. leucoptera*			
Proteaceae	*Hakea leucoptera subsp. sericipes*			
Proteaceae	*Hakea lorea*			
Proteaceae	*Persoonia falcata*			
Rhamnaceae	*Alphitonia excelsa*	soap tree		
Rhamnaceae	*Ventilago viminalis*	supplejack		

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Rubiaceae	*Dentella repens*	dentella		
Rubiaceae	*Everistia vacciniifolia*			
Rubiaceae	*Hedyotis*			
Rubiaceae	*Oldenlandia*			
Rubiaceae	*Oldenlandia galioides*			
Rubiaceae	*Oldenlandia mitrasacmoides*			
Rubiaceae	*Oldenlandia mitrasacmoides subsp. mitrasacmoides*			
Rubiaceae	*Oldenlandia mitrasacmoides subsp. nigricans*			
Rubiaceae	*Oldenlandia mitrasacmoides subsp. trachymenoides*			
Rubiaceae	*Pogonolobus reticulatus*			
Rubiaceae	*Pomax umbellata*			
Rubiaceae	*Psydrax attenuata*			
Rubiaceae	*Psydrax attenuata forma megalantha*			
Rubiaceae	*Psydrax forsteri*			
Rubiaceae	*Psydrax odorata*			
Rubiaceae	*Psydrax odorata forma buxifolia*			
Rubiaceae	*Psydrax oleifolia*			
Rubiaceae	*Psydrax saligna forma saligna*			
Rubiaceae	*Spermacoce baileyana*			
Rubiaceae	*Spermacoce brachystema*			
Rutaceae	*Citrus glauca*			
Rutaceae	*Flindersia dissosperma*			
Rutaceae	*Flindersia maculosa*	leopardwood		
Rutaceae	*Geijera parviflora*	wilga		
Rutaceae	*Geijera salicifolia*	brush wilga		
Santalaceae	*Anthobolus leptomerioides*			
Santalaceae	*Exocarpos sparteus*	slender cherry		
Santalaceae	*Santalum lanceolatum*			
Sapindaceae	*Alectryon diversifolius*	scrub boonaree		
Sapindaceae	*Alectryon oleifolius*			
Sapindaceae	*Alectryon oleifolius subsp. elongatus*			
Sapindaceae	*Atalaya hemiglauca*			
Sapindaceae	*Atalaya salicifolia*			
Sapindaceae	*Distichostemon dodecandrus*			
Sapindaceae	*Dodonaea filifolia*			
Sapindaceae	*Dodonaea lanceolata var. lanceolata*			
Sapindaceae	*Dodonaea lanceolata var. subsessilifolia*			
Sapindaceae	*Dodonaea stenophylla*			
Sapindaceae	*Dodonaea tenuifolia*			
Sapindaceae	*Dodonaea viscosa*			
Sapindaceae	*Dodonaea viscosa subsp. angustissima*			
Scrophulariaceae	*Buchnera linearis*			
Scrophulariaceae	*Buchnera ramosissima*			
Scrophulariaceae	*Lindernia scapigera*			
Scrophulariaceae	*Mimulus repens*	creeping monkey flower		
Scrophulariaceae	*Peplidium*			
Scrophulariaceae	*Peplidium foecundum*			
Scrophulariaceae	*Scoparia dulcis*	Scoparia	Introduced	
Scrophulariaceae	*Stemodia glabella*			
Solanaceae	*Nicotiana forsteri*			
Solanaceae	*Nicotiana megalosiphon*			
Solanaceae	*Solanum*			
Solanaceae	*Solanum cleistogamum*			
Solanaceae	*Solanum crebrispinum*			
Solanaceae	*Solanum ellipticum*	potato bush		
Solanaceae	*Solanum esuriale*	quena		
Solanaceae	*Solanum nodiflorum*		Introduced	
Solanaceae	*Solanum parvifolium*			
Solanaceae	*Solanum parvifolium subsp. parvifolium*			
Sparrmanniaceae	*Corchorus*			
Sparrmanniaceae	*Corchorus tomentellus*			

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Sparrmanniaceae	*Grewia latifolia*	dysentery plant		
Sparrmanniaceae	*Grewia retusifolia*			
Sparrmanniaceae	*Triumfetta pentandra*		Introduced	
Stackhousiaceae	*Stackhousia viminea*	slender stackhousia		
Sterculiaceae	*Brachychiton populneus subsp. trilobus*			
Stylidiaceae	*Stylidium adenophorum*			
Stylidiaceae	*Stylidium eglandulosum*			
Stylidiaceae	*Stylidium eriorhizum*			
Stylidiaceae	*Stylidium velleioides*			
Thymelaeaceae	*Thecanthes sanguinea*			
Verbenaceae	*Verbena macrostachya*			
Violaceae	*Hybanthus*			
Violaceae	*Hybanthus enneaspermus*			
Zygophyllaceae	*Tribulopis angustifolia*			
Zygophyllaceae	*Tribulus*			
Zygophyllaceae	*Tribulus terrestris*	caltrop		
Lower dicots				
Aristolochiaceae	*Aristolochia*			
Lauraceae	*Cassytha filiformis*	dodder laurel		
Lauraceae	*Cassytha pubescens*	downy devil's twine		
Nymphaeaceae	*Nymphaea gigantea*			
Papaveraceae	*Argemone mexicana*	prickly poppy	Introduced	
Papaveraceae	*Papaver aculeatum*	bristle poppy	Introduced	
Monocots				
Alismataceae	*Caldesia oligococca*			
Amaryllidaceae	*Calostemma luteum*			
Amaryllidaceae	*Crinum*			
Amaryllidaceae	*Crinum flaccidum*	Murray lily		
Asphodelaceae	*Bulbine bulbosa*	golden lily		
Commelinaceae	*Commelina*			
Commelinaceae	*Commelina diffusa*	wandering jew		
Commelinaceae	*Commelina lanceolata*			
Commelinaceae	*Cyanotis axillaris*			
Commelinaceae	*Murdannia graminea*	murdannia		
Cyperaceae	*Abildgaardia ovata*			
Cyperaceae	*Baumea rubiginosa*	soft twigrush		
Cyperaceae	*Bulbostylis barbata*			
Cyperaceae	*Cyperus*			
Cyperaceae	*Cyperus alterniflorus*			
Cyperaceae	*Cyperus betchei*			
Cyperaceae	*Cyperus betchei subsp. betchei*			
Cyperaceae	*Cyperus bifax*	western nutgrass		
Cyperaceae	*Cyperus bulbosus*			
Cyperaceae	*Cyperus concinnus*			
Cyperaceae	*Cyperus conicus*			
Cyperaceae	*Cyperus conicus var. conicus*			
Cyperaceae	*Cyperus dactylotes*			
Cyperaceae	*Cyperus difformis*	rice sedge		
Cyperaceae	*Cyperus exaltatus*	tall flatsedge		
Cyperaceae	*Cyperus flaccidus*			
Cyperaceae	*Cyperus flavidus*			
Cyperaceae	*Cyperus haspan subsp. haspan*			
Cyperaceae	*Cyperus iria*			
Cyperaceae	*Cyperus isabellinus*			
Cyperaceae	*Cyperus javanicus*			
Cyperaceae	*Cyperus laevigatus*			
Cyperaceae	*Cyperus laevis*			
Cyperaceae	*Cyperus pulchellus*			
Cyperaceae	*Cyperus rotundus*	nutgrass	Introduced	
Cyperaceae	*Cyperus sanguinolentus*			
Cyperaceae	*Cyperus squarrosus*	bearded flatsedge		
Cyperaceae	*Cyperus victoriensis*			
Cyperaceae	*Eleocharis atropurpurea*			
Cyperaceae	*Eleocharis equisetina*			
Cyperaceae	*Eleocharis pallens*	pale spikerush		
Cyperaceae	*Eleocharis plana*	ribbed spikerush		
Cyperaceae	*Fimbristylis*			

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Cyperaceae	*Fimbristylis aestivalis*			
Cyperaceae	*Fimbristylis depauperata*			
Cyperaceae	*Fimbristylis dichotoma*	common fringe-rush		
Cyperaceae	*Fimbristylis littoralis*			
Cyperaceae	*Fimbristylis macrantha*			
Cyperaceae	*Fimbristylis microcarya*			
Cyperaceae	*Fimbristylis neilsonii*			
Cyperaceae	*Fimbristylis nutans*			
Cyperaceae	*Fimbristylis rara*			
Cyperaceae	*Fimbristylis sp. (Lake Buchanan V.J.Neldner+ 3362)*			
Cyperaceae	*Fimbristylis vagans*		Near threatened	
Cyperaceae	*Fuirena ciliaris*			
Cyperaceae	*Fuirena umbellata*			
Cyperaceae	*Gahnia aspera*			
Cyperaceae	*Schoenoplectus dissachanthus*			
Cyperaceae	*Schoenoplectus erectus*		Introduced	
Cyperaceae	*Schoenoplectus laevis*			
Cyperaceae	*Schoenoplectus lateriflorus*			
Cyperaceae	*Schoenoplectus validus*			
Cyperaceae	*Schoenus falcatus*			
Cyperaceae	*Schoenus kennyi*			
Cyperaceae	*Scleria sphacelata*			
Cyperaceae	*Scleria tricuspidata*			
Eriocaulaceae	*Eriocaulon carsonii subsp. orientale*		Endangered	Endangered
Eriocaulaceae	*Eriocaulon cinereum*			
Eriocaulaceae	*Eriocaulon scariosum*			
Hemerocallidaceae	*Dianella longifolia*			
Hemerocallidaceae	*Dianella longifolia var. longifolia*			
Hemerocallidaceae	*Dianella longifolia var. stupata*			
Hypoxidaceae	*Hypoxis arillacea*			
Johnsoniaceae	*Caesia chlorantha*			
Johnsoniaceae	*Tricoryne elatior*	yellow autumn lily		
Juncaceae	*Juncus polyanthemus*			
Juncaceae	*Juncus usitatus*			
Juncaginaceae	*Triglochin dubium*			
Juncaginaceae	*Triglochin multifructum*			
Laxmanniaceae	*Lomandra confertifolia subsp. pallida*			
Laxmanniaceae	*Lomandra leucocephala*			
Laxmanniaceae	*Lomandra leucocephala subsp. leucocephala*			
Laxmanniaceae	*Lomandra multiflora subsp. multiflora*			
Laxmanniaceae	*Thysanotus*			
Laxmanniaceae	*Thysanotus tuberosus subsp. tuberosus*			
Orchidaceae	*Cadetia collinsii*		Near threatened	
Orchidaceae	*Cymbidium*			
Orchidaceae	*Cymbidium canaliculatum*			
Philesiaceae	*Petermannia*			
Poaceae	*Acrachne racemosa*			
Poaceae	*Alloteropsis cimicina*			
Poaceae	*Alloteropsis semialata*	cockatoo grass		
Poaceae	*Amphipogon caricinus*			
Poaceae	*Amphipogon caricinus var. caricinus*			
Poaceae	*Amphipogon sericeus*			
Poaceae	*Ancistrachne uncinulata*	hooky grass		
Poaceae	*Aristida*			
Poaceae	*Aristida benthamii*			
Poaceae	*Aristida benthamii var. benthamii*			
Poaceae	*Aristida biglandulosa*			
Poaceae	*Aristida burraensis*		Near threatened	
Poaceae	*Aristida calycina*			
Poaceae	*Aristida calycina var. calycina*			
Poaceae	*Aristida calycina var. praealta*			

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Poaceae	*Aristida helicophylla*			
Poaceae	*Aristida holathera*			
Poaceae	*Aristida holathera var. holathera*			
Poaceae	*Aristida hygrometrica*			
Poaceae	*Aristida inaequiglumis*			
Poaceae	*Aristida ingrata*			
Poaceae	*Aristida jerichoensis*			
Poaceae	*Aristida jerichoensis var. jerichoensis*			
Poaceae	*Aristida jerichoensis var. subspinulifera*			
Poaceae	*Aristida latifolia*	feathertop wiregrass		
Poaceae	*Aristida leptopoda*	white speargrass		
Poaceae	*Aristida pruinosa*			
Poaceae	*Aristida queenslandica var. dissimilis*			
Poaceae	*Aristida sciuroides*			
Poaceae	*Arundinella nepalensis*	reedgrass		
Poaceae	*Astrebla elymoides*	hoop mitchell grass		
Poaceae	*Astrebla lappacea*	curly mitchell grass		
Poaceae	*Astrebla pectinata*	barley mitchell grass		
Poaceae	*Astrebla squarrosa*	bull mitchell grass		
Poaceae	*Austrochloris*			
Poaceae	*Austrochloris dichanthioides*			
Poaceae	*Bothriochloa bladhii subsp. bladhii*			
Poaceae	*Bothriochloa decipiens*			
Poaceae	*Bothriochloa decipiens var. cloncurrensis*			
Poaceae	*Bothriochloa decipiens var. decipiens*			
Poaceae	*Bothriochloa erianthoides*	satintop grass		
Poaceae	*Bothriochloa ewartiana*	desert bluegrass		
Poaceae	*Bothriochloa pertusa*		Introduced	
Poaceae	*Brachyachne convergens*	common native couch		
Poaceae	*Brachyachne tenella*			
Poaceae	*Chloris*			
Poaceae	*Chloris divaricata var. divaricata*	slender chloris		
Poaceae	*Chloris gayana*	rhodes grass	Introduced	
Poaceae	*Chloris inflata*	purpletop chloris	Introduced	
Poaceae	*Chloris pectinata*	comb chloris		
Poaceae	*Chloris sp. (Edgbaston R.J.Fensham 5694)*			
Poaceae	*Chloris truncata*			
Poaceae	*Chloris ventricosa*	tall chloris		
Poaceae	*Chloris virgata*	feathertop rhodes grass	Introduced	
Poaceae	*Chrysopogon fallax*			
Poaceae	*Cleistochloa subjuncea*			
Poaceae	*Cymbopogon ambiguus*	lemon grass		
Poaceae	*Cymbopogon bombycinus*	silky oilgrass		
Poaceae	*Cymbopogon obtectus*			
Poaceae	*Cymbopogon refractus*	barbed-wire grass		
Poaceae	*Cynodon dactylon var. dactylon*		Introduced	
Poaceae	*Dactyloctenium*			
Poaceae	*Dactyloctenium aegyptium*	coast button grass	Introduced	
Poaceae	*Dactyloctenium buchananensis*			
Poaceae	*Dactyloctenium radulans*	button grass		
Poaceae	*Dichanthium*			
Poaceae	*Dichanthium annulatum*	sheda grass	Introduced	
Poaceae	*Dichanthium fecundum*	curly bluegrass		
Poaceae	*Dichanthium sericeum*			
Poaceae	*Dichanthium sericeum subsp. sericeum*			
Poaceae	*Digitaria*			
Poaceae	*Digitaria ammophila*	silky umbrella grass		
Poaceae	*Digitaria bicornis*			
Poaceae	*Digitaria breviglumis*			

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Poaceae	*Digitaria brownii*			
Poaceae	*Digitaria ciliaris*	summer grass	Introduced	
Poaceae	*Digitaria divaricatissima*	spreading umbrella grass		
Poaceae	*Digitaria gibbosa*			
Poaceae	*Digitaria hystrichoides*	umbrella grass		
Poaceae	*Digitaria longiflora*			
Poaceae	*Digitaria parviflora*			
Poaceae	*Digitaria ramularis*			
Poaceae	*Echinochloa colona*	awnless barnyard grass	Introduced	
Poaceae	*Echinochloa crus-galli*	barnyard grass	Introduced	
Poaceae	*Echinochloa inundata*	marsh millet		
Poaceae	*Echinochloa turneriana*	channel millet		
Poaceae	*Elionurus citreus*	lemon-scented grass		
Poaceae	*Elymus*			
Poaceae	*Elytrophorus spicatus*			
Poaceae	*Enneapogon*			
Poaceae	*Enneapogon avenaceus*			
Poaceae	*Enneapogon gracilis*	slender nineawn		
Poaceae	*Enneapogon lindleyanus*			
Poaceae	*Enneapogon pallidus*	conetop nineawn		
Poaceae	*Enneapogon polyphyllus*	leafy nineawn		
Poaceae	*Enneapogon robustissimus*			
Poaceae	*Enneapogon truncatus*			
Poaceae	*Enneapogon virens*			
Poaceae	*Enteropogon acicularis*	curly windmill grass		
Poaceae	*Enteropogon ramosus*			
Poaceae	*Enteropogon unispiceus*			
Poaceae	*Eragrostis*			
Poaceae	*Eragrostis basedowii*			
Poaceae	*Eragrostis brownii*	Brown's lovegrass		
Poaceae	*Eragrostis confertiflora*			
Poaceae	*Eragrostis cumingii*			
Poaceae	*Eragrostis elongata*			
Poaceae	*Eragrostis falcata*	sickle lovegrass		
Poaceae	*Eragrostis lacunaria*	purple lovegrass		
Poaceae	*Eragrostis lanicaulis*			
Poaceae	*Eragrostis leptocarpa*	drooping lovegrass		
Poaceae	*Eragrostis leptostachya*			
Poaceae	*Eragrostis microcarpa*			
Poaceae	*Eragrostis parviflora*	weeping lovegrass		
Poaceae	*Eragrostis pergracilis*			
Poaceae	*Eragrostis pilosa*	soft lovegrass	Introduced	
Poaceae	*Eragrostis schultzii*			
Poaceae	*Eragrostis setifolia*			
Poaceae	*Eragrostis sororia*			
Poaceae	*Eragrostis spartinoides*			
Poaceae	*Eragrostis speciosa*			
Poaceae	*Eragrostis tenellula*	delicate lovegrass		
Poaceae	*Eriachne*			
Poaceae	*Eriachne aristidea*			
Poaceae	*Eriachne benthamii*			
Poaceae	*Eriachne mucronata*			
Poaceae	*Eriachne obtusa*			
Poaceae	*Eriachne sp. (Dugald River B.K.Simon+ 3007)*			
Poaceae	*Eriochloa*			
Poaceae	*Eriochloa australiensis*			
Poaceae	*Eriochloa crebra*	spring grass		
Poaceae	*Eriochloa pseudoacrotricha*			
Poaceae	*Eulalia*			
Poaceae	*Eulalia aurea*	silky browntop		
Poaceae	*Heteropogon contortus*	black speargrass		
Poaceae	*Hymenachne amplexicaulis cv. Olive*		Introduced	
Poaceae	*Isachne globosa*	swamp millet		
Poaceae	*Ischaemum australe*			
Poaceae	*Ischaemum australe var. australe*			
Poaceae	*Ischaemum australe var. villosum*			
Poaceae	*Iseilema membranaceum*	small flinders grass		

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status
Poaceae	*Iseilema vaginiflorum*	red flinders grass		
Poaceae	*Leersia hexandra*	swamp rice grass		
Poaceae	*Leptochloa*			
Poaceae	*Leptochloa decipiens*			
Poaceae	*Leptochloa decipiens subsp. asthenes*			
Poaceae	*Leptochloa decipiens subsp. decipiens*			
Poaceae	*Leptochloa digitata*			
Poaceae	*Leptochloa divaricatissima*			
Poaceae	*Leptochloa fusca*	brown beetle grass		
Poaceae	*Leptochloa fusca subsp. fusca*			
Poaceae	*Melinis repens*	red natal grass	Introduced	
Poaceae	*Oxychloris scariosa*	winged chloris		
Poaceae	*Panicum*			
Poaceae	*Panicum decompositum*			
Poaceae	*Panicum decompositum var. decompositum*			
Poaceae	*Panicum effusum*			
Poaceae	*Panicum laevinode*	pepper grass		
Poaceae	*Panicum larcomianum*			
Poaceae	*Panicum simile*			
Poaceae	*Paspalidium*			
Poaceae	*Paspalidium albovillosum*			
Poaceae	*Paspalidium caespitosum*	brigalow grass		
Poaceae	*Paspalidium constrictum*			
Poaceae	*Paspalidium distans*	shotgrass		
Poaceae	*Paspalidium globoideum*	sago grass		
Poaceae	*Paspalidium gracile*	slender panic		
Poaceae	*Paspalidium jubiflorum*	warrego grass		
Poaceae	*Paspalidium rarum*			
Poaceae	*Paspalum dilatatum*	paspalum	Introduced	
Poaceae	*Paspalum distichum*	water couch		
Poaceae	*Paspalum vaginatum*	saltwater couch		
Poaceae	*Pennisetum alopecuroides*	swamp foxtail		
Poaceae	*Pennisetum ciliare*		Introduced	
Poaceae	*Pennisetum polystachion*	mission grass	Introduced	
Poaceae	*Pennisetum setigerum*		Introduced	
Poaceae	*Perotis rara*	comet grass		
Poaceae	*Poaceae*			
Poaceae	*Pseudoraphis spinescens*	spiny mudgrass		
Poaceae	*Sacciolepis indica*	Indian cupscale grass		
Poaceae	*Sarga plumosum*			
Poaceae	*Schizachyrium fragile*	firegrass		
Poaceae	*Sehima nervosum*			
Poaceae	*Setaria dielsii*			
Poaceae	*Setaria paspalidioides*			
Poaceae	*Setaria surgens*			
Poaceae	*Sorghum bicolor*	forage sorghum	Introduced	
Poaceae	*Sporobolus*			
Poaceae	*Sporobolus actinocladus*	katoora grass		
Poaceae	*Sporobolus australasicus*			
Poaceae	*Sporobolus caroli*	fairy grass		
Poaceae	*Sporobolus contiguus*			
Poaceae	*Sporobolus coromandelianus*		Introduced	
Poaceae	*Sporobolus creber*			
Poaceae	*Sporobolus disjunctus*			
Poaceae	*Sporobolus elongatus*			
Poaceae	*Sporobolus fertilis*	giant Parramatta grass	Introduced	
Poaceae	*Sporobolus mitchellii*	rat's tail couch		
Poaceae	*Sporobolus pamelae*		Endangered	
Poaceae	*Sporobolus partimpatens*		Near threatened	
Poaceae	*Sporobolus scabridus*			
Poaceae	*Sporobolus virginicus*	sand couch		
Poaceae	*Thaumastochloa pubescens*			
Poaceae	*Thellungia advena*	coolibah grass		
Poaceae	*Themeda avenacea*			
Poaceae	*Themeda triandra*	kangaroo grass		
Poaceae	*Tragus australianus*	small burr grass		
Poaceae	*Triodia*			
Poaceae	*Triodia longiceps*	giant grey spinifex		

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status
Poaceae	*Triodia microstachya*			
Poaceae	*Triodia mitchellii*	buck spinifex		
Poaceae	*Triodia pungens*			
Poaceae	*Tripogon loliiformis*	five minute grass		
Poaceae	*Triraphis mollis*	purple plumegrass		
Poaceae	*Urochloa*			
Poaceae	*Urochloa foliosa*			
Poaceae	*Urochloa gilesii*			
Poaceae	*Urochloa mosambicensis*	sabi grass	Introduced	
Poaceae	*Urochloa piligera*			
Poaceae	*Urochloa praetervisa*			
Poaceae	*Urochloa reptans*			
Poaceae	*Urochloa subquadripara*		Introduced	
Poaceae	*Whiteochloa airoides*			
Poaceae	*Yakirra pauciflora*			
Potamogetonaceae	*Potamogeton tricarinatus*	floating pondweed		
Ruppiaceae	*Ruppia maritima*	sea tassel		
Typhaceae	*Typha domingensis*			
Xanthorrhoeaceae	*Xanthorrhoea johnsonii*			

Queensland Herbarium HERBRECS Database Search Results

Family	Botanical name	NC Act Status	EPBC Act Status
Acanthaceae	*Brunoniella australis (Cav.) Bremek.*		
Acanthaceae	*Dipteracanthus australasicus F.Muell. subsp. australasicus*		
Acanthaceae	*Dipteracanthus australasicus subsp. corynothecus (F.Muell. ex Benth.) R.M.Barker*		
Acanthaceae	*Nelsonia campestris R.Br.*		
Acanthaceae	*Pseuderanthemum tenellum (Benth.) Radlk.*		
Acanthaceae	*Rostellularia adscendens (R.Br.) R.M.Barker*		
Aizoaceae	*Trianthema portulacastrum L.*	Introduced	
Aizoaceae	*Trianthema sp. (Coorabulka R.W.Purdie 1404)*		
Aizoaceae	*Trianthema triquetra Rottb. ex Willd.*		
Aizoaceae	*Zaleya galericulata (Melville) H.Eichler*		
Alismataceae	*Caldesia oligococca (F.Muell.) Buchenau*		
Amaranthaceae	*Alternanthera angustifolia R.Br.*		
Amaranthaceae	*Alternanthera denticulata var. micrantha Benth.*		
Amaranthaceae	*Alternanthera nana R.Br.*		
Amaranthaceae	*Alternanthera pungens Kunth*	Introduced	
Amaranthaceae	*Amaranthus interruptus R.Br.*		
Amaranthaceae	*Gomphrena lanata R.Br.*		
Amaranthaceae	*Gomphrena sp. (Doongmabulla E.J.Thompson+ GAL137)*		
Amaranthaceae	*Nyssanthes erecta R.Br.*		
Amaranthaceae	*Ptilotus nobilis subsp. semilanatus (Lindl.) A.R.Bean*		
Amaranthaceae	*Ptilotus polystachyus (Gaudich.) F.Muell.*		
Amaryllidaceae	*Calostemma luteum Sims*		
Amaryllidaceae	*Crinum*		
Apiaceae	*Daucus glochidiatus (Labill.) Fisch., C.A.Mey. & Ave-Lall.*		
Apiaceae	*Eryngium fontanum A.E.Holland & E.J.Thomps.*	Endangered	Endangered
Apiaceae	*Eryngium plantagineum F.Muell.*		
Apocynaceae	*Alstonia constricta F.Muell.*		
Apocynaceae	*Carissa lanceolata R.Br.*		
Apocynaceae	*Carissa ovata R.Br.*		
Apocynaceae	*Marsdenia viridiflora R.Br. subsp. viridiflora*		
Apocynaceae	*Parsonsia lanceolata R.Br.*		
Apocynaceae	*Secamone elliptica R.Br.*		
Araliaceae	*Hydrocotyle dipleura A.R.Bean*	Vulnerable	
Asphodelaceae	*Bulbine bulbosa (R.Br.) Haw.*		
Asteraceae	*Acmella grandiflora var. brachyglossa (Benth.) R.K.Jansen*		
Asteraceae	*Blumea mollis (D.Don) Merr.*		
Asteraceae	*Brachyscome*		
Asteraceae	*Calotis sp. (Lake Buchanan J.Kemp+ 3384H)*		
Asteraceae	*Calotis xanthosioidea Domin*		
Asteraceae	*Camptacra barbata N.T.Burb.*		
Asteraceae	*Chrysocephalum apiculatum (Labill.) Steetz*		
Asteraceae	*Eclipta platyglossa F.Muell.*		
Asteraceae	*Emilia sonchifolia (L.) DC. var. sonchifolia*	Introduced	
Asteraceae	*Epaltes australis Less.*		
Asteraceae	*Flaveria trinervia (Spreng.) C.Mohr*	Introduced	
Asteraceae	*Minuria integerrima (DC.) Benth.*		
Asteraceae	*Parthenium hysterophorus L.*	Introduced	
Asteraceae	*Peripleura hispidula var. setosa (N.T.Burb.) G.L.Nesom*		
Asteraceae	*Peripleura scabra (DC.) G.L.Nesom*	Near threatened	
Asteraceae	*Pluchea baccharoides (F.Muell.) F.Muell. ex Benth.*		
Asteraceae	*Pluchea dentex R.Br. ex Benth.*		
Asteraceae	*Pluchea dioscoridis DC.*		
Asteraceae	*Pluchea rubelliflora (F.Muell.) B.L.Rob.*		
Asteraceae	*Pterocaulon serrulatum (Montrouz.) Guillaumin var. serrulatum*		
Asteraceae	*Pterocaulon sp. (Yarrowmere Station E.J.Thompson + BUC340)*		
Asteraceae	*Pterocaulon sphacelatum (Labill.) F.Muell.*		
Asteraceae	*Senecio depressicola I.Thomps.*		
Asteraceae	*Sphaeranthus indicus L.*		
Asteraceae	*Streptoglossa adscendens (Benth.) Dunlop*		
Asteraceae	*Streptoglossa odora (F.Muell.) Dunlop*		
Asteraceae	*Verbesina encelioides (Cav.) Benth. & Hook.f. ex A.Gray*	Introduced	
Asteraceae	*Vittadinia cuneata DC.*		
Asteraceae	*Vittadinia pustulata N.T.Burb.*		

Family	Botanical name	NC Act Status	EPBC Act Status
Asteraceae	*Wedelia spilanthoides F.Muell.*		
Asteraceae	*Xanthium occidentale Bertol.*	Introduced	
Azollaceae	*Azolla filiculoides Lam.*		
Azollaceae	*Azolla pinnata R.Br.*		
Boraginaceae	*Ehretia membranifolia R.Br.*		
Boraginaceae	*Heliotropium curassavicum L.*	Introduced	
Boraginaceae	*Heliotropium geocharis Domin*		
Boraginaceae	*Heliotropium moorei Craven*		
Boraginaceae	*Heliotropium ovalifolium Forssk.*		
Boraginaceae	*Heliotropium peninsulare Craven*		
Boraginaceae	*Trichodesma zeylanicum (Burm.f.) R.Br. var. zeylanicum*		
Brassicaceae	*Rorippa dietrichiana Hewson*		
Brassicaceae	*Rorippa eustylis (F.Muell.) L.A.S.Johnson*		
Byttneriaceae	*Keraudrenia collina Domin*		
Byttneriaceae	*Keraudrenia hookeriana Walp.*		
Byttneriaceae	*Keraudrenia nephrosperma Benth.*		
Byttneriaceae	*Melochia pyramidata L.*	Introduced	
Byttneriaceae	*Waltheria indica L.*		
Caesalpiniaceae	*Cassia brewsteri (F.Muell.) F.Muell. ex Benth.*		
Caesalpiniaceae	*Labichea rupestris Benth.*		
Caesalpiniaceae	*Lysiphyllum carronii (F.Muell.) Pedley*		
Caesalpiniaceae	*Lysiphyllum hookeri (F.Muell.) Pedley*		
Caesalpiniaceae	*Senna artemisioides (DC.) Randell subsp. artemisioides*		
Caesalpiniaceae	*Senna artemisioides subsp. coriacea (Benth.) Randell*		
Caesalpiniaceae	*Senna artemisioides subsp. filifolia Randell*		
Caesalpiniaceae	*Senna artemisioides subsp. oligophylla (F.Muell.) Randell*		
Caesalpiniaceae	*Senna artemisioides subsp. sturtii (R.Br.) Randell*		
Caesalpiniaceae	*Senna artemisioides subsp. zygophylla (Benth.) Randell*		
Caesalpiniaceae	*Senna circinnata (Benth.) Randell*		
Caesalpiniaceae	*Senna costata (J.F.Bailey & C.T.White) Randell*		
Caesalpiniaceae	*Senna notabilis (F.Muell.) Randell*		
Caesalpiniaceae	*Senna planitiicola (Domin) Randell*		
Campanulaceae	*Isotoma*		
Campanulaceae	*Wahlenbergia tumidifructa P.J.Sm.*		
Capparaceae	*Apophyllum anomalum F.Muell.*		
Capparaceae	*Capparis canescens Banks ex DC.*		
Capparaceae	*Capparis lasiantha R.Br. ex DC.*		
Capparaceae	*Capparis umbonata Lindl.*		
Caryophyllaceae	*Polycarpaea corymbosa (L.) Lam.*		
Caryophyllaceae	*Polycarpaea multicaulis Cowie*		
Caryophyllaceae	*Polycarpaea spirostylis subsp. compacta Pedley*		
Casuarinaceae	*Casuarina cristata Miq.*		
Celastraceae	*Denhamia oleaster (Lindl.) F.Muell.*		
Celastraceae	*Maytenus cunninghamii (Hook.) Loes.*		
Chenopodiaceae	*Atriplex lindleyi Moq.*		
Chenopodiaceae	*Atriplex lindleyi Moq. subsp. lindleyi*		
Chenopodiaceae	*Atriplex muelleri Benth.*		
Chenopodiaceae	*Atriplex sp. (Doongmabulla Homestead E.J.Thompson+ GAL20)*		
Chenopodiaceae	*Chenopodium auricomum Lindl.*		
Chenopodiaceae	*Dissocarpus biflorus var. cephalocarpus (F.Muell.) A.J.Scott*		
Chenopodiaceae	*Dissocarpus paradoxus (R.Br.) F.Muell. ex Ulbr.*		
Chenopodiaceae	*Dissocarpus sp. (Doongmabulla E.J.Thompson+ GAL21)*		
Chenopodiaceae	*Dysphania melanocarpa (J.M.Black) Mosyakin & Clemants forma melanocarpa*		
Chenopodiaceae	*Dysphania plantaginella F.Muell.*		
Chenopodiaceae	*Einadia nutans (R.Br.) A.J.Scott subsp. nutans*		
Chenopodiaceae	*Einadia nutans subsp. linifolia (R.Br.) Paul G.Wilson*		
Chenopodiaceae	*Einadia trigonos subsp. stellulata (Benth.) Paul G.Wilson*		
Chenopodiaceae	*Enchylaena tomentosa R.Br.*		
Chenopodiaceae	*Eremophea spinosa (Ewart & O.B.Davies) Paul G.Wilson*		
Chenopodiaceae	*Maireana coronata (J.M.Black) Paul G.Wilson*		
Chenopodiaceae	*Maireana dichoptera (F.Muell.) Paul G.Wilson*		
Chenopodiaceae	*Maireana georgei (Diels) Paul G.Wilson*		
Chenopodiaceae	*Maireana villosa (Lindl.) Paul G.Wilson*		
Chenopodiaceae	*Rhagodia spinescens R.Br.*		
Chenopodiaceae	*Salsola kali L.*		
Chenopodiaceae	*Sclerolaena anisacanthoides (F.Muell.) Domin*		
Chenopodiaceae	*Sclerolaena bicornis Lindl.*		
Chenopodiaceae	*Sclerolaena bicornis Lindl. var. bicornis*		

Family	Botanical name	NC Act Status	EPBC Act Status
Chenopodiaceae	*Sclerolaena bicornis var. horrida Domin*		
Chenopodiaceae	*Sclerolaena birchii (F.Muell.) Domin*		
Chenopodiaceae	*Sclerolaena calcarata (Ising) A.J.Scott*		
Chenopodiaceae	*Sclerolaena convexula (R.H.Anderson) A.J.Scott*		
Chenopodiaceae	*Sclerolaena diacantha (Nees) Benth.*		
Chenopodiaceae	*Sclerolaena everistiana (Ising) A.J.Scott*		
Chenopodiaceae	*Sclerolaena glabra (F.Muell.) Domin*		
Chenopodiaceae	*Sclerolaena lanicuspis (F.Muell.) F.Muell. ex Benth.*		
Chenopodiaceae	*Sclerolaena muricata (Moq.) Domin var. muricata*		
Chenopodiaceae	*Sclerolaena ramulosa (C.T.White) A.J.Scott*		
Chenopodiaceae	*Sclerolaena tetracuspis (C.T.White) A.J.Scott*		
Chenopodiaceae	*Sclerolaena tricuspis (F.Muell.) Ulbr.*		
Chenopodiaceae	*Tecticornia indica (Willd.) K.A.Sheph. & Paul G.Wilson*		
Chenopodiaceae	*Tecticornia pergranulata (J.M.Black) K.A.Sheph. & Paul G.Wilson*		
Chenopodiaceae	*Tecticornia pergranulata subsp. divaricata (Paul G.Wilson) K.A.Sheph. & Paul G.Wilson*		
Chlorophyceae	*Chara*		
Chlorophyceae	*Lamprothamnium papulosum (Wallr.) J.Groves*		
Cleomaceae	*Cleome tetrandra DC. var. tetrandra*		
Clusiaceae	*Hypericum gramineum G.Forst.*		
Commelinaceae	*Commelina diffusa Burm.f.*		
Commelinaceae	*Cyanotis axillaris (L.) D.Don*		
Commelinaceae	*Murdannia graminea (R.Br.) G.Brueckn.*		
Convolvulaceae	*Bonamia media (R.Br.) Hallier f. var. media*		
Convolvulaceae	*Convolvulus graminetinus R.W.Johnson*		
Convolvulaceae	*Evolvulus alsinoides (L.) L.*		
Convolvulaceae	*Ipomoea*		
Convolvulaceae	*Ipomoea coptica (L.) Roth ex Roem. & Schult.*		
Convolvulaceae	*Ipomoea gracilis R.Br.*		
Convolvulaceae	*Ipomoea gracilis var. sagittata F.Muell.*		
Convolvulaceae	*Ipomoea lonchophylla J.M.Black*		
Convolvulaceae	*Ipomoea plebeia R.Br.*		
Convolvulaceae	*Jacquemontia sp. (Fairview R.W.Johnson 4026)*		
Convolvulaceae	*Polymeria calycina R.Br.*		
Convolvulaceae	*Polymeria longifolia Lindl.*		
Convolvulaceae	*Polymeria marginata Benth.*		
Convolvulaceae	*Polymeria pusilla R.Br.*		
Cucurbitaceae	*Cucumis melo subsp. (Manfred D.Davidson 47)*		
Cyperaceae	*Abildgaardia ovata (Burm.f.) Kral*		
Cyperaceae	*Baumea rubiginosa (Spreng.) Boeck.*		
Cyperaceae	*Bulbostylis barbata (Rottb.) C.B.Clarke*		
Cyperaceae	*Cyperus alterniflorus R.Br.*		
Cyperaceae	*Cyperus betchei (Kuek.) S.T.Blake subsp. betchei*		
Cyperaceae	*Cyperus bifax C.B.Clarke*		
Cyperaceae	*Cyperus bulbosus Vahl*		
Cyperaceae	*Cyperus concinnus R.Br.*		
Cyperaceae	*Cyperus conicus (R.Br.) Boeck.*		
Cyperaceae	*Cyperus dactylotes Benth.*		
Cyperaceae	*Cyperus difformis L.*		
Cyperaceae	*Cyperus exaltatus Retz.*		
Cyperaceae	*Cyperus flaccidus R.Br.*		
Cyperaceae	*Cyperus flavidus Retz.*		
Cyperaceae	*Cyperus gracilis R.Br.*		
Cyperaceae	*Cyperus haspan L. subsp. haspan*		
Cyperaceae	*Cyperus iria L.*		
Cyperaceae	*Cyperus isabellinus K.L.Wilson*		
Cyperaceae	*Cyperus laevigatus L.*		
Cyperaceae	*Cyperus pulchellus R.Br.*		
Cyperaceae	*Cyperus sanguinolentus Vahl*		
Cyperaceae	*Cyperus squarrosus L.*		
Cyperaceae	*Cyperus victoriensis C.B.Clarke*		
Cyperaceae	*Eleocharis equisetina C.Presl*		
Cyperaceae	*Eleocharis pallens S.T.Blake*		
Cyperaceae	*Eleocharis philippinensis Svenson*		
Cyperaceae	*Eleocharis plana S.T.Blake*		
Cyperaceae	*Fimbristylis*		
Cyperaceae	*Fimbristylis aestivalis (Retz.) Vahl*		
Cyperaceae	*Fimbristylis depauperata R.Br.*		
Cyperaceae	*Fimbristylis dichotoma (L.) Vahl*		

Family	Botanical name	NC Act Status	EPBC Act Status
Cyperaceae	*Fimbristylis littoralis Gaudich.*		
Cyperaceae	*Fimbristylis microcarya F.Muell.*		
Cyperaceae	*Fimbristylis nutans (Retz.) Vahl*		
Cyperaceae	*Fimbristylis rara R.Br.*		
Cyperaceae	*Fimbristylis sp. (Lake Buchanan V.J.Neldner+ 3362)*		
Cyperaceae	*Fuirena ciliaris (L.) Roxb.*		
Cyperaceae	*Fuirena incrassata S.T.Blake*		
Cyperaceae	*Fuirena umbellata Rottb.*		
Cyperaceae	*Lipocarpha microcephala (R.Br.) Kunth*		
Cyperaceae	*Schoenoplectus dissachanthus (S.T.Blake) J.Raynal*		
Cyperaceae	*Schoenoplectus erectus (Poir.) Palla ex J.Raynal*	Introduced	
Cyperaceae	*Schoenoplectus laevis (S.T.Blake) J.Raynal*		
Cyperaceae	*Schoenoplectus lateriflorus (J.G.Gmel.) Lye*		
Cyperaceae	*Schoenoplectus validus (Vahl) A.Love & D.Love*		
Cyperaceae	*Schoenus falcatus R.Br.*		
Cyperaceae	*Schoenus kennyi (F.M.Bailey) S.T.Blake*		
Cyperaceae	*Scleria rugosa R.Br.*		
Cyperaceae	*Scleria sphacelata F.Muell.*		
Cyperaceae	*Scleria tricuspidata S.T.Blake*		
Eriocaulaceae	*Eriocaulon carsonii subsp. orientale R.J.Davies*	Endangered	Endangered
Eriocaulaceae	*Eriocaulon cinereum R.Br.*		
Euphorbiaceae	*Beyeria viscosa Miq.*		
Euphorbiaceae	*Chamaesyce*		
Euphorbiaceae	*Chamaesyce coghlanii (F.M.Bailey) D.C.Hassall ex P.I.Forst. & R.J.F.Hend.*		
Euphorbiaceae	*Chamaesyce dallachyana (Baill.) D.C.Hassall*		
Euphorbiaceae	*Chamaesyce drummondii (Boiss.) D.C.Hassall*		
Euphorbiaceae	*Chamaesyce hirta (L.) Millsp.*	Introduced	
Euphorbiaceae	*Chamaesyce mitchelliana (Boiss.) D.C.Hassall*		
Euphorbiaceae	*Chamaesyce petala (Ewart & L.R.Kerr) P.I.Forst. & R.J.F.Hend.*		
Euphorbiaceae	*Euphorbia stevenii F.M.Bailey*		
Euphorbiaceae	*Euphorbia tannensis subsp. eremophila (A.Cunn.) D.C.Hassall*		
Euphorbiaceae	*Microstachys chamaelea (L.) A.Juss. ex Hook.f.*		
Fabaceae	*Aeschynomene indica L.*		
Fabaceae	*Cajanus marmoratus (Benth.) F.Muell.*		
Fabaceae	*Cajanus scarabaeoides (L.) Thouars var. scarabaeoides*		
Fabaceae	*Crotalaria dissitiflora Benth. subsp. dissitiflora*		
Fabaceae	*Cullen cinereum (Lindl.) J.W.Grimes*		
Fabaceae	*Desmodium campylocaulon F.Muell. ex Benth.*		
Fabaceae	*Desmodium filiforme Zoll. & Moritzi*		
Fabaceae	*Desmodium muelleri Benth.*		
Fabaceae	*Gastrolobium grandiflorum F.Muell.*		
Fabaceae	*Glycine falcata Benth.*		
Fabaceae	*Glycine sp. (Laglan Station L.S.Smith 10302)*		
Fabaceae	*Glycine tomentella Hayata*		
Fabaceae	*Hovea parvicalyx I.Thomps.*		
Fabaceae	*Indigastrum parviflorum (B.Heyne ex Wight & Arn.) Schrire*		
Fabaceae	*Indigofera colutea (Burm.f.) Merr.*		
Fabaceae	*Indigofera ewartiana Domin*		
Fabaceae	*Indigofera haplophylla F.Muell.*		
Fabaceae	*Indigofera linifolia (L.f.) Retz.*		
Fabaceae	*Indigofera linnaei Ali*		
Fabaceae	*Indigofera pratensis F.Muell.*		
Fabaceae	*Jacksonia ramosissima Benth.*		
Fabaceae	*Jacksonia rhadinoclona F.Muell.*		
Fabaceae	*Leptosema oxylobioides F.Muell.*		
Fabaceae	*Lotus cruentus Court*		
Fabaceae	*Rhynchosia minima var. australis (Benth.) C.Moore*		
Fabaceae	*Swainsona affinis (A.T.Lee) Joy Thomps.*		
Fabaceae	*Swainsona campylantha F.Muell.*		
Fabaceae	*Swainsona swainsonioides (Benth.) A.T.Lee ex J.M.Black*		
Fabaceae	*Tephrosia astragaloides var. (Belyando Crossing E.J.Thompson+ 139)*		
Fabaceae	*Tephrosia barbatala Bosman & A.J.P.De Haas*		
Fabaceae	*Tephrosia juncea Benth.*		
Fabaceae	*Tephrosia leptoclada Benth.*		
Fabaceae	*Tephrosia purpurea var. sericea Benth.*		
Fabaceae	*Tephrosia sp. (Lake Buchanan E.J.Thompson+ BUC2128)*		

Family	Botanical name	NC Act Status	EPBC Act Status
Fabaceae	*Tephrosia supina Domin*		
Fabaceae	*Vigna luteola (Jacq.) Benth.*	Introduced	
Fabaceae	*Vigna vexillata var. angustifolia (Schumach. & Thonn.) Baker*		
Fabaceae	*Vigna vexillata var. youngiana F.M.Bailey*		
Fabaceae	*Zornia adenophora (Domin) Mohlenbr.*		
Fabaceae	*Zornia areolata Mohlenbr.*		
Gentianaceae	*Schenkia australis (R.Br.) G.Mans.*		
Goodeniaceae	*Goodenia*		
Goodeniaceae	*Goodenia armitiana F.Muell.*		
Goodeniaceae	*Goodenia byrnesii Carolin*		
Goodeniaceae	*Goodenia gracilis R.Br.*		
Goodeniaceae	*Goodenia grandiflora Sims*		
Goodeniaceae	*Goodenia hirsuta F.Muell.*		
Goodeniaceae	*Goodenia lunata J.M.Black*		
Goodeniaceae	*Goodenia rosulata Domin*		
Goodeniaceae	*Goodenia splendida A.E.Holland & T.P.Boyle*		
Goodeniaceae	*Goodenia strangfordii F.Muell.*		
Goodeniaceae	*Goodenia viridula Carolin*		
Goodeniaceae	*Scaevola spinescens R.Br.*		
Haloragaceae	*Myriophyllum artesium Halford & Fensham*	Endangered	
Hemerocallidaceae	*Dianella longifolia R.Br. var. longifolia*		
Hemerocallidaceae	*Dianella longifolia var. stupata R.J.F.Hend.*		
Hypoxidaceae	*Hypoxis arillacea R.J.F.Hend.*		
Johnsoniaceae	*Caesia chlorantha F.Muell.*		
Johnsoniaceae	*Tricoryne elatior R.Br.*		
Juncaceae	*Juncus polyanthemus Buchenau*		
Juncaceae	*Juncus usitatus L.A.S.Johnson*		
Juncaginaceae	*Triglochin dubium R.Br.*		
Juncaginaceae	*Triglochin multifructum Aston*		
Lamiaceae	*Clerodendrum floribundum R.Br.*		
Lamiaceae	*Ocimum tenuiflorum L.*		
Lamiaceae	*Plectranthus parviflorus Willd.*		
Lamiaceae	*Prostanthera parvifolia Domin*		
Lamiaceae	*Teucrium integrifolium F.Muell.*		
Lauraceae	*Cassytha filiformis L.*		
Laxmanniaceae	*Lomandra leucocephala (R.Br.) Ewart subsp. leucocephala*		
Laxmanniaceae	*Thysanotus*		
Laxmanniaceae	*Thysanotus tuberosus R.Br. subsp. tuberosus*		
Lentibulariaceae	*Utricularia caerulea L.*		
Lentibulariaceae	*Utricularia dichotoma Labill.*		
Lentibulariaceae	*Utricularia gibba L.*		
Loganiaceae	*Mitrasacme sp. (Warang M.B.Thomas 1571)*		
Loranthaceae	*Amyema maidenii subsp. angustifolia Barlow*		
Loranthaceae	*Amyema quandang (Lindl.) Tiegh. var. quandang*		
Loranthaceae	*Amyema quandang var. bancroftii (F.M.Bailey) Barlow*		
Loranthaceae	*Dendrophthoe glabrescens (Blakely) Barlow*		
Loranthaceae	*Diplatia grandibractea (F.Muell.) Tiegh.*		
Loranthaceae	*Lysiana spathulata subsp. parvifolia Barlow*		
Loranthaceae	*Lysiana subfalcata (Hook.) Barlow*		
Lythraceae	*Ammannia multiflora Roxb.*		
Lythraceae	*Nesaea robertsii (F.Muell.) Koehne*	Endangered	
Malvaceae	*Abelmoschus ficulneus (L.) Wight & Arn. ex Wight*		
Malvaceae	*Abutilon calliphyllum Domin*		
Malvaceae	*Abutilon fraseri (Hook.) Hook. ex Walp. subsp. fraseri*		
Malvaceae	*Abutilon malvifolium (Benth.) J.M.Black*		
Malvaceae	*Abutilon otocarpum F.Muell.*		
Malvaceae	*Abutilon oxycarpum var. subsagittatum Domin*		
Malvaceae	*Gossypium australe F.Muell.*		
Malvaceae	*Herissantia crispa (L.) Brizicky*		
Malvaceae	*Hibiscus brachysiphonius F.Muell.*		
Malvaceae	*Hibiscus krichauffianus F.Muell.*		
Malvaceae	*Hibiscus sturtii var. campylochlamys F.Muell. ex Benth.*		
Malvaceae	*Hibiscus trionum var. vesicarius (Cav.) Hochr.*		
Malvaceae	*Lawrencia buchananensis Lander*	Vulnerable	Vulnerable
Malvaceae	*Sida aprica var. solanacea Domin*		
Malvaceae	*Sida atherophora Domin*		
Malvaceae	*Sida brachypoda F.Muell. ex A.E.Holland & S.T.Reynolds*		
Malvaceae	*Sida cordifolia L.*	Introduced	
Malvaceae	*Sida everistiana S.T.Reynolds & A.E.Holland*		

Family	Botanical name	NC Act Status	EPBC Act Status
Malvaceae	*Sida fibulifera Lindl.*		
Malvaceae	*Sida goniocarpa (F.Muell. ex Benth.) Domin*		
Malvaceae	*Sida rhombifolia L.*	Introduced	
Malvaceae	*Sida rohlenae Domin subsp. rohlenae*		
Malvaceae	*Sida sp. (Aramac E.J.Thompson+ JER192)*		
Malvaceae	*Sida sp. (Charters Towers E.J.THompson+ CHA456)*		
Malvaceae	*Sida sp. (Laglan Station L.S.Smith 10325)*		
Malvaceae	*Sida sp. (Musselbrook M.B.Thomas+ MRS437)*		
Malvaceae	*Sida spinosa L.*	Introduced	
Malvaceae	*Sida trichopoda F.Muell.*		
Malvaceae	*Sida trichopoda var. (Palardo S.T.Blake 7600)*		
Marsileaceae	*Marsilea mutica Mett.*		
Meliaceae	*Owenia acidula F.Muell.*		
Mimosaceae	*Acacia adsurgens Maiden & Blakely*		
Mimosaceae	*Acacia aneura var. intermedia Pedley*		
Mimosaceae	*Acacia aprepta Pedley*		
Mimosaceae	*Acacia argyrodendron Domin*		
Mimosaceae	*Acacia bidwillii Benth.*		
Mimosaceae	*Acacia cambagei R.T.Baker*		
Mimosaceae	*Acacia catenulata C.T.White*		
Mimosaceae	*Acacia cowleana Tate*		
Mimosaceae	*Acacia decora Rchb.*		
Mimosaceae	*Acacia dietrichiana F.Muell.*		
Mimosaceae	*Acacia farnesiana (L.) Willd.*	Introduced	
Mimosaceae	*Acacia flavescens A.Cunn. ex Benth.*		
Mimosaceae	*Acacia galioides Benth.*		
Mimosaceae	*Acacia holosericea A.Cunn. ex G.Don var. holosericea*		
Mimosaceae	*Acacia hyaloneura Pedley*		
Mimosaceae	*Acacia laccata Pedley*		
Mimosaceae	*Acacia lazaridis Pedley*		
Mimosaceae	*Acacia leptostachya Benth.*		
Mimosaceae	*Acacia melleodora Pedley*		
Mimosaceae	*Acacia microcybe Pedley*		
Mimosaceae	*Acacia multisiliqua (Benth.) Maconochie*		
Mimosaceae	*Acacia orthocarpa F.Muell.*		
Mimosaceae	*Acacia oswaldii F.Muell.*		
Mimosaceae	*Acacia platycarpa F.Muell.*		
Mimosaceae	*Acacia salicina Lindl.*		
Mimosaceae	*Acacia sericophylla F.Muell.*		
Mimosaceae	*Acacia shirleyi Maiden*		
Mimosaceae	*Acacia sp. (Ronlow Park E.J.Thompson+ 61)*		
Mimosaceae	*Acacia sp. (Urandangie L.Pedley 2025)*		
Mimosaceae	*Acacia stenophylla A.Cunn. ex Benth.*		
Mimosaceae	*Acacia stipuligera F.Muell.*		
Mimosaceae	*Acacia tenuissima F.Muell.*		
Mimosaceae	*Acacia torulosa Benth.*		
Mimosaceae	*Acacia umbellata A.Cunn. ex Benth.*		
Mimosaceae	*Neptunia dimorphantha Domin*		
Molluginaceae	*Glinus lotoides L.*		
Molluginaceae	*Mollugo cerviana (L.) Ser.*		
Moraceae	*Ficus opposita Miq.*		
Myoporaceae	*Eremophila bignoniiflora (Benth.) F.Muell.*		
Myoporaceae	*Eremophila deserti (A.Cunn. ex Benth.) Chinnock*		
Myoporaceae	*Eremophila latrobei F.Muell.*		
Myoporaceae	*Eremophila longifolia (R.Br.) F.Muell.*		
Myoporaceae	*Eremophila maculata (Ker Gawl.) F.Muell. subsp. maculata*		
Myoporaceae	*Eremophila mitchellii Benth.*		
Myoporaceae	*Eremophila polyclada (F.Muell.) F.Muell.*		
Myoporaceae	*Myoporum montanum R.Br.*		
Myrtaceae	*Calytrix microcoma Craven*		
Myrtaceae	*Corymbia aparrerinja K.D.Hill & L.A.S.Johnson - C.dallachiana (Benth.) K.D.Hill & L.A.S.Johnson*		
Myrtaceae	*Corymbia blakei K.D.Hill & L.A.S.Johnson subsp. blakei*		
Myrtaceae	*Corymbia brachycarpa (D.J.Carr & S.G.M.Carr) K.D.Hill & L.A.S.Johnson x C.plena K.D.Hill & L.A.S.Johnson*		
Myrtaceae	*Corymbia brachycarpa (D.J.Carr & S.G.M.Carr) K.D.Hill & L.A.S.Johnson x C.setosa subsp. pedicellaris K.D.Hill & L.A.S.Johnson*		
Myrtaceae	*Corymbia clarksoniana (D.J.Carr & S.G.M.Carr) K.D.Hill & L.A.S.Johnson*		

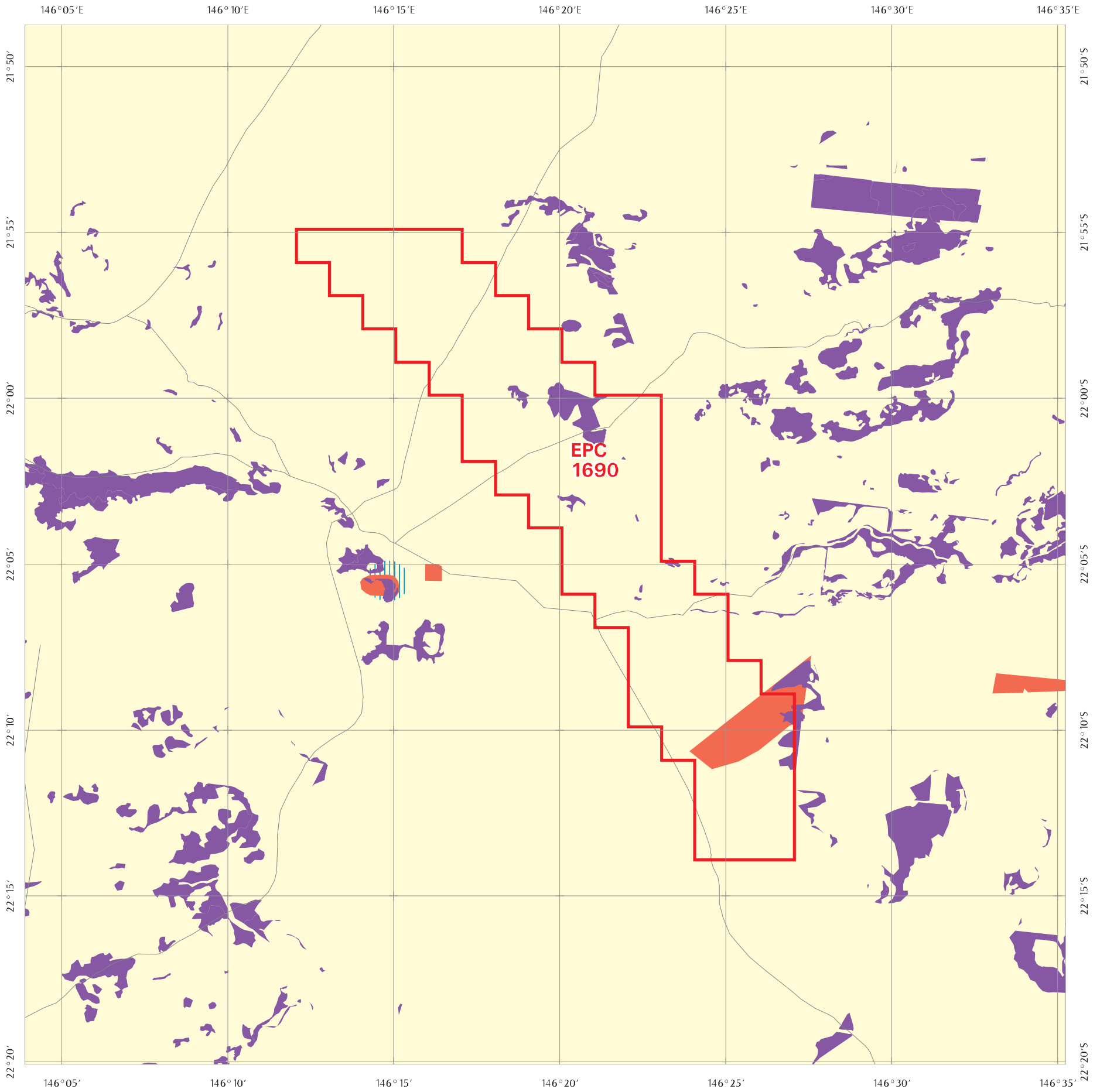
Family	Botanical name	NC Act Status	EPBC Act Status
Myrtaceae	*Corymbia dallachiana (Benth.) K.D.Hill & L.A.S.Johnson*		
Myrtaceae	*Corymbia lamprophylla (Brooker & A.R.Bean) K.D.Hill & L.A.S.Johnson*		
Myrtaceae	*Corymbia leichhardtii (F.M.Bailey) K.D.Hill & L.A.S.Johnson*		
Myrtaceae	*Corymbia plena K.D.Hill & L.A.S.Johnson*		
Myrtaceae	*Corymbia setosa subsp. pedicellaris K.D.Hill & L.A.S.Johnson*		
Myrtaceae	*Corymbia terminalis (F.Muell.) K.D.Hill & L.A.S.Johnson*		
Myrtaceae	*Eucalyptus brownii Maiden & Cambage*		
Myrtaceae	*Eucalyptus brownii Maiden & Cambage - E.populnea F.Muell.*		
Myrtaceae	*Eucalyptus brownii Maiden & Cambage x E.drepanophylla F.Muell. ex Benth.*		
Myrtaceae	*Eucalyptus camaldulensis subsp. acuta Brooker & M.W.McDonald*		
Myrtaceae	*Eucalyptus cambageana Maiden*		
Myrtaceae	*Eucalyptus coolabah Blakely & Jacobs*		
Myrtaceae	*Eucalyptus drepanophylla F.Muell. ex Benth.*		
Myrtaceae	*Eucalyptus melanophloia F.Muell.*		
Myrtaceae	*Eucalyptus melanophloia F.Muell. - E.whitei Maiden & Blakely*		
Myrtaceae	*Eucalyptus persistens L.A.S.Johnson & K.D.Hill*		
Myrtaceae	*Eucalyptus populnea F.Muell.*		
Myrtaceae	*Eucalyptus socialis subsp. eucentrica (L.A.S.Johnson & K.D.Hill) Nicolle*		
Myrtaceae	*Eucalyptus thozetiana F.Muell. ex R.T.Baker*		
Myrtaceae	*Eucalyptus whitei Maiden & Blakely*		
Myrtaceae	*Leptospermum lamellatum Joy Thomps.*		
Myrtaceae	*Lithomyrtus microphylla (Benth.) N.Snow & Guymer*		
Myrtaceae	*Melaleuca chisholmii (Cheel) Craven*		
Myrtaceae	*Melaleuca fluviatilis Barlow*		
Myrtaceae	*Melaleuca foliolosa A.Cunn. ex Benth.*		
Myrtaceae	*Melaleuca leucadendra (L.) L.*		
Myrtaceae	*Melaleuca nervosa (Lindl.) Cheel*		
Myrtaceae	*Melaleuca nervosa (Lindl.) Cheel subsp. nervosa*		
Myrtaceae	*Melaleuca pallescens Byrnes*		
Myrtaceae	*Melaleuca tamariscina Hook.f.*		
Myrtaceae	*Melaleuca trichostachya Lindl.*		
Myrtaceae	*Melaleuca uncinata R.Br.*		
Myrtaceae	*Thryptomene parviflora (F.Muell. ex Benth.) Domin*		
Nyctaginaceae	*Boerhavia burbidgeana Hewson*		
Nyctaginaceae	*Boerhavia dominii Meikle & Hewson*		
Nyctaginaceae	*Boerhavia paludosa (Domin) Meikle*		
Nyctaginaceae	*Boerhavia pubescens R.Br.*		
Nymphaeaceae	*Nymphaea gigantea Hook.*		
Oleaceae	*Jasminum didymum subsp. racemosum (F.Muell.) P.S.Green*		
Oleaceae	*Notelaea microcarpa R.Br. var. microcarpa*		
Onagraceae	*Ludwigia octovalvis (Jacq.) P.H.Raven*		
Onagraceae	*Ludwigia peploides subsp. montevidensis (Spreng.) P.H.Raven*		
Onagraceae	*Ludwigia perennis L.*		
Orchidaceae	*Cymbidium canaliculatum R.Br.*		
Orchidaceae	*Prasophyllum*		
Oxalidaceae	*Oxalis corniculata L.*	Introduced	
Parkeriaceae	*Ceratopteris thalictroides (L.) Brongn.*		
Pentapetaceae	*Melhania oblongifolia F.Muell.*		
Pentapetaceae	*Melhania ovata (Cav.) Spreng.*		
Phyllanthaceae	*Breynia oblongifolia (Muell.Arg.) Muell.Arg.*		
Phyllanthaceae	*Flueggea leucopyrus Willd.*		
Phyllanthaceae	*Phyllanthus fuernrohrii F.Muell.*		
Phyllanthaceae	*Phyllanthus maderaspatensis L.*		
Phyllanthaceae	*Phyllanthus maderaspatensis L. var. maderaspatensis*		
Phyllanthaceae	*Phyllanthus virgatus G.Forst.*		
Phyllanthaceae	*Poranthera microphylla Brongn.*		
Phyllanthaceae	*Sauropus trachyspermus (F.Muell.) Airy Shaw*		
Picrodendraceae	*Petalostigma banksii Britten & S.Moore*		
Pittosporaceae	*Bursaria incana Lindl.*		
Poaceae	*Acrachne racemosa (B.Heyne ex Roem. & Schult.) Ohwi*		
Poaceae	*Alloteropsis cimicina (L.) Stapf*		

Family	Botanical name	NC Act Status	EPBC Act Status
Poaceae	*Alloteropsis semialata (R.Br.) Hitchc.*		
Poaceae	*Amphipogon caricinus F.Muell. var. caricinus*		
Poaceae	*Amphipogon sericeus (Vickery) T.D.Macfarl.*		
Poaceae	*Ancistrachne uncinulata (R.Br.) S.T.Blake*		
Poaceae	*Aristida benthamii Henrard var. benthamii*		
Poaceae	*Aristida biglandulosa J.M.Black*		
Poaceae	*Aristida calycina R.Br.*		
Poaceae	*Aristida calycina R.Br. var. calycina*		
Poaceae	*Aristida calycina var. praealta Domin*		
Poaceae	*Aristida helicophylla S.T.Blake*		
Poaceae	*Aristida holathera Domin var. holathera*		
Poaceae	*Aristida hygrometrica R.Br.*		
Poaceae	*Aristida ingrata Domin*		
Poaceae	*Aristida jerichoensis (Domin) Henrard var. jerichoensis*		
Poaceae	*Aristida latifolia Domin*		
Poaceae	*Aristida leptopoda Benth.*		
Poaceae	*Aristida pruinosa Domin*		
Poaceae	*Aristida sciuroides Domin*		
Poaceae	*Arundinella nepalensis Trin.*		
Poaceae	*Astrebla elymoides F.Muell. ex F.M.Bailey*		
Poaceae	*Astrebla lappacea (Lindl.) Domin*		
Poaceae	*Astrebla pectinata (Lindl.) F.Muell. ex Benth.*		
Poaceae	*Astrebla squarrosa C.E.Hubb.*		
Poaceae	*Austrochloris dichanthioides (Everist) Lazarides*		
Poaceae	*Bothriochloa bladhii (Retz.) S.T.Blake subsp. bladhii*		
Poaceae	*Bothriochloa decipiens var. cloncurrensis (Domin) C.E.Hubb.*		
Poaceae	*Bothriochloa erianthoides (F.Muell.) C.E.Hubb.*		
Poaceae	*Bothriochloa ewartiana (Domin) C.E.Hubb.*		
Poaceae	*Bothriochloa pertusa (L.) A.Camus*	Introduced	
Poaceae	*Brachyachne convergens (F.Muell.) Stapf*		
Poaceae	*Brachyachne tenella (R.Br.) C.E.Hubb.*		
Poaceae	*Chloris divaricata R.Br. var. divaricata*		
Poaceae	*Chloris inflata Link*	Introduced	
Poaceae	*Chloris pectinata Benth.*		
Poaceae	*Chloris sp. (Edgbaston R.J.Fensham 5694)*		
Poaceae	*Chloris virgata Sw.*	Introduced	
Poaceae	*Chrysopogon fallax S.T.Blake*		
Poaceae	*Cymbopogon ambiguus A.Camus*		
Poaceae	*Cymbopogon bombycinus (R.Br.) Domin*		
Poaceae	*Cynodon dactylon (L.) Pers. var. dactylon*	Introduced	
Poaceae	*Dactyloctenium aegyptium (L.) Willd.*	Introduced	
Poaceae	*Dactyloctenium buchananensis B.K.Simon*		
Poaceae	*Dactyloctenium radulans (R.Br.) P.Beauv.*		
Poaceae	*Dichanthium annulatum (Forssk.) Stapf*	Introduced	
Poaceae	*Dichanthium fecundum S.T.Blake*		
Poaceae	*Dichanthium sericeum (R.Br.) A.Camus subsp. sericeum*		
Poaceae	*Digitaria bicornis (Lam.) Roem. & Schult.*		
Poaceae	*Digitaria breviglumis (Domin) Henrard*		
Poaceae	*Digitaria brownii (Roem. & Schult.) Hughes*		
Poaceae	*Digitaria ciliaris (Retz.) Koeler*	Introduced	
Poaceae	*Digitaria divaricatissima (R.Br.) Hughes*		
Poaceae	*Echinochloa colona (L.) Link*	Introduced	
Poaceae	*Echinochloa crus-galli (L.) P.Beauv.*	Introduced	
Poaceae	*Echinochloa inundata P.W.Michael & Vickery*		
Poaceae	*Echinochloa turneriana (Domin) J.M.Black*		
Poaceae	*Elionurus citreus (R.Br.) Munro ex Benth.*		
Poaceae	*Elytrophorus spicatus (Willd.) E.G.Camus & A.Camus*		
Poaceae	*Enneapogon avenaceus (Lindl.) C.E.Hubb.*		
Poaceae	*Enneapogon gracilis (R.Br.) P.Beauv.*		
Poaceae	*Enneapogon lindleyanus (Domin) C.E.Hubb.*		
Poaceae	*Enneapogon polyphyllus (Domin) N.T.Burb.*		
Poaceae	*Enneapogon robustissimus (Domin) N.T.Burb.*		
Poaceae	*Enneapogon truncatus Kakudidi*		
Poaceae	*Enneapogon virens (Lindl.) Kakudidi*		
Poaceae	*Enteropogon acicularis (Lindl.) Lazarides*		
Poaceae	*Enteropogon ramosus B.K.Simon*		
Poaceae	*Eragrostis basedowii Jedwabn.*		
Poaceae	*Eragrostis confertiflora J.M.Black*		
Poaceae	*Eragrostis cumingii Steud.*		

Family	Botanical name	NC Act Status	EPBC Act Status
Poaceae	*Eragrostis dielsii Pilg.*		
Poaceae	*Eragrostis elongata (Willd.) J.Jacq.*		
Poaceae	*Eragrostis falcata (Gaudich.) Gaudich. ex Steud.*		
Poaceae	*Eragrostis lacunaria F.Muell. ex Benth.*		
Poaceae	*Eragrostis lanicaulis Lazarides*		
Poaceae	*Eragrostis leptocarpa Benth.*		
Poaceae	*Eragrostis leptostachya (R.Br.) Steud.*		
Poaceae	*Eragrostis microcarpa Vickery*		
Poaceae	*Eragrostis parviflora (R.Br.) Trin.*		
Poaceae	*Eragrostis pergracilis S.T.Blake*		
Poaceae	*Eragrostis pilosa (L.) P.Beauv.*	Introduced	
Poaceae	*Eragrostis schultzii Benth.*		
Poaceae	*Eragrostis setifolia Nees*		
Poaceae	*Eragrostis sororia Domin*		
Poaceae	*Eragrostis spartinoides Steud.*		
Poaceae	*Eragrostis speciosa (Roem. & Schult.) Steud.*		
Poaceae	*Eragrostis tenellula (Kunth) Steud.*		
Poaceae	*Eriachne aristidea F.Muell.*		
Poaceae	*Eriachne benthamii W.Hartley*		
Poaceae	*Eriachne mucronata R.Br.*		
Poaceae	*Eriachne obtusa R.Br.*		
Poaceae	*Eriachne pulchella Domin subsp. pulchella*		
Poaceae	*Eriochloa australiensis Stapf ex Thell.*		
Poaceae	*Eriochloa crebra S.T.Blake*		
Poaceae	*Eriochloa procera (Retz.) C.E.Hubb.*		
Poaceae	*Eriochloa pseudoacrotricha (Stapf ex Thell.) J.M.Black*		
Poaceae	*Eulalia aurea (Bory) Kunth*		
Poaceae	*Heteropogon contortus (L.) P.Beauv. ex Roem. & Schult.*		
Poaceae	*Hymenachne amplexicaulis (Rudge) Nees cv. Olive*	Introduced	
Poaceae	*Isachne globosa (Thunb.) Kuntze*		
Poaceae	*Ischaemum australe R.Br. var. australe*		
Poaceae	*Ischaemum australe var. villosum (R.Br.) Benth.*		
Poaceae	*Iseilema membranaceum (Lindl.) Domin*		
Poaceae	*Iseilema vaginiflorum Domin*		
Poaceae	*Leersia hexandra Sw.*		
Poaceae	*Leptochloa decipiens (R.Br.) Stapf ex Maiden subsp. decipiens*		
Poaceae	*Leptochloa decipiens subsp. asthenes (Roem. & Schult.) N.Snow*		
Poaceae	*Leptochloa decipiens subsp. peacockii (Maiden & Betche) N.Snow*		
Poaceae	*Leptochloa digitata (R.Br.) Domin*		
Poaceae	*Leptochloa fusca (L.) Kunth subsp. fusca*		
Poaceae	*Melinis repens (Willd.) Zizka*	Introduced	
Poaceae	*Oxychloris scariosa (F.Muell.) Lazarides*		
Poaceae	*Panicum antidotale Retz.*	Introduced	
Poaceae	*Panicum decompositum R.Br. var. decompositum*		
Poaceae	*Panicum effusum R.Br.*		
Poaceae	*Panicum laevinode Lindl.*		
Poaceae	*Panicum larcomianum Hughes*		
Poaceae	*Paspalidium albovillosum S.T.Blake*		
Poaceae	*Paspalidium caespitosum C.E.Hubb.*		
Poaceae	*Paspalidium constrictum (Domin) C.E.Hubb.*		
Poaceae	*Paspalidium criniforme S.T.Blake*		
Poaceae	*Paspalidium distans (Trin.) Hughes*		
Poaceae	*Paspalidium globoideum (Domin) Hughes*		
Poaceae	*Paspalidium gracile (R.Br.) Hughes*		
Poaceae	*Paspalidium jubiflorum (Trin.) Hughes*		
Poaceae	*Paspalidium rarum (R.Br.) Hughes*		
Poaceae	*Paspalum dilatatum Poir.*	Introduced	
Poaceae	*Paspalum distichum L.*		
Poaceae	*Paspalum vaginatum Sw.*		
Poaceae	*Pennisetum alopecuroides (L.) Spreng.*		
Poaceae	*Pennisetum setigerum (Vahl) Wipff*	Introduced	
Poaceae	*Perotis rara R.Br.*		
Poaceae	*Pseudoraphis spinescens (R.Br.) Vickery*		
Poaceae	*Sacciolepis indica (L.) Chase*		
Poaceae	*Sarga plumosum (R.Br.) Spangler*		
Poaceae	*Sehima nervosum (Rottler) Stapf*		
Poaceae	*Setaria paspalidioides Vickery*		

Family	Botanical name	NC Act Status	EPBC Act Status
Poaceae	*Setaria surgens Stapf*		
Poaceae	*Sorghum bicolor (L.) Moench*	Introduced	
Poaceae	*Sporobolus actinocladus (F.Muell.) F.Muell.*		
Poaceae	*Sporobolus australasicus Domin*		
Poaceae	*Sporobolus caroli Mez*		
Poaceae	*Sporobolus contiguus S.T.Blake*		
Poaceae	*Sporobolus coromandelianus (Retz.) Kunth*	Introduced	
Poaceae	*Sporobolus disjunctus R.Mills ex B.K.Simon*		
Poaceae	*Sporobolus elongatus R.Br.*		
Poaceae	*Sporobolus mitchellii (Trin.) C.E.Hubb. ex S.T.Blake*		
Poaceae	*Sporobolus pamelae B.K.Simon*	Endangered	
Poaceae	*Sporobolus partimpatens R.Mills ex B.K.Simon*	Near threatened	
Poaceae	*Sporobolus scabridus S.T.Blake*		
Poaceae	*Sporobolus virginicus (L.) Kunth*		
Poaceae	*Thaumastochloa pubescens (Benth.) C.E.Hubb.*		
Poaceae	*Thellungia advena Stapf ex Probst*		
Poaceae	*Themeda avenacea (F.Muell.) Maiden & Betche*		
Poaceae	*Themeda triandra Forssk.*		
Poaceae	*Tragus australianus S.T.Blake*		
Poaceae	*Triodia longiceps J.M.Black*		
Poaceae	*Triodia microstachya R.Br.*		
Poaceae	*Triodia mitchellii Benth.*		
Poaceae	*Triodia pungens R.Br.*		
Poaceae	*Tripogon loliiformis (F.Muell.) C.E.Hubb.*		
Poaceae	*Triraphis mollis R.Br.*		
Poaceae	*Urochloa foliosa (R.Br.) R.D.Webster*		
Poaceae	*Urochloa gilesii (Benth.) Hughes*		
Poaceae	*Urochloa mosambicensis (Hack.) Dandy*	Introduced	
Poaceae	*Urochloa piligera (F.Muell. ex Benth.) R.D.Webster*		
Poaceae	*Urochloa praetervisa (Domin) Hughes*		
Poaceae	*Urochloa reptans (L.) Stapf*		
Poaceae	*Yakirra pauciflora (R.Br.) Lazarides & R.D.Webster*		
Polygalaceae	*Polygala linariifolia Willd.*		
Polygalaceae	*Polygala sp. (Georgetown K.R.McDonald KRM673)*		
Polygalaceae	*Polygala sp. (White Mountains M.B.Thomas+ 1738)*		
Polygonaceae	*Persicaria attenuata (R.Br.) Sojak*		
Polygonaceae	*Persicaria decipiens (R.Br.) K.L.Wilson*		
Polygonaceae	*Persicaria lapathifolia (L.) Gray*		
Portulacaceae	*Calandrinia ptychosperma F.Muell.*		
Portulacaceae	*Portulaca oligosperma F.Muell.*		
Potamogetonaceae	*Potamogeton tricarinatus F.Muell. & A.Benn. ex A.Benn.*		
Proteaceae	*Grevillea parallela Knight*		
Proteaceae	*Grevillea sessilis C.T.White & W.D.Francis*		
Proteaceae	*Grevillea striata R.Br.*		
Proteaceae	*Hakea leucoptera R.Br.*		
Proteaceae	*Hakea leucoptera subsp. sericipes W.R.Barker*		
Proteaceae	*Persoonia falcata R.Br.*		
Rhamnaceae	*Alphitonia excelsa (Fenzl) Benth.*		
Rhamnaceae	*Ventilago viminalis Hook.*		
Rubiaceae	*Dentella repens (L.) J.R.Forst. & G.Forst.*		
Rubiaceae	*Oldenlandia galioides (F.Muell.) F.Muell.*		
Rubiaceae	*Oldenlandia mitrasacmoides (F.Muell.) F.Muell.*		
Rubiaceae	*Oldenlandia mitrasacmoides subsp. nigricans Halford*		
Rubiaceae	*Oldenlandia mitrasacmoides subsp. trachymenoides (F.Muell.) Halford*		
Rubiaceae	*Psydrax attenuata forma megalantha S.T.Reynolds & R.J.F.Hend.*		
Rubiaceae	*Psydrax forsteri S.T.Reynolds & R.J.F.Hend.*		
Rubiaceae	*Psydrax oleifolia (Hook.) S.T.Reynolds & R.J.F.Hend.*		
Rubiaceae	*Psydrax saligna S.T.Reynolds & R.J.F.Hend. forma saligna*		
Rubiaceae	*Spermacoce baileyana Domin*		
Rubiaceae	*Spermacoce brachystema R.Br. ex Benth.*		
Ruppiaceae	*Ruppia maritima L.*		
Rutaceae	*Citrus glauca (Lindl.) Burkill*		
Rutaceae	*Flindersia dissosperma (F.Muell.) Domin*		
Rutaceae	*Flindersia maculosa (Lindl.) Benth.*		
Rutaceae	*Geijera parviflora Lindl.*		
Rutaceae	*Geijera salicifolia Schott*		
Santalaceae	*Anthobolus leptomerioides F.Muell.*		

Family	Botanical name	NC Act Status	EPBC Act Status
Santalaceae	*Exocarpos sparteus R.Br.*		
Santalaceae	*Santalum lanceolatum R.Br.*		
Sapindaceae	*Alectryon diversifolius (F.Muell.) S.T.Reynolds*		
Sapindaceae	*Alectryon oleifolius subsp. elongatus S.T.Reynolds*		
Sapindaceae	*Atalaya hemiglauca (F.Muell.) F.Muell. ex Benth.*		
Sapindaceae	*Distichostemon dodecandrus Domin*		
Sapindaceae	*Dodonaea lanceolata var. subsessilifolia J.G.West*		
Sapindaceae	*Dodonaea stenophylla F.Muell.*		
Sapindaceae	*Dodonaea tenuifolia Lindl.*		
Sapindaceae	*Dodonaea viscosa subsp. angustissima (DC.) J.G.West*		
Sapindaceae	*Dodonaea viscosa subsp. spatulata (Sm.) J.G.West*		
Scrophulariaceae	*Buchnera linearis R.Br.*		
Scrophulariaceae	*Buchnera ramosissima R.Br.*		
Scrophulariaceae	*Lindernia scapigera R.Br.*		
Scrophulariaceae	*Mimulus repens R.Br.*		
Scrophulariaceae	*Peplidium*		
Scrophulariaceae	*Peplidium foecundum W.R.Barker*		
Scrophulariaceae	*Scoparia dulcis L.*	Introduced	
Scrophulariaceae	*Stemodia glabella W.R.Barker*		
Solanaceae	*Nicotiana forsteri Roem. & Schult.*		
Solanaceae	*Solanum cleistogamum Symon*		
Solanaceae	*Solanum crebrispinum A.R.Bean*		
Solanaceae	*Solanum ellipticum R.Br.*		
Solanaceae	*Solanum esuriale Lindl.*		
Solanaceae	*Solanum nodiflorum Jacq.*	Introduced	
Solanaceae	*Solanum parvifolium R.Br. subsp. parvifolium*		
Sparrmanniaceae	*Corchorus sidoides subsp. vermicularis (F.Muell.) Halford*		
Sparrmanniaceae	*Triumfetta pentandra A.Rich.*	Introduced	
Stackhousiaceae	*Stackhousia viminea Sm.*		
Stylidiaceae	*Stylidium adenophorum Lowrie & Kenneally*		
Stylidiaceae	*Stylidium velleioides A.R.Bean*		
Thelypteridaceae	*Cyclosorus interruptus (Willd.) H.Ito*		
Thymelaeaceae	*Thecanthes sanguinea (F.Muell.) Rye*		
Typhaceae	*Typha domingensis Pers.*		
Verbenaceae	*Verbena macrostachya F.Muell.*		
Violaceae	*Hybanthus enneaspermus (L.) F.Muell.*		
Zygophyllaceae	*Tribulopis*		
Zygophyllaceae	*Tribulopis angustifolia R.Br.*		



ENVIRONMENTALLY SENSITIVE AREAS - Mining Activities

Requested By: LAUREN.MULLER@GHD.COM
Date: 08 Dec 11 Time: 14.28.12

Centered on Tenure:
EPC 1690

Legend

- Selected Exploration Permit Coal

CATEGORY A

- National Parks
- Conservation Parks
- Forest Reserves
- Wet Tropics World Heritage Area
- Great Barrier Reef Marine Park Region
- Marine Parks other than General Use Zones

CATEGORY B

- World Heritage Areas
- Queensland Heritage Register Places
- Ramsar Sites
- Cultural Heritage Registered Areas and DLA's other than Stanbroke
- Special Forestry Areas
- Fish Habitat Areas
- Koala Plan
- Coordinated Conservation Areas
- Endangered Regional Ecosystems (Biodiversity Status)
- General Use Zones of Marine Parks
- Marine Plants

CATEGORY C

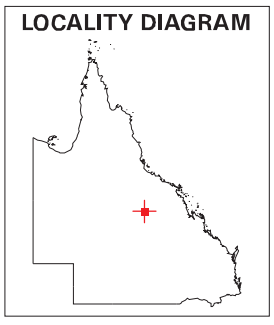
- Nature Refuges
- Resources Reserves
- Declared Catchment Areas
- Declared Irrigation Areas
- Drainage Areas
- River Improvement Areas
- Stanbroke DLA
- State Forests
- Timber Reserves
- Coastal Management Control Districts
- Dams and Weirs

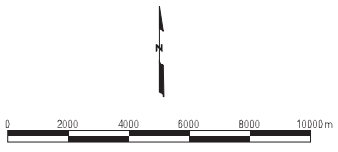
OTHERS

- Roads
- Towns
- Wild River Nominated Waterways
- Wild River High Preservation Areas
- Wild River Preservation Areas
- Mahogany Glider Habitat
- Directory of Important Wetlands
- Queensland

Queensland Government

LOCALITY DIAGRAM





This scale bar is approximate only
Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)
This product is unprojected and is not suitable for measuring distances

External contributors (non-government parties) of the data for this product are:
Great Barrier Reef Marine Park Authority
MapInfo Australia Pty Ltd

NOTE TO USER: Themes presented in this map are indicative only. Field survey may be required to verify the 'true' spatial extent and value. Not all environmentally sensitive areas are presented in this map. A user should refer to the particular circumstances relevant to their situation to assess the 'completeness' of themes provided.

The user should note that some boundaries and indicated values are ambient and may change over time (e.g. regional ecosystem boundaries and conservation status, watercourse mapping etc).

The user should be aware that due to multiple overlapping themes/ layers present, some themes/layers may be obscured by others. Ordering in the Legend does not accurately reflect the order by which themes/layers are displayed.

Birds Australia Database Search Results

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status
Acanthizidae	*Acanthiza chrysorrhoa*	yellow-rumped thornbill		
Acanthizidae	*Acanthiza nana*	yellow thornbill		
Acanthizidae	*Acanthiza reguloides*	buff-rumped thornbill		
Acanthizidae	*Acanthiza uropygialis*	chestnut-rumped thornbill		
Acanthizidae	*Gerygone albogularis*	white-throated gerygone		
Acanthizidae	*Gerygone fusca*	western gerygone		
Acanthizidae	*Smicrornis brevirostris*	weebill		
Accipitridae	*Accipiter fasciatus*	brown goshawk		Marine
Accipitridae	*Aquila audax*	wedge-tailed eagle		
Accipitridae	*Aviceda subcristata*	Pacific baza		
Accipitridae	*Circus assimilis*	spotted harrier		
Accipitridae	*Haliastur sphenurus*	whistling kite		Marine
Accipitridae	*Hieraaetus morphnoides*	little eagle		
Accipitridae	*Lophoictinia isura*	square-tailed kite	Near threatened	
Accipitridae	*Milvus migrans*	black kite		
Acrocephalidae	*Acrocephalus australis*	Australian reed-warbler		
Aegothelidae	*Aegotheles cristatus*	Australian owlet-nightjar		
Alaudidae	*Mirafra javanica*	Horsfield's bushlark		
Anatidae	*Anas gracilis*	grey teal		
Anatidae	*Anas superciliosa*	Pacific black duck		
Anatidae	*Aythya australis*	hardhead		
Anatidae	*Chenonetta jubata*	Australian wood duck		
Anatidae	*Cygnus atratus*	black swan		
Anatidae	*Dendrocygna eytoni*	plumed whistling-duck		
Anatidae	*Malacorhynchus membranaceus*	pink-eared duck		
Anhingidae	*Anhinga novaehollandiae*	Australasian darter		
Ardeidae	*Ardea intermedia*	intermediate egret		Marine
Ardeidae	*Ardea pacifica*	white-necked heron		
Ardeidae	*Egretta garzetta*	little egret		Marine
Ardeidae	*Egretta novaehollandiae*	white-faced heron		
Ardeidae	*Nycticorax caledonicus*	nankeen night-heron		Marine
Artamidae	*Artamus cinereus*	black-faced woodswallow		
Artamidae	*Artamus leucorynchus*	white-breasted woodswallow		
Artamidae	*Artamus minor*	little woodswallow		
Artamidae	*Cracticus nigrogularis*	pied butcherbird		
Artamidae	*Cracticus tibicen*	Australian magpie		
Artamidae	*Cracticus torquatus*	grey butcherbird		
Artamidae	*Strepera graculina*	pied currawong		
Burhinidae	*Burhinus grallarius*	bush stone-curlew		
Cacatuidae	*Cacatua galerita*	sulphur-crested cockatoo		
Cacatuidae	*Calyptorhynchus banksii*	red-tailed black-cockatoo		
Cacatuidae	*Calyptorhynchus funereus*	yellow-tailed black-cockatoo		
Cacatuidae	*Eolophus roseicapillus*	galah		
Cacatuidae	*Nymphicus hollandicus*	cockatiel		
Campephagidae	*Coracina maxima*	ground cuckoo-shrike		
Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		Marine
Campephagidae	*Coracina papuensis*	white-bellied cuckoo-shrike		Marine
Campephagidae	*Coracina tenuirostris*	cicadabird		Marine
Campephagidae	*Lalage sueurii*	white-winged triller		
Casuariidae	*Dromaius novaehollandiae*	emu		
Charadriidae	*Elseyornis melanops*	black-fronted dotterel		
Charadriidae	*Vanellus miles*	masked lapwing		
Climacteridae	*Climacteris picumnus*	brown treecreeper		
Columbidae	*Geopelia cuneata*	diamond dove		
Columbidae	*Geopelia humeralis*	bar-shouldered dove		
Columbidae	*Geopelia striata*	peaceful dove		
Columbidae	*Geophaps scripta scripta*	squatter pigeon (southern)	Vulnerable	Vulnerable
Columbidae	*Ocyphaps lophotes*	crested pigeon		
Columbidae	*Phaps chalcoptera*	common bronzewing		
Corcoracidae	*Corcorax melanorhamphos*	white-winged chough		
Corcoracidae	*Struthidea cinerea*	apostlebird		
Corvidae	*Corvus bennetti*	little crow		
Corvidae	*Corvus coronoides*	Australian raven		
Corvidae	*Corvus orru*	Torresian crow		
Cuculidae	*Cacomantis pallidus*	pallid cuckoo		Marine
Cuculidae	*Cacomantis variolosus*	brush cuckoo		

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status
Cuculidae	*Centropus phasianinus*	pheasant coucal		
Cuculidae	*Chalcites basalis*	Horsfield's bronze-cuckoo		Marine
Cuculidae	*Scythrops novaehollandiae*	channel-billed cuckoo		Marine
Estrildidae	*Neochmia modesta*	plum-headed finch		
Estrildidae	*Poephila cincta cincta*	black-throated finch (southern)	Endangered	Endangered
Estrildidae	*Taeniopygia bichenovii*	double-barred finch		
Estrildidae	*Taeniopygia guttata*	zebra finch		
Eurostopodidae	*Eurostopodus argus*	spotted nightjar		Marine
Eurostopodidae	*Eurostopodus mystacalis*	white-throated nightjar		Marine
Falconidae	*Falco berigora*	brown falcon		
Falconidae	*Falco cenchroides*	nankeen kestrel		Marine
Falconidae	*Falco longipennis*	Australian hobby		
Gruidae	*Grus rubicunda*	brolga		
Halcyonidae	*Dacelo leachii*	blue-winged kookaburra		
Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra		
Halcyonidae	*Todiramphus macleayii*	forest kingfisher		Marine
Halcyonidae	*Todiramphus pyrrhopygius*	red-backed kingfisher		
Halcyonidae	*Todiramphus sanctus*	sacred kingfisher		Marine
Hirundinidae	*Petrochelidon ariel*	fairy martin		
Hirundinidae	*Petrochelidon nigricans*	tree martin		Marine
Laridae	*Chroicocephalus novaehollandiae*	silver gull		Marine
Maluridae	*Malurus lamberti*	variegated fairy-wren		
Maluridae	*Malurus melanocephalus*	red-backed fairy-wren		
Megaluridae	*Cincloramphus mathewsi*	rufous songlark		
Megaluridae	*Eremiornis carteri*	spinifexbird		
Meliphagidae	*Acanthagenys rufogularis*	spiny-cheeked honeyeater		
Meliphagidae	*Entomyzon cyanotis*	blue-faced honeyeater		
Meliphagidae	*Lichenostomus penicillatus*	white-plumed honeyeater		
Meliphagidae	*Lichenostomus plumulus*	grey-fronted honeyeater		
Meliphagidae	*Lichenostomus virescens*	singing honeyeater		
Meliphagidae	*Lichmera indistincta*	brown honeyeater		
Meliphagidae	*Manorina flavigula*	yellow-throated miner		
Meliphagidae	*Melithreptus albogularis*	white-throated honeyeater		
Meliphagidae	*Philemon citreogularis*	little friarbird		
Meliphagidae	*Philemon corniculatus*	noisy friarbird		
Meliphagidae	*Plectorhyncha lanceolata*	striped honeyeater		
Meropidae	*Merops ornatus*	rainbow bee-eater		Marine; Migratory (JAMBA)
Monarchidae	*Grallina cyanoleuca*	magpie-lark		
Monarchidae	*Myiagra inquieta*	restless flycatcher		
Monarchidae	*Myiagra rubecula*	leaden flycatcher		
Motacillidae	*Anthus novaeseelandiae*	Australasian pipit		Marine
Nectariniidae	*Dicaeum hirundinaceum*	mistletoebird		
Neosittidae	*Daphoenositta chrysoptera*	varied sittella		
Oriolidae	*Oriolus sagittatus*	olive-backed oriole		
Otididae	*Ardeotis australis*	Australian bustard		
Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush		
Pachycephalidae	*Oreoica gutturalis*	crested bellbird		
Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		
Pardalotidae	*Pardalotus striatus*	striated pardalote		
Petroicidae	*Melanodryas cucullata*	hooded robin		
Petroicidae	*Microeca fascinans*	jacky winter		
Petroicidae	*Petroica goodenovii*	red-capped robin		
Phalacrocoracidae	*Microcarbo melanoleucos*	little pied cormorant		
Phasianidae	*Coturnix pectoralis*	stubble quail		Marine
Phasianidae	*Coturnix ypsilophora*	brown quail		
Podargidae	*Podargus strigoides*	tawny frogmouth		
Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe		
Pomatostomidae	*Pomatostomus temporalis*	grey-crowned babbler		
Psittacidae	*Aprosmictus erythropterus*	red-winged parrot		
Psittacidae	*Melopsittacus undulatus*	budgerigar		
Psittacidae	*Platycercus adscitus*	pale-headed rosella		
Psittacidae	*Trichoglossus haematodus*	rainbow lorikeet		
Ptilonorhynchidae	*Ptilonorhynchus maculatus*	spotted bowerbird		
Rallidae	*Fulica atra*	Eurasian coot		
Rallidae	*Gallinula tenebrosa*	dusky moorhen		
Rallidae	*Tribonyx ventralis*	black-tailed native-hen		
Recurvirostridae	*Himantopus himantopus*	black-winged stilt		Marine
Rhipiduridae	*Rhipidura albiscapa*	grey fantail		
Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status
Strigidae	*Ninox novaeseelandiae*	southern boobook		Marine
Threskiornithidae	*Platalea flavipes*	yellow-billed spoonbill		
Threskiornithidae	*Platalea regia*	royal spoonbill		
Turnicidae	*Turnix pyrrhothorax*	red-chested button-quail		
Tytonidae	*Tyto javanica*	eastern barn owl		

Queensland Museum Database Search Results

Family	Scientific name	Common Name	NC Act Status	EPBC Act Status
Amphibians				
Hylidae	*Cyclorana alboguttata*	green-stripe frog		
Hylidae	*Cyclorana brevipes*	superb collared-frog		
Hylidae	*Cyclorana novaehollandiae*	New Holland frog		
Hylidae	*Litoria inermis*	Peters' frog		
Hylidae	*Litoria latopalmata*	broad-palmed rocketfrog		
Hylidae	*Litoria nasuta*	striped rocketfrog		
Hylidae	*Litoria rothii*	Roth's tree-frog		
Hylidae	*Litoria rubella*	naked treefrog		
Limnodynastidae	*Notaden bennettii*	holy cross toad		
Limnodynastidae	*Platyplectrum ornatum*	ornate burrowing frog		
Myobatrachidae	*Uperoleia littlejohni*	Littlejohn's toadlet		
Myobatrachidae	*Uperoleia rugosa*	chubby gungan		
Bufonidae	*Rhinella marina*	cane toad	Introduced	
Reptiles				
Agamidae	*Amphibolurus burnsi*	Burns' dragon		
Agamidae	*Amphibolurus gilberti*	ta ta lizard		
Agamidae	*Amphibolurus nobbi*	nobbi dragon		
Cheluidae	*Chelodina longicollis*	eastern long-necked turtle		
Elapidae	*Cryptophis boschmai*	Carpentaria snake		
Elapidae	*Demansia papuensis*	greater black whipsnake		
Gekkonidae	*Diplodactylus conspicillatus*	fat-tailed gecko		
Gekkonidae	*Gehyra dubia*	dubious dtella		
Gekkonidae	*Heteronotia binoei*	Bynoe's gecko		
Gekkonidae	*Lucasium steindachneri*	box-patterned gecko		
Gekkonidae	*Oedura castelnaui*	northern velvet gecko		
Gekkonidae	*Oedura ocellata*	ocellated velvet gecko		
Gekkonidae	*Oedura rhombifer*	zigzag velvet gecko		
Gekkonidae	*Strophurus taenicauda*	golden-tailed gecko	Near threatened	
Gekkonidae	*Strophurus williamsi*	eastern spiny-tailed gecko		
Pygopodidae	*Lialis burtonis*	Burton's snake lizard		
Pygopodidae	*Paradelma orientalis*	brigalow scaly-foot	Vulnerable	Vulnerable
Pygopodidae	*Pygopus schraderi*	eastern hooded scaly-foot		
Pythonidae	*Aspidites melanocephalus*	black-headed python		
Pythonidae	*Morelia spilota*	carpet python		
Scincidae	*Carlia munda*	shaded-litter rainbow-skink		
Scincidae	*Carlia pectoralis*	open-litter rainbow skink		
Scincidae	*Ctenotus hebetior*	stout ctenotus		
Scincidae	*Ctenotus ingrami*	unspotted yellow-sided ctenotus		
Scincidae	*Ctenotus pantherinus*	leopard ctenotus		
Scincidae	*Ctenotus robustus*	eastern striped skink		
Scincidae	*Ctenotus sp.*			
Scincidae	*Ctenotus strauchii*	eastern barred wedge-snout ctenotus		
Scincidae	*Eremiascincus fasciolatus*	narrow-banded sand-swimmer		
Scincidae	*Eulamprus sokosoma*			
Scincidae	*Lampropholis delicata*	garden skink		
Scincidae	*Lerista fragilis*	eastern mulch-slider		
Scincidae	*Lerista punctatovittata*	eastern robust slider		
Scincidae	*Menetia greyii*	common dwarf skink		
Scincidae	*Menetia maini*	northern dwarf skink		
Scincidae	*Menetia timlowi*	dwarf litter-skink		
Scincidae	*Morethia boulengeri*	south-eastern morethia skink		
Typhlopidae	*Ramphotyphlops wiedii*	brown-snouted blind snake		
Varanidae	*Varanus panoptes*	yellow-spotted monitor		
Varanidae	*Varanus tristis*	black-headed monitor		
Birds				
Alcedinidae	*Dacelo leachii*	blue-winged kookaburra		
Alcedinidae	*Dacelo novaeguineae*	laughing kookaburra		
Alcedinidae	*Todiramphus pyrrhopygius*	red-backed kingfisher		
Artamidae	*Artamus cinereus*	black-faced woodswallow		
Cacatuidae	*Cacatua roseicapilla*	galah		
Cacatuidae	*Calyptorhynchus banksii*	red-tailed black-cockatoo		
Cacatuidae	*Nymphicus hollandicus*	cockatiel		

Campephagidae	*Coracina papuensis*	white-bellied cuckoo-shrike		Marine
Campephagidae	*Lalage tricolor*	white-winged triller		
Climacteridae	*Climacteris picumnus*	brown treecreeper		
Columbidae	*Geopelia placida*	peaceful dove		
Columbidae	*Phaps chalcoptera*	common bronzewing		
Corcoracidae	*Struthidea cinerea*	apostlebird		
Cracticidae	*Cracticus nigrogularis*	pied butcherbird		
Cuculidae	*Cuculus pallidus*	pallid cuckoo		Marine
Estrildidae	*Taeniopygia bichenovii*	double-barred finch		
Meliphagidae	*Acanthagenys rufogularis*	spiny-cheeked honeyeater		
Meliphagidae	*Lichenostomus penicillatus*	white-plumed honeyeater		
Meliphagidae	*Lichenostomus virescens*	singing honeyeater		
Meliphagidae	*Lichmera indistincta*	brown honeyeater		
Meliphagidae	*Manorina flavigula*	yellow-throated miner		
Meliphagidae	*Melithreptus albogularis*	white-throated honeyeater		
Meliphagidae	*Philemon corniculatus*	noisy friarbird		
Meliphagidae	*Plectorhyncha lanceolata*	striped honeyeater		
Monarchidae	*Myiagra rubecula*	leaden flycatcher		
Monarchidae	*Seisura inquieta*	restless flycatcher		
Neosittidae	*Daphoenositta chrysoptera*	varied sittella		
Oriolidae	*Oriolus sagittatus*	olive-backed oriole		
Otididae	*Ardeotis australis*	Australian bustard		
Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		
Pardalotidae	*Pardalotus striatus*	striated pardalote		
Petroicidae	*Microeca fascinans*	jacky winter		
Podargidae	*Podargus strigoides*	Tawny frogmouth		
Pomatostomidae	*Pomatostomus temporalis*	grey-crowned babbler		
Psittacidae	*Aprosmictus erythropterus*	red-winged parrot		
Psittacidae	*Platycercus adscitus*	pale-headed rosella		
Ptilonorhynchidae	*Chlamydera maculata*	spotted bowerbird		
Mammals				
Bovidae	*Bos taurus*	domestic cattle	Introduced	
Dasyuridae	*Dasyurus hallucatus*	northern quoll		Endangered
Dasyuridae	*Sminthopsis macroura*	stripe-faced dunnart		
Macropodidae	*Lagorchestes conspicillatus*	spectacled hare wallaby		
Macropodidae	*Macropus dorsalis*	black-striped wallaby		
Macropodidae	*Macropus giganteus*	eastern grey kangaroo		
Macropodidae	*Macropus robustus*	common wallaroo		
Macropodidae	*Macropus rufus*	red kangaroo		
Macropodidae	*Petrogale assimilis*	allied rock wallaby		
Macropodidae	*Wallabia bicolor*	swamp wallaby		
Molossidae	*Chaerophon jobensis*	northern mastiff-bat		
Molossidae	*Mormopterus beccarii*	Beccari's mastiff-bat		
Molossidae	*Mormopterus planiceps*	little mastiff-bat		
Muridae	*Leggadina lakedownensis*	Lakeland Downs mouse		
Muridae	*Mus musculus*	house mouse	Introduced	
Muridae	*Pseudomys delicatulus*	delicate mouse		
Muridae	*Pseudomys desertor*	desert mouse		
Muridae	*Pseudomys patrius*	pebble- mound mouse		
Muridae	*Rattus tunneyi*	pale field rat		
Phalangeridae	*Trichosurus vulpecula*	common brushtail possum		
Potoroidae	*Aepyprymnus rufescens*	rufous bettong		
Vespertilionidae	*Chalinolobus gouldii*	Gould's wattled bat		
Vespertilionidae	*Scotorepens balstoni*	western broad-nosed bat		
Vombatidae	*Lasiorhinus krefftii*	northern hairy-nosed wombat	Endangered	Endangered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Appendix C – Flora survey results


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Offsite Infrastructure Study Area Flora Species List

Family	Taxon	Common name	LP Act	EPBC Act	NC Act*	Life form[1]	Site(s) recorded[2]
Acanthaceae	*Rostellularia adscendens* var. *hispida*	pink tongues			LC	H	Q1, Q3, Q14, Q27
Aizoaceae	*Trianthema portulacastrum*	black pigweed			I	H	Q5, Q6, Q33, Q38, Q39, Q40, Q41 Q42, Q43, Q48
Amaranthaceae	*Alternanthera denticulata* var. *micrantha*	joyweed			LC	H	Q7, Q8, Q19, Q20, Q26, Q36, Q40, Q42, Q43
Amaranthaceae	*Alternanthera nana*	joyweed			LC	H	Q38
Amaranthaceae	*Alternanthera pungens*	khaki weed			I	H	Q6, Q38
Amaranthaceae	*Gomphrena celosioides*	soft khaki weed			I	H	Q1, Q6, Q19, Q38
Amaryllidaceae	*Crinum sp.*				LC	H	Q37
Apocynaceae	*Alstonia constricta*	bitter bark			LC	S	Q9, Q27
Apocynaceae	*Carissa lanceolata*	conkerberry			LC	S	Q1, Q3, Q4, Q5, Q6, Q12, Q14, Q15, Q16, Q18, Q19, Q20, Q21, Q23, Q24, Q26, Q27
Apocynaceae	*Carissa ovata*	currant bush			LC	S	Q9, Q10, Q34, Q35, Q37, Q46
Apocynaceae	*Marsdenia viridiflora* subsp. *viridiflora*	doubah			LC	S	Q22, Q23, Q24
Apocynaceae	*Parsonsia eucalyptophylla*	gargaloo			LC	v	Q35
Apocynaceae	*Parsonsia lanceolata*	rough silkpod			LC	v	Q21, Q26, Q31
Asphodelaceae	*Bulbine bulbosa*	native leek			LC	H	Q22, Q23, Q24, Q30, Q45, Q47
Asteraceae	*Brachyscome dentata*				LC	H	Q41
Asteraceae	*Calotis cuneata*	mountain burr-daisy			LC	H	Q28, Q36
Asteraceae	*Calotis scapigera*	tufted burr-daisy			LC	H	Q11
Asteraceae	*Calotis sp.*				LC	H	Q38

Family	Taxon	Common name	LP Act	EPBC Act	NC Act*	Life form[1]	Site(s) recorded[2]
Asteraceae	*Chrysocephalum apiculatum*	billy buttons			LC	H	Q9, Q27
Asteraceae	*Cyanthillium cinereum*	vernonia			LC	H	Q3, Q14, Q30
Asteraceae	*Parthenium hysterophorus*	parthenium	Class 2		I	H	Q1, Q2, Q4, Q6, Q8, Q11, Q12, Q13, Q16, Q17, Q19, Q20, Q22, Q23, Q24, Q26, Q29, Q30, Q31, Q32, Q33, Q34, Q35, Q36, Q37, Q38, Q39, Q40, Q41, Q42, Q43, Q44, Q45, Q46, Q47, Q48
Asteraceae	*Pterocaulon sphacelatum*	fruit salad plant			LC	H	Q3
Asteraceae	*Vittadinia pustulata*	daisy			LC	H	Q22
Asteraceae	*Xanthium pungens*	noogoora burr			I	H	Q13
Brassicaceae	*Lepidium bonariensi*	cut-leaf peppercress			I	H	Q13
Byttneriaceae	*Keraudrenia collina*				LC	H	Q16
Cactaceae	*Opuntia stricta*	prickly pear	Class 2		I	S	Q28
Cactaceae	*Opuntia tomentosa*	velvety tree pear	Class 2		I	S	Q2, Q14, Q15, Q34, Q39, Q40, Q47, Q48
Caesalpiniaceae	*Cassia brewsteri*	Leichhardt bean			LC	S	Q18
Caesalpiniaceae	*Lysiphyllum carronii*	red bauhinia			LC	ST	Q5, Q7, Q9, Q10, Q12, Q14, Q15, Q20, Q22, Q23, Q24, Q25, Q29, Q31, Q32, Q33, Q34, Q35, Q37, Q38, Q39, Q40, Q41, Q42, Q43, Q44, Q45, Q48
Caesalpiniaceae	*Parkinsonia aculeata*	parkinsonia	Class 2		I	S	Q48
Campanulaceae	*Wahlenbergia gracilis*	Australian bluebell			LC	H	Q19, Q20
Capparaceae	*Apophyllum anomalum*	warrior bush			LC	S	Q2, Q22, Q23, Q24, Q31, Q32, Q34, Q35, Q44, Q47, Q48

Family	Taxon	Common name	LP Act	EPBC Act	NC Act*	Life form[1]	Site(s) recorded[2]
Capparaceae	*Capparis canescens*	wild orange			LC	S	Q15
Capparaceae	*Capparis lasiantha*	wait-a-while			LC	S	Q12, Q14, Q15, Q22, Q23, Q24, Q25, Q30, Q31, Q32, Q33, Q34, Q35, Q36, Q37, Q44
Capparaceae	*Capparis loranthifolia*				LC	v	Q31, Q34, Q44
Capparaceae	*Capparis mitchellii*	bumble tree			LC	S	Q3, Q4, Q12, Q30, Q31, Q39, Q45
Casuarinaceae	*Casuarina cristata*	belah			LC	ST	Q17, Q26
Chenopodiaceae	*Chenopodium auricomum*	Queensland bluebush			LC	S	Q47
Chenopodiaceae	*Chenopodium cristatum*	crested goosefoot			LC	S	Q19
Chenopodiaceae	*Chenopodium murale*	nettle-leaf goosefoot			I	H	Q13, Q28
Chenopodiaceae	*Einadia nutans subsp. Linifolia*	climbing saltbush			LC	H	Q48
Chenopodiaceae	*Salsola kali*	soft roly-poly			LC	H	Q13
Chenopodiaceae	*Sclerolaena anisacanthoides*	yellow burr			LC	S	Q38
Combretaceae	*Terminalia oblongata*	yellow wood			LC	ST	Q1, Q2, Q4, Q7, Q10, Q11, Q12, Q13, Q15, Q20, Q23, Q24, Q26, Q28, Q29, Q30, Q34, Q36, Q37, Q38
Commelinaceae	*Commelina diffusa*	wandering jew			LC	H	Q3, Q14, Q47
Commelinaceae	*Commelina ensifolia*	scurvy grass			LC	H	Q30, Q40
Convolvulaceae	*Evolvulus alsinoides*	tropical speedwell			LC	H	Q1, Q6, Q18, Q21, Q41, Q42, Q43
Convolvulaceae	*Polymeria ambigua*	creeping polymeria			LC	H	Q33, Q40, Q42, Q43, Q47
Convolvulaceae	*Polymeria longifolia*				LC	H	Q28, Q33
Convolvulaceae	*Polymeria* sp.				LC	H	Q18

Family	Taxon	Common name	LP Act	EPBC Act	NC Act*	Life form[1]	Site(s) recorded[2]
Cucurbitaceae	*Cucumis melo subsp. agrestis*	Ulcardo melon			LC	H	Q33, Q39, Q41, Q42, Q43, Q48
Cucurbitaceae	*Cucumis myriocarpus* subsp. *myriocarpus*	prickly paddy-melon			I	v	Q22, Q29
Cyperaceae	*Cyperus exaltatus*	giant sedge			LC	R	Q7
Cyperaceae	*Cyperus gracilis*	slender flat-sedge			LC	R	Q36
Cyperaceae	*Cyperus sp.*				LC	R	Q31, Q32, Q36, Q39, Q41, Q42, Q43, Q47, Q48
Cyperaceae	*Eleocharis pallens*				LC	R	Q8, Q11, Q28, Q36
Cyperaceae	*Fimbristylis dichotoma*	common finger rush			LC	R	Q14, Q19
Cyperaceae	*Fimbristylis* sp.				LC	R	Q8, Q18
Euphorbiaceae	*Chamaesyce dallachyana*	caustic weed			LC	H	Q7, Q9
Euphorbiaceae	*Euphorbia tannensis*	spurge			LC	F	Q47
Fabaceae	*Aeschynomene indica*	budda pea			LC	S	Q7
Fabaceae	*Cullen tenax*	emu foot			LC	H	Q7, Q47
Fabaceae	*Desmodium campylocaulon*	creeping tick-trefoil			LC	H	Q25, Q30, Q31, Q32, Q33, Q41, Q42, Q43
Fabaceae	*Desmodium sp.*				LC	H	Q34, Q39, Q40, Q44, Q45
Fabaceae	*Glycine falcata*	glycine			LC	H	Q22
Fabaceae	*Glycine tabacina*				LC	H	Q44
Fabaceae	*Rhynchosia minima* var. *australis*	rhynchosia			LC	H	Q14, Q22, Q23, Q24, Q31, Q33, Q37, Q40, Q42, Q43, Q44, Q47
Fabaceae	*Senna artemisioides subsp. zygophylla*	silver cassia			LC	S	Q33

Family	Taxon	Common name	LP Act	EPBC Act	NC Act*	Life form[1]	Site(s) recorded[2]
Fabaceae	*Sesbania cannabina*	sesbania pea			LC	S	Q13, Q32, Q48
Fabaceae	*Stylosanthes scabra*	stylo			I	S	Q1, Q3, Q6, Q9, Q14, Q16, Q18, Q20
Fabaceae	*Tephrosia supina*				LC	H	Q22, Q38, Q45, Q47
Fabaceae	*Zornia dyctiocarpa*	zornia			LC	H	Q14, Q20
Juncaceae	*Juncus usitatus*	common rush			LC	R	Q1, Q13
Lamiaceae	*Ocimum tenuiflorum*	native thyme			LC	H	Q23
Laxmanniaceae	*Lomandra longifolia*	long-leaved matrush			LC	R	Q1, Q21
Loranthaceae	*Amyema miraculosa* var. *boormanii*	fleshy mistletoe			LC	e	Q9, Q10
Loranthaceae	*Amyema quandang* var. *bancroftii*	grey mistletoe			LC	e	Q27, Q35
Loranthaceae	*Lysiana sp.*				LC	e	Q35, Q46
Loranthaceae	*Lysiana subfalcata*	lemon-flowered mistletoe			LC	e	Q12, Q23, Q29
Malvaceae	*Abutilon auritum*				LC	H	Q21
Malvaceae	*Abutilon fraseri*	dwarf lantern flower			LC	H	Q3, Q14, Q15, Q21
Malvaceae	*Abutilon oxycarpum*	flannel flower			LC	H	Q7
Malvaceae	*Hibiscus sturtii*	hill hibiscus			LC	H	Q30, Q41, Q42, Q43, Q48
Malvaceae	*Hibiscus trionum*	bladder ketmia			LC	H	Q29, Q31, Q33, Q41, Q42, Q43
Malvaceae	*Sida cordifolia*	flannel weed			I	H	Q15, Q19, Q32, Q33, Q36, Q40, Q42, Q43, Q45, Q48
Malvaceae	*Sida cunninghamii*	ridge sida			LC	H	Q9
Malvaceae	*Sida filiformis*	fine sida			LC	H	Q9, Q10

Family	Taxon	Common name	LP Act	EPBC Act	NC Act*	Life form[1]	Site(s) recorded[2]
Malvaceae	*Sida hackettiana*	spiked sida			LC	H	Q16
Malvaceae	*Sida rhombifolia*	common sida			I	H	Q8
Malvaceae	*Sida rohlenae* subsp. *rohlenae*	shrub sida			LC	H	Q11, Q18, Q19, Q21
Malvaceae	*Sida sp.*				LC	H	Q48
Malvaceae	*Sida trichopoda*	high sida			LC	H	Q22, Q23, Q24, Q27, Q33, Q38, Q45, Q47, Q48
Marsileaceae	*Marsilea mutica*	smooth nardoo			LC	a	Q7
Marsileaceae	*Marsilea sp.*				LC	a	Q33
Meliaceae	*Owenia acidula*	emu apple			LC	ST	Q10, Q22, Q23, Q24, Q25, Q30, Q31, Q33, Q34
Mimosaceae	*Acacia argyrodendron*	blackwood			LC	ST	Q29, Q34, Q33
Mimosaceae	*Acacia bidwillii*	corkwood wattle			LC	S	Q3
Mimosaceae	*Acacia cambagei*	Gidgee			LC	T	Q2, Q4, Q8, Q17, Q26, Q31, Q33, Q34, Q35
Mimosaceae	*Acacia decora*	pretty wattle			LC	S	Q21
Mimosaceae	*Acacia excelsa* subsp. *excelsa*	ironwood			LC	S	Q1, Q3, Q4, Q5, Q9, Q10, Q11, Q14, Q15, Q20, Q21
Mimosaceae	*Acacia harpophylla*	brigalow			LC	T	Q1, Q2, Q4, Q5, Q11, Q12, Q13, Q14, Q16, Q17, Q19, Q20, Q26, Q28, Q29, Q30, Q34, Q35, Q36, Q37, Q38, Q44, Q45, Q46, Q48
Mimosaceae	*Acacia oswaldii*	miljee			LC	S	Q38
Mimosaceae	*Acacia salicina*	sally wattle			LC	ST	Q1, Q4, Q6, Q7, Q9, Q12, Q16, Q19, Q20, Q21, Q22, Q23, Q24, Q27, Q39, Q41, Q42, Q43, Q44, Q47

Family	Taxon	Common name	LP Act	EPBC Act	NC Act*	Life form[1]	Site(s) recorded[2]
Mimosaceae	*Acacia stenophylla*	belalie			LC	S	Q7
Mimosaceae	*Neptunia gracilis*	native sensitive plant			LC	H	Q11, Q13, Q23, Q29, Q30, Q31, Q32, Q34, Q36, Q37, Q39, Q40, Q41, Q42, Q43, Q44, Q45, Q48
Mimosaceae	*Vachellia farnesiana*	mimosa bush			I	S	Q1, Q5, Q6, Q8, Q11, Q12, Q14, Q16, Q19, Q21, Q22, Q23, Q24, Q25, Q28, Q29, Q30, Q31, Q33, Q34, Q36, Q37, Q38, Q39, Q40, Q41, Q42, Q43, Q44, Q45, Q47, Q48
Molluginaceae	*Glinus lotoides*	hairy carpet-weed			LC	H	Q13, Q26
Myoporaceae	*Eremophila bignoniiflora*	dogwood			LC	S	Q8
Myoporaceae	*Eremophila deserti*	Ellangowan poison bush			LC	S	Q23, Q26
Myoporaceae	*Eremophila mitchellii*	false sandalwood			LC	ST	Q13, Q14, Q15, Q17, Q21, Q23, Q24, Q25, Q26, Q31, Q34, Q35, Q46
Myrtaceae	*Corymbia clarksoniana*	Clarkson's bloodwood			LC	T	Q1, Q9, Q13, Q14, Q18, Q27, Q36
Myrtaceae	*Corymbia dallachiana*	ghost gum			LC	T	Q1, Q14, Q16, Q27
Myrtaceae	*Eucalyptus brownii*	Reid River box			LC	T	Q3, Q4, Q5, Q6, Q9, Q10, Q11, Q14, Q15, Q18, Q19, Q21, Q27
Myrtaceae	*Eucalyptus camaldulensis* var. *camaldulensis*	river red gum			LC	T	Q5, Q7
Myrtaceae	*Eucalyptus camaldulensis* var. *obtusa*	river red gum			LC	T	Q1, Q9, Q15, Q16, Q21
Myrtaceae	*Eucalyptus cambageana*	blackbutt			LC	ST	Q20
Myrtaceae	*Eucalyptus coolabah*	coolibah			LC	T	Q1, Q3, Q7, Q8, Q13, Q16, Q21, Q38, Q48
Myrtaceae	*Eucalyptus melanophloia*	silver-leaved ironbark			LC	T	Q3, Q6, Q14, Q18, Q21, Q27

Family	Taxon	Common name	LP Act	EPBC Act	NC Act*	Life form[1]	Site(s) recorded[2]
Myrtaceae	*Eucalyptus persistens*				LC	T	Q13
Myrtaceae	*Melaleuca leucadendra*	weeping teatree			LC	T	Q7
Myrtaceae	*Melaleuca trichostachya*	river teatree			LC	ST	Q7
Oleaceae	*Jasminum didymum*	jasmine			LC	v	Q26
Orchidaceae	*Cymbidium canaliculatum*	black orchid			Type A	e	Q7, Q13, Q21, Q34, Q38, Q46
Oxalidaceae	*Oxalis corniculata*	yellow wood-sorrel			I	H	Q27
Passifloraceae	*Passiflora* sp.	passionfruit			I	v	Q26
Phyllanthaceae	*Phyllanthus virgatus*	spurge			LC	H	Q7, Q20, Q27, Q30
Picrodendraceae	*Petalostigma pubescens*	quinine berry bush			LC	ST	Q1, Q9, Q27
Pittosporaceae	*Bursaria incana* var. *incana*	prickly pine			LC	S	Q18
Pittosporaceae	*Pittosporum spinescens*	wallaby apple			LC	S	Q15
Poaceae	*Alloteropsis semialata*	cockatoo grass			LC	G	Q7, Q19
Poaceae	*Aristida calycina* var. *calycina*	dark wiregrass			LC	G	Q1, Q3, Q5, Q14, Q15, Q18, Q21, Q27, Q37
Poaceae	*Aristida jerichoensis* var. *jerichoensis*	Jericho wiregrass			LC	G	Q7, Q14, Q20, Q27
Poaceae	*Aristida latifolia*	feather-top wiregrass			LC	G	Q30, Q40, Q47
Poaceae	*Aristida leptopoda*	white speargrass			LC	G	Q30, Q32, Q47
Poaceae	*Aristida personata*	purple wiregrass			LC	G	Q32
Poaceae	*Arundinella nepalensis*	reed grass			LC	G	Q14, Q27
Poaceae	*Astrebla elymoides*	Mitchell grass			LC	G	Q29, Q30, Q32
Poaceae	*Astrebla lappacea*	curly Mitchell grass			LC	G	Q30

Family	Taxon	Common name	LP Act	EPBC Act	NC Act*	Life form[1]	Site(s) recorded[2]
Poaceae	*Astrebla pectinata*	barley Mitchell grass			LC	G	Q28
Poaceae	*Bothriochloa bladhii* subsp. *bladhii*	forest bluegrass			LC	G	Q1, Q20, Q21, Q33, Q36, Q44, Q45
Poaceae	*Bothriochloa pertusa*	Indian bluegrass			I	G	Q29, Q30, Q32, Q36, Q37, Q38, Q48
Poaceae	*Brachyachne convergens*	native couch			LC	G	Q1, Q37
Poaceae	*Capillipedium spicigerum*	scented top			LC	G	Q1, Q14, Q16
Poaceae	*Cenchrus ciliaris*	buffel grass			I	G	Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q9, Q10, Q11, Q12, Q14, Q15, Q16, Q17 , Q18, Q19, Q20, Q21, Q22, Q23, Q24, Q25, Q26, Q27, Q28, Q29, Q30, Q31, Q32, Q33, Q34, Q35, Q36, Q37, Q38, Q39, Q40, Q41, Q42, Q43, Q44, Q45, Q46, Q47, Q48
Poaceae	*Chloris ventricosa*	tall chloris			LC	G	Q2, Q7
Poaceae	*Chrysopogon fallax*	golden beard grass			LC	G	Q1, Q3, Q5, Q6, Q7, Q14, Q10, Q18, Q27, Q37
Poaceae	*Cymbopogon*	silky oilgrass			LC	G	Q36
Poaceae	*Cynodon dactylon*	couch			I	G	Q33
Poaceae	*Dactyloctenium radulans*	button grass			LC	G	Q5, Q19, Q35, Q37
Poaceae	*Dichanthium sericeum*	Queensland bluegrass			LC	G	Q1, Q11, Q16, Q20, Q30, Q32
Poaceae	*Digitaria divaricatissima*	umbrella grass			LC	G	Q30
Poaceae	*Echinochloa colona*	awnless barnyard grass			I	G	Q2, Q4, Q7, Q8, Q26, Q29, Q33, Q38
Poaceae	*Enneapogon avenaceus*	ridge grass			LC	G	Q21, Q27
Poaceae	*Enneapogon gracilis*	slender bottlewashers			LC	G	Q15, Q20

Family	Taxon	Common name	LP Act	EPBC Act	NC Act*	Life form[1]	Site(s) recorded[2]
Poaceae	*Enneapogon polyphyllus*	leafy nineawn			LC	G	Q30
Poaceae	*Enneapogon robustissimus*				LC	G	Q9
Poaceae	*Enteropogon ramosus*	curly windmill grass			LC	G	Q38
Poaceae	*Eragrostis elongata*	clustered lovegrass			LC	G	Q1, Q7, Q19
Poaceae	*Eragrostis lacunaria*	purple lovegrass			LC	G	Q14
Poaceae	*Eragrostis parviflora*	weeping lovegrass			LC	G	Q9
Poaceae	*Eragrostis sororia*	woodland lovegrass			LC	G	Q21
Poaceae	*Eragrostis tenellula*	delicate lovegrass			LC	G	Q48
Poaceae	*Eriachne mucronata*	mountain wanderrie			LC	G	Q27
Poaceae	*Eulalia aurea*	silky browntop			LC	G	Q7, Q36
Poaceae	*Heteropogon contortus*	black spear grass			LC	G	Q1, Q3, Q6, Q14, Q18, Q27
Poaceae	*Iseilema vaginiflorum*	red Flinders grass			LC	G	Q32
Poaceae	*Leptochloa decipiens*				LC	G	Q16
Poaceae	*Leptochloa digitata*	umbrella canegrass			LC	G	Q1, Q11, Q13, Q21, Q26, Q35, Q36, Q37, Q38, Q48
Poaceae	*Panicum decompositum* var. *decompositum*	native millet			LC	G	Q11, Q29, Q30, Q32
Poaceae	*Panicum effusum*	hairy panic			LC	G	Q20
Poaceae	*Paspalidium distans*				LC	G	Q7, Q8, Q16
Poaceae	*Paspalidium jubiflorum*	Warrego grass			LC	G	Q36, Q38
Poaceae	*Perotis rara*	comet grass			LC	G	Q9, Q27

Family	Taxon	Common name	LP Act	EPBC Act	NC Act*	Life form[1]	Site(s) recorded[2]
Poaceae	*Sporobolus caroli*	fairy grass			LC	G	Q2, Q35, Q38
Poaceae	*Sporobolus creber*	western rat's tail grass			LC	G	Q8, Q38
Poaceae	*Sporobolus mitchellii*	rat's tail couch			LC	G	Q36, Q37
Poaceae	*Themeda triandra*	kangaroo grass			LC	G	Q14, Q20, Q21, Q27
Poaceae	*Urochloa mosambicensis*				I	G	Q5, Q6, Q7, Q15, Q16
Polygonaceae	*Polygonum aviculare*				I	H	Q13
Portulacaceae	*Portulaca oleracea*	common pigweed			I	H	Q26, Q29, Q33, Q35, Q47
Portulacaceae	*Portulaca pilosa*	akulikuli			I	H	Q38, Q44, Q48
Proteaceae	*Grevillea striata*	beefwood			LC	ST	Q3, Q15, Q18
Rhamnaceae	*Ventilago viminalis*	vine tree			LC	ST	Q1
Rubiaceae	*Spermacoce brachystema*				LC	H	Q27
Rutaceae	*Citrus glauca*	wild lime			LC	S	Q2, Q3, Q12, Q17, Q15, Q31, Q48
Rutaceae	*Geijera parviflora*	wilga			LC	S	Q13, Q23, Q24, Q31, Q34, Q36, Q46
Santalaceae	*Santalum lanceolatum*	sandalwood			LC	ST	Q1, Q4, Q22, Q23, Q24, Q25, Q26, Q35, Q37, Q45, Q46
Sapindaceae	*Alectryon diversifolius*	scrub boonaree			LC	S	Q22, Q26, Q30, Q31, Q33
Sapindaceae	*Alectryon oleifolius*	western rosewood			LC	ST	Q36, Q44, Q47, Q48
Sapindaceae	*Atalaya hemiglauca*	cattle bush			LC	ST	Q4, Q15, Q16, Q22, Q23, Q24, Q25, Q28, Q30, Q31, Q32, Q33, Q34, Q35, Q37, Q38, Q39, Q40, Q41, Q42, Q43, Q44, Q45, Q46, Q47, Q48
Scrophulariaceae	*Stemodia glabella*	smooth bluerod			LC	H	Q30, Q32, Q40, Q42, Q43, Q45, Q47, Q48

Family	Taxon	Common name	LP Act	EPBC Act	NC Act*	Life form[1]	Site(s) recorded[2]
Solanaceae	*Physalis angulata*				I	H	Q32
Solanaceae	*Solanum esuriale*	quena			LC	H	Q30, Q32
Solanaceae	*Solanum nigrum*	black-berry nightshade			I	H	Q29
Solanaceae	*Solanum sp.*				LC	H	Q33, Q36, Q40, Q42, Q43
Sparrmanniaceae	*Grewia retusifolia*	dog's balls			LC	S	Q1, Q3, Q7, Q14, Q15, Q16, Q18, Q20, Q21
Verbenaceae	*Stachytarpheta jamaicensis*	snakeweed			I	H	Q23
Violaceae	*Hybanthus monopetalus*	spade flower			LC	H	Q6, Q7, Q21
Zygophyllaceae	*Tribulus terrestris*	caltrop			LC	H	Q9, Q26, Q30, Q31, Q33, Q39, Q40, Q41, Q42, Q43

*NC Act status: LC = Least concern; I = Introduced

[1]Life form: T = tree; ST = short tree; S = shrub; H= herb/forb; G= grass; R = sedge/rush/lily; V = vine; a = aquatic; e = epiphytic; p = parasitic

[2]Q = Quaternary assessment site

Appendix D – Weeds

Summary of Desktop Weed Searches


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Species	Common Name	Status	Source
Hymenachne amplexicaulis	hymenachne	WoNS, Class 2 declared	ERT, Herbrecs, Wildlife Online, IRC medium priority weed species
Parkinsonia aculeata	parkinsonia	WoNS, Class 2 declared	ERT, Biosec mapping (Highly suitable), IRC medium priority weed species
Parthenium hysterophorus	parthenium weed	WoNS, Class 2 declared	ERT, Herbrecs, Wildlife Online, Biosec mapping (Suitable), IRC high/medium priority weed species
Harrisia martini	harrisia cactus	Class 2 declared	Wildlife Online, IRC medium priority weed species
Opuntia tomentosa	velvety tree pear	Class 2 declared	Wildlife Online
Sporobolus fertilis	giant Parramatta grass	Class 2 declared	Wildlife Online
Pennisetum setaceum	African fountain grass	Class 3 declared	Biosec mapping (High to Very High)
Nassella neesiana	Chilean needlegrass	WoNS, Class 1 declared	Biosec mapping (Moderate suitability to Suitable)
Ziziphus mauritiana	chinee apple	Class 2 declared	Biosec mapping (Suitable to Highly Suitable), IRC medium priority weed species
Myriophyllum spicatum	Eurasian water milfoil	Class 1 declared	Biosec mapping (High)
Acacia karroo	karoo thorn	Class 1 declared	Biosec mapping (High)
Prosopis pallida	mesquite	WoNS, Class 2 declared	Biosec mapping (Highly suitable)
Bryophyllum delagoense	mother of millions	Class 2 declared	Biosec mapping (Highly suitable), IRC low priority weed species
Acacia nilotica	prickly acacia	WoNS, Class 2 declared	Biosec mapping (Suitable), IRC high priority weed species
Sesbania punicea	red sesbania	Class 1 declared	Biosec mapping (High to Very High)
Eichhornia crassipes	water hyacinth	Class 2 declared	Biosec mapping (Highly suitable)
Pistia stratiotes	water lettuce	Class 2 declared	Biosec mapping (Highly suitable)
Striga asiatica	striga	Class 1 declared	Biosec mapping (Moderate to High)
Tecoma stans	yellow bells	Class 3 declared	Biosec mapping (High)

Note: Status indicated the species class as listed under the *Land Protection (Pest and Stock Route Management) Act 2002*.

WoNS are Weeds of National Significance identified by the Australian Government.


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Appendix E – Fauna survey results


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Common name	Species	EPBC	NC	Survey Method						
				DW	AS	S	T	IO	RC	A
Amphibians										
green-striped burrowing frog	*Cyclorana alboguttata*					1				
spotted marsh frog	*Limnodynastes tasmaniensis*			10			1			
green tree frog	*Litoria caerulea*					3				
bumpy rocket frog	*Litoria inermis*				10					
broad-palmed rocket frog	*Litoria latopalmata*			1	1		1			
emerald-spotted tree frog	*Litoria peronii*			2						
cane toad	**Rhinella marina*				20	41				
Birds										
apostlebird	*Struthidea cinerea*			5	20		20			
Australasian darter	*Anhinga novaehollandiae*			10		1	1		2	
Australasian figbird	*Sphecotheres vieilloti*				2					
Australasian grebe	*Tachybaptus novaehollandiae*			1						
Australasian pipit	*Anthus novaeseelandiae*				2					
Australian bustard	*Ardeotis australis*				2	1		1		
Australian hobby	*Falco longipennis*			2	1					
Australian magpie	*Cracticus tibicen*			11	14		5		2	
Australian owlet-nightjar	*Aegotheles cristatus*			1	1	4				
Australian pelican	*Pelecanus conspicillatus*	Ma		47					45	
Australian raven	*Corvus coronoides*			5	11		13		12	
Australian reed-warbler	*Acrocephalus australis*			1						
Australian wood duck	*Chenonetta jubata*			137	29		20		40	

Common name	Species	EPBC	NC	DW	AS	S	T	IO	RC	A
black kite	*Milvus migrans*			10						
black swan	*Cygnus atratus*			13						
black-eared cuckoo	*Chrysococcyx osculans*	Ma			1					
black-faced cuckoo-shrike	*Coracina novaehollandiae*	Ma		4	1		3			
black-faced woodswallow	*Artamus cinereus*			159	256					
black-fronted dotterel	*Elseyornis melanops*			10						
black-necked stork	*Ephippiorhynchus asiaticus*		NT	5	1				4	
black-shouldered kite	*Elanus axillaris*			3	1					
black-tailed native-hen	*Tribonyx ventralis*			14					2	
black-throated finch	*Poephila cincta cincta*	E	E							
black-winged stilt	*Himantopus himantopus*	Ma		2						
blue-faced honeyeater	*Entomyzon cyanotis*			5	4		4			
blue-winged kookaburra	*Dacelo leachii*				1					
brown falcon	*Falco berigora*			1	2			1		
brown honeyeater	*Lichmera indistincta*			1	6					
brown quail	*Coturnix ypsilophora*			2	2			5		
brown treecreeper	*Climacteris picumnus*			1	3		5			
budgerigar	*Melopsittacus undulatus*			172	472		105	6		
common bronzewing	*Phaps chalcoptera*			2						
cotton pygmy-goose	*Nettapus coromandelianus*		NT	4						
crested bellbird	*Oreoica gutturalis*				1					
crested pigeon	*Ocyphaps lophotes*			27	4		5		2	
crimson chat	*Epthianura tricolor*			1	1					
diamond dove	*Geopelia cuneata*			1	4		1			
double-barred finch	*Taeniopygia bichenovii*			68	45		25	6		

Common name	Species	EPBC	NC	DW	AS	S	T	IO	RC	A
dusky honeyeater	*Myzomela obscura*				6		1			
dusky woodswallow	*Artamus cyanopterus*			30	7		10			
eastern barn owl	*Tyto javanica*					4				
eastern great egret	*Ardea modesta*	Mi, Ma		1					4	
emu	*Dromaius novaehollandiae*			12	5					
Eurasian coot	*Fulica atra*			5						
fairy martin	*Petrochelidon ariel*			9	71					
galah	*Eolophus roseicapillus*			26	12		10			
grey butcherbird	*Cracticus torquatus*				7		19			
grey fantail	*Rhipidura albiscapa*			2	11		3			
grey shrike-thrush	*Colluricincla harmonica*				2					
grey teal	*Anas gracilis*			4					2	
grey-crowned babbler	*Pomatostomus temporalis*			17	15					
hardhead	*Aythya australis*			4						
Horsfield's bronze-cuckoo	*Chalcites basalis*	Ma		3	1		2			
intermediate egret	*Ardea intermedia*	Ma		1						
jacky winter	*Microeca fascinans*			1	2		1			
Lewin's rail	*Lewinia pectoralis*			2						
little black cormorant	*Phalacrocorax sulcirostris*			10						
little friarbird	*Philemon citreogularis*				2		1			
little pied cormorant	*Phalacrocorax melanoleucos*					1			1	
magpie-lark	*Grallina cyanoleuca*			20	9		4		7	
masked lapwing	*Vanellus miles*			12		2				
masked woodswallow	*Artamus personatus*				5					
mistletoebird	*Dicaeum hirundinaceum*			1	2		2			
nankeen kestrel	*Falco cenchroides*	Ma		1				1		

Common name	Species	EPBC	NC	DW	AS	S	T	IO	RC	A
nankeen night heron	*Nycticorax caledonicus*			1						
noisy friarbird	*Philemon corniculatus*			1						
Pacific black duck	*Anas superciliosa*			21			5			
pale-headed rosella	*Platycercus adscitus*			22	7		6		1	
pallid cuckoo	*Cacomantis pallidus*	Ma			1					
peaceful dove	*Geopelia striata*			23	22		36	2		
pheasant coucal	*Centropus phasianinus*			1						
pied butcherbird	*Cracticus nigrogularis*			7	7				1	
pink-eared duck	*Malacorhynchus membranaceus*			16						
plumed whistling-duck	*Dendrocygna eytoni*			5						
plum-headed finch	*Neochmia modesta*			2	110		2	5		
rainbow lorikeet	*Trichoglossus haematodus*						5			
red-backed fairy-wren	*Malurus melanocephalus*			14	61		10			
red-capped robin	*Petroica goodenovii*			1						
red-kneed dotterel	*Erythrogonys cinctus*			1						
red-winged parrot	*Aprosmictus erythropterus*			4	7		6			
restless flycatcher	*Myiagra inquieta*			13	4		2			
royal spoonbill	*Platalea regia*			2	1				3	
rufous songlark	*Cincloramphus mathewsi*				19					
rufous whistler	*Pachycephala rufiventris*			2	16		18			
rufous-throated honeyeater	*Conopophila rufogularis*						2			
scaly-breasted lorikeet	*Trichoglossus chlorolepidotus*			3						
silvereye	*Zosterops lateralis*	Ma		30	7		10			
singing honeyeater	*Lichenostomus virescens*			9	42		8			
southern boobook	*Ninox boobook*	Ma				1				

Common name	Species	EPBC	NC	DW	AS	S	T	IO	RC	A
spiny-cheeked honeyeater	*Acanthagenys rufogularis*								1	
spotted bowerbird	*Ptilonorhynchus maculatus*			1	1				1	
squatter pigeon	*Geophila scripta scripta*									
straw-necked ibis	*Threskiornis spinicollis*	Ma		4					2	
striated pardalote	*Pardalotus striatus*			1	8		2			
striped honeyeater	*Plectorhyncha lanceolata*			1	6		7			
sulphur-crested cockatoo	*Cacatua galerita*					1	10			
tawny frogmouth	*Podargus strigoides*									
Torresian crow	*Corvus orru*			11	13				3	
tree martin	*Petrochelidon nigricans*	Ma		9	40		4			
variegated fairy-wren	*Malurus assimilis*				5					
wandering whistling-duck	*Dendrocygna arcuata*			5						
weebill	*Smicrornis brevirostris*				55		18			
western gerygone	*Gerygone fusca*			2	4		1			
whistling kite	*Haliastur sphenurus*	Ma		16	6	1			3	
white-bellied sea-eagle	*Haliaeetus leucogaster*	Mi, Ma		3					1	
white-breasted woodswallow	*Artamus leucorynchus*			2	81					
white-browed woodswallow	*Artamus superciliosus*			5	81		13	6		
white-faced heron	*Ardea novaehollandiae*			1					2	
white-necked heron	*Ardea pacifica*			4					2	
white-plumed honeyeater	*Lichenostomus penicillatus*				3		1		1	
white-throated gerygone	*Gerygone albogularis*			1	1					
willie wagtail	*Rhipidura leucophrys*			27	28		2		6	

Common name	Species	EPBC	NC	DW	AS	S	T	IO	RC	A
white-throated honeyeater	*Melithreptus albogularis*				2					
yellow honeyeater	*Lichenostomus flavus*				2		4			
yellow-rumped thornbill	*Acanthiza chrysorrhoa*			8	6		7			
yellow-throated miner	*Manorina flavigula*			23	47	4	5			
zebra finch	*Taeniopygia guttata*			110	29				10	
Mammals										
common brushtail possum	*Trichosurus vulpecula*				4		4			
eastern grey kangaroo	*Macropus giganteus*				21	2	7		11	
northern brown bandicoot	*Isoodon macrourus*				3		1		1	
pig	**Sus scrofa*				1				2	
rabbit	**Oryctolagus cuniculus*				6	13				
cat	**Felis catus*					1				
black rat	**Rattus rattus*								1	
red kangaroo	*Macropus rufus*				2	2				
rufous bettong	*Aepyprymnus rufescens*					3			1	
Gould's wattled bat	*Chalinolobus gouldii*									X
chocolate wattled bat	*Chalinolobus morio*									X
long-eared bat	*Nyctophilus sp.*									X
inland broad-nosed bat	*Scotorepens balstoni*									X
little broad-nosed bat or northern broad-nosed bat	*Scotorepens greyii* or *S. sanborni*									X
inland forest bat	*Vespedelus baverstocki*									X
northern freetail bat	*Chaerephon jobensis*									X
Beccari's freetail bat	*Mormopterus beccarii*									X

Common name	Species	EPBC	NC	DW	AS	S	T	IO	RC	A
yellow-bellied sheathtail bat	*Saccolaimus flaviventris*									X
short-beaked echidna	*Tachyglossus aculeatus*		SLC		4		1			
water-rat	*Hydromys chrysogaster*			1		3				
wild dog	**Canis lupis familiaris*				1	5			12	
Reptiles										
dubious dtella	*Gehyra dubia*				3	1	1			
Bynoe's gecko	*Heteronotia binoei*				2					
zigzag velvet gecko	*Oedura rhombifer*				1					
yellow-faced whipsnake	*Demansia psammophis*						1			
ornamental snake	*Denisonia maculata*	V	V		1	1				
pale-headed snake	*Hoplocephalus bitorquatus*				0	1				
eastern brown snake	*Pseudonaja textilis*			1	1					
Gilbert's dragon	*Amphibolurus gilberti*				1					
nobbi dragon	*Diporiphora nobbi*				1		2			
open-litter rainbow-skink	*Carlia pectoralis*				1		7			
skink	*Carlia* sp.				2					
Paeron's skink	*Cryptoblepharus plagiocephalus*				4		1			
wall skink	*Cryptoblepharus virgatus*				4					
eastern striped skink	*Ctenotus robustus*			1						
copper-tailed skink	*Ctenotus taeniolatus*				1					
Boulenger's skink	*Morethia boulengeri*				3					
Total				1315	1906	126	484	33	216	

Methods: DW = dam watch, AS = active search, S = spotlighting, T = trapping, IO = incidental observation, RC = remote camera, A = anabat


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Appendix F – Likelihood of occurrence assessment Results

Commonwealth and State Listed Flora Species

Commonwealth and State Listed Fauna Species

Commonwealth Listed Migratory Species

Commonwealth Listed Marin Species


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Likelihood of Occurrence Assessment - Commonwealth and State Listed Flora

Species	EPBC Act status / NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
Commonwealth Matters of National Significance						
Threatened Ecological Communities						
Brigalow (Acacia harpophylla) dominant and co-dominant TEC	endangered/ not listed	✓	X	✓	The listed ecological community is characterised by the presence of Brigalow (Acacia harpophylla) as one of the three most abundant tree species. Brigalow is usually either dominant in the tree layer or co-dominant with other species such as Casuarina cristata (Belah), other species of Acacia, or species of Eucalyptus. Occasionally Belah, or species or Acacia or Eucalyptus may be more common than Brigalow within the broad matrix of Brigalow vegetation. The structure of the vegetation ranges from open forest to open woodland. The height of the tree layer varies from about 9 m in low rainfall areas (averaging around 500 mm per annum) to around 25 m in higher rainfall areas (averaging around 750 mm per annum). A prominent shrub layer is usually present (SEWPAC 2013) The listed Brigalow community extends south of Charters Towers to northern NSW and occurs within the brigalow Bioregion (SEWPAC 2013)	The brigalow TEC was confirmed present in the field verified REs 11.3.1 and 11.4.9 which occur within the Study Area, representing approximately 31.3 ha (0.4 percent) of the total Study Area. This brigalow community occurs in isolated patches across the Project Area, in mixed RE polygons. **Confirmed present**
The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin	endangered/ not listed	✓	x	x	This TEC comprises a community of species of flora and fauna including fish, invertebrates and aquatic and terrestrial plants clustered around discharge springs emanating from the Great Artesian Basin (GAB) (Fensham et al, 2010). For this reason, the TEC is geographically limited to the Great Artesian Basin. The nearest GAB discharge spring is the Doongmabulla wetland, a cluster of 11 springs located within a 4 km radius of each other along the Carmichael River, approximately 10 km upstream (west) from the western boundary of the Project Area (Fensham pers. comm., 2012). This wetland has an area of 5 ha.	The TEC is geographically limited to the Great Artesian Basin and no suitable discharge springs are present within the Study Area. Surveys confirmed that this TEC is not present within the Study Area. **Unlikely to occur**

Species	EPBC Act status / NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
Flora Species						
***Acacia deuteroneura*^**	vulnerable/ vulnerable	x	x	x	This taxon is only known from two locations: one 64 km north-north-east of Tambo in central-western Queensland, growing on a knoll of weathered sandstone with *Eucalyptus bakeri* (Maslin, 2001) and the other 10 km east of Malta Station on Savaltor Rosa – Tambo Road. Both locations are mapped as RE 11.10.9 which does not occur in the Study Area. Closest known location is >230 km south of the Study Area (HERBRECS, 2011).	Not previously recorded in region (i.e. desktop search extent) and current known distribution does not incorporate the Study Area **Unlikely to occur**
Acacia ramiflora	vulnerable/ not listed	✓	x	x	A shrub known from the Mitchell, South and North Kennedy districts. Grows in woodland on sandstone hills (Pedley, 1978, 1987). A collection from Hughenden is from pebbly red earth in low open woodland of *Eucalyptus whitei* and *Triodia* sp. (SEWPAC, 2013). Closest known location is approximately 43 km to the north-east of the Project Area.	Not previously recorded in region (i.e. desktop search extent) **.** No suitable sandstone hill habitat occurs within the Study Area. **Unlikely occur**
Marlborough blue cycad^ ***Cycas ophiolitica***	endangered/ endangered	x	x	x	*Cycas ophiolitica* inhabits eucalypt open forest and woodland communities with a grassy understorey. They occur on hill tops or steep slopes, at altitudes of 80-620 m above sea level. It grows on shallow, stony, red clay loams or sandy soils. (Halford, 1995a). Closest known location is over 350 km to the east-south-east of the Project Area.	Not previously recorded in region (i.e. desktop search extent) and current known distribution does not incorporate the Study Area. **Unlikely to occur**
king blue-grass^ ***Dichanthium queenslandicum***	endangered/ vulnerable	x	x	x	This taxon is typically confined to natural grasslands on the heavy black clay soils of the Central Highlands (Fletcher, 2001). Closest known population is >130 km south-east of the Project Area.	Not previously recorded in region (i.e. desktop search extent) and current known distribution does not incorporate the Study Area. **Unlikely to occur**

Species	EPBC Act status / NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
finger panic grass^ ***Digitaria porrecta***	near threatened/ endangered	x	x	x	This taxon usually occurs in natural grasslands on extensive basaltic plains, and in undulating woodlands and open forests with an underlying basaltic geology. It usually occurs on dark and fine textured soils with some degree of seasonal cracking (Leigh *et al*, 1984; Fletcher 2001; Halford, 1995b). It also persists in disturbed habitats, such as fallow paddocks, but its capability to maintain a viable population in these situations is unknown (Halford, 1995b). It commonly occurs in communities dominated by *Eucalyptus orgadophila* on hills and slopes and *E. tereticornis* and *E. populnea* in drainage lines. Closest known location is >230 km to the east and south-east of the Project Area.	Not previously recorded in region (i.e. desktop search extent) and current known distribution does not incorporate the Study Area **Unlikely to occur**
Eriocaulon carsonii	endangered /endangered	✓	WO HERBRECS	x	This species is restricted to permanent wetlands fed by natural springs in the Great Artesian Basin (Fatchen, 2000; Fensham *et al*, 2004). It has been recorded 15 km south-west of the Project Area in Doongmabulla Mound Springs Nature Refuge (HERBRECS). No mound springs are found within the Study Area.	Previously recorded in region (i.e. desktop search extent). Required habitat (artesian springs) not present in the Study Area. **Unlikely to occur**
blue devil ***Eryngium fontanum***	endangered /endangered	✓	WO HERBRECS	x	A low herb only associated with mounds springs fed by the Great Artesian Basin (HERBRECS). Essential habitat for this species occurs approximately 15 km south-west of the Project Area in Doongmabulla Mound Springs Nature Refuge. However it is only known from two locations in the Barcaldine spring super-group. This system has been extensively surveyed (Fensham and Fairfax, 2003) and there is a high level of certainty that no further populations of *E. fontanum* await discovery (Fensham *et al*, 2010). No mound springs are found within the Project Area.	Previously recorded in region (i.e. desktop search extent). Required habitat (artesian springs) not present in the Study Area. **Unlikely to occur**

Species	EPBC Act status / NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
black ironbox^ ***Eucalyptus raveretiana***	vulnerable/ vulnerable	x	x	x	Occurs in riparian woodlands on alluvial flats along creek and river banks on sandy or alluvial soils (Calvert *et al,* 2005). Closest known location is approximately 200 km to the north of the Project Area (HERBRECS, 2011).	Not previously recorded in region (i.e. desktop search extent) and current known distribution does not incorporate the Study Area **Unlikely to occur**
Lawrencia buchananensis	vulnerable /vulnerable	x	WO HERBRECS	x	This species occurs in saline muds and sand dunes associated with Lake Buchanan. It is known only from a single population in a highly specific habitat at Lake Buchanan in north-central Queensland, about 170 km south-south-west of Charters Towers (DEWHA, 2008) The Project Area is geographically removed from Lake Buchanan as the lake is approximately 30 km NW of the centre of the Project Area.	Previously recorded in region. Required habitat not present in the Study Area. **Unlikely to occur**

Species	EPBC Act status / NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
waxy cabbage palm ***Livistona lanuginosa***	vulnerable/ vulnerable	x	✓	x	This palm is endemic to the Burdekin River catchment, where it is restricted to ephemeral, sandy watercourse beds and banks and adjacent floodplains, with small groups often clustered around the more permanent pools (and the outskirts of the Moses spring group) (TSSC, 2008). It has been recorded in seven populations, with a total population extent estimated at 1, 000 mature individuals (Pettit and Dowe, 2003). It is unclear to what extent this species is dependent on access to groundwater – there is evidence that waxy cabbage palm survives best when it is located where seasonal floods recharge soilwater (that is, within the channel itself growing in protected areas within lenses of soil with a higher soilwater storage capacity) (SEWPAC, 2013). The species is certainly capable of benefiting from access to permanent groundwater – the nearby Moses spring group (part of the Doongmabulla Nature Refuge) has a population of approximately 25 waxy cabbage palms (of which half are mature trees) growing in Quaternary alluvium on the outskirts of a large group of mound springs. Therefore, it is likely that it is dependent on soil water being recharged by annual flood events, or through groundwater base flow.	Previously recorded within the EPC 1690 Study Area as isolated individuals in the Carmichael River bed. Potential suitable habitat may occur within the Belyando River bed. However, given that no individuals were recorded during surveys of the majority of the Study Area, including watercourses, the species is considered to have low potential to occur. **May occur**
northern beard heath^ ***Leucopogon cuspidatus***	vulnerable/ not listed	x	x	x	Usually occurs on mountain tops on poor skeletal soils, amongst granite or serpentinite outcrops in stunted open woodlands or shrublands (Calvert *et al,* 2005). Closest known population is >190 km north-west and east of the Project Area (HERBRECS, 2011).	Not previously recorded in region (i.e. desktop search extent) and current known distribution does not incorporate the Study Area **Unlikely to occur**
Ozothamnus eriocephalus^	vulnerable/ vulnerable	x	x	x	This species typically grows on rocky escarpments, slopes and creek gullies in closed rainforest margins and open eucalypt forest (HERBRECS, 2011) Closest known population is >200 km north-east of the Project Area (HERBRECS, 2011).	Not previously recorded in region (i.e. desktop search extent) and required habitat not present in Study Area **Unlikely to occur**

Species	EPBC Act status / NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
State Matters of Conservation Significance						
Acacia deuteroneura^	Also listed under EPBC Act – refer above for description and likelihood of occurrence assessment of this species					
Aristida burraensis	not listed/ near threatened	x	WO	x	Restricted to Burra Range, which is approximately 160 km north of the Project Area, on sandstone in *Eucalyptus similis* woodland (Sharp and Simon, 2002). Closest known location is >125 km north-west of the Project Area (HERBRECS 2011).	Previously recorded in region (i.e. desktop search extent). Current known distribution does not incorporate Project Area. No suitable habitat occurs within the Study Area. **Unlikely to occur**
Cadetia collinsii	not listed/ near threatened	x	WO	x	Restricted to Cape York Peninsula in rainforest on the coastal side of ranges (Jones *et al,* 2010). This record is over a thousand kilometres away from its known range and is an error that has been confirmed with Queensland Herbarium.	Not previously recorded in region (i.e. desktop search extent) and current known distribution does not incorporate the Study Area. **Unlikely to occur**
Marlborough blue cycad ***Cycas ophiolitica^***	Also listed under EPBC Act – refer above for description and likelihood of occurrence assessment of this species					
king blue-grass ***Dichanthium queenslandicum^***	Also listed under EPBC Act – refer above for description and likelihood of occurrence assessment of this species					
finger panic grass ***Digitaria porrecta^***	Also listed under EPBC Act – refer above for description and likelihood of occurrence assessment of this species					
black ironbox ***Eucalyptus raveretiana^***	Also listed under EPBC Act – refer above for description and likelihood of occurrence assessment of this species					

Species	EPBC Act status / NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
Fimbristylis vagans	not listed/ near threatened	x	WO	x	The only records for this species are for far south-eastern Queensland - this species has been recorded near Chinchilla in the Darling Downs district, growing in moist places on sandy soil (Integrated Botanical Information System, 2011). This appears to be an erroneous record (confirmed with Queensland Herbarium).	Not previously recorded in region (i.e. desktop search extent) and current known distribution does not incorporate the Study Area. **Unlikely to occur**
Hydrocotyle dipleura	not listed /vulnerable	x	WO HERBRECS	x	A water plant associated with mounds springs fed by the Great Artesian Basin. This species is only found near Aramac, Clermont and Eulo (Bean and Henwood, 2003). It grows on the flat dried-out margins of artesian springs in highly saline sands or clay soils (Bean and Henwood (2003) as cited in Bean and Mayhew (2009)). No mound springs are found within the Study Area. Closest known location is 15 km south-west of the Project Area.	Previously recorded in region (i.e. desktop search extent) Required habitat (artesian springs) not present in the Study Area **Unlikely to occur**
Lawrencia buchananensis	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species					
waxy cabbage palm ***Livistona lanuginosa***	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species					
Myriophyllum artesium	not listed/ endangered	x	WO HERBRECS	x	A water plant associated with mounds springs fed by the Great Artesian Basin. This plant can also colonise bore drains in Queensland (Fensham *et al*, 2010).No mound springs are found within the Study Area. Closest known location is 15 km south-west of the Project Area.	Previously recorded in region (i.e. desktop search extent). Required habitat (artesian springs) not present in the Study Area. **Unlikely to occur**
Nesaea robertsii	not listed/ endangered	x	WO HERBRECS	x	A low shrub found in brigalow, gidgee and coolabah woodlands on clay/alluvium (from HERBRECS records). Suitable habitat occurs in the Project Area within REs 10.4.5, 11.3.1 and 11.3.3. Closest known locations are 25 km north-west and 35 km south-west of the Study Area.	Previously recorded in region (i.e. desktop search extent) and potentially suitable habitat occurs at Study Area. **May occur**

Species	EPBC Act status / NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
Ozothamnus eriocephalus^	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species					
Peripleura scabra	not listed/. near threatened	x	WO HERBRECS	x	An erect annual herb. Occurs in ironbark or lancewood woodland on rocky slopes, usually with skeletal soils (granite or sandstone is most common) (Calvert *et al,* 2005). Closest known locations are 25 km east and 40 km south-west of the Project Area.	Previously recorded in region (i.e. desktop search extent). No suitable habitat occurs within the Study Area. **Unlikely to occur**
Sporobolus pamelae	not listed/ endangered	x	WO HERBRECS	x	A tussock grass endemic with mound springs fed by the Great Artesian Basin. No mound springs are found within the Study Area. Closest known location is 15 km south-west of the Project Area.	Previously recorded in region (i.e. desktop search extent). Required habitat (artesian springs) not present in the Study Area. **Unlikely to occur**
Sporobolus partimpatens	not listed/ near threatened	x	WO HERBRECS	x	A locally common grass species growing on clay pans and low dunes in a restricted zone around Lake Galilee (Simon, 2005). The Project Area is approximately 25 km to the south-west of Lake Galilee.	Previously recorded in region (i.e. desktop search extent). Required habitat not present in Study Area. **Unlikely to occur**

Predicted to occur within approximately 50 km of the Study Area: SEWPAC Protected Matters Search Tool

* Previously recorded within approximately 50 km of the Study Area: desktop sources including Wildlife Online (WO) / HERBRECS

^ Included as this species was specifically mentioned in the Project terms of reference

Likelihood of Occurrence Assessment – Commonwealth and State Listed Fauna

Species	EPBC Act status/NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
Commonwealth Matters of National Significance						
Reptiles						
ornamental snake ***Denisonia maculata***	vulnerable/ vulnerable	✓	WO	x	The ornamental snake's distribution is confined to the northern brigalow belt bioregion. Modelled distribution mapping for the species prepared by the Commonwealth Government indicates that the ornamental snake is known to occur or likely to occur in the landscape incorporating the Project Area (SEWPAC, 2013). This species is typically found in areas of brigalow, riverside woodland and open forest on natural levees (SEWPAC, 2013). Habitats featuring cracking clay and sandy substrates are known to be utilised by the species, with gilgai habitat especially favoured.	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs at Project Area in acacia woodlands and riparian areas. **Confirmed present – two ornamental snakes were observed: one individual was observed within open woodland habitat with some brigalow in the southern part of the Study Area; the other individual was found under organic litter in gidgee/brigalow woodland habitat in the northern part of the Study Area.**
yakka skink ***Egernia rugosa***	vulnerable/ vulnerable	x	WO	x	The yakka skink is endemic to dry open forests, woodlands and rocky areas of central and eastern Queensland. Modelled distribution mapping for the species prepared by the Commonwealth Government indicates that the yakka skink is known to occur or likely to occur in the landscape at and near the southern part of the Project Area (SEWPAC, 2013). Yakka skinks live in communal burrow complexes, and often take refuge among low vegetation or under heaped dead timber, logs, and rocks and in deep rock crevices (Wilson 2005; SEWPAC, 2013). The species occurs in a wide variety of vegetation types including poplar box (*Eucalyptus populnea*), ironbark (Eucalyptus spp.), brigalow (*Acacia harpophylla*), white cypress pine (Callitris spp.), mulga (*Acacia aneura*), bendee (*Acacia catenulata*) and lancewood	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area in woodland habitats featuring ground level microhabitats. **Likely to occur**

Species	EPBC Act status/NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
					(Acacia spp.) woodland and open forest (SEWPaC, 2013).	
Dunmall's snake ***Furina dunmalli***	vulnerable/ vulnerable	✓	Not previously recorded	x	Dunmall's snake occurs in central and south-east Queensland – the northern limit of its known range extends between Yeppoon and the Expedition Range (DEHP, 2013). It inhabits open forest and woodland habitats. Brigalow (Acacia harpophylla) growing on cracking clay and loam soils on floodplains is a known habitat for the species (DEHP, 2013a).	Not previously recorded in region (i.e. desktop search extent) and current known distribution does not incorporate Study Area. **Unlikely to occur**
brigalow scaly-foot ***Paradelma orientalis***	vulnerable/ vulnerable	x	WO QM	x	The brigalow scaly-foot inhabits a variety of open forest habitats in central and south-east Queensland. Acacia and eucalypt woodlands are known to be utilised by this species. The species has been recorded from habitats featuring substrates including cracking clays and sandy alluvium (SEWPAC, 2013).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs at Project Area. Current distribution mapping for species does not incorporate Study Area (SEWPAC, 2013). **Unlikely to occur**
Mammals						
northern quoll ***Dasyurus hallucatus***	endangered/ not listed	x	QM	x	While the distribution of the northern quoll covers much of north-eastern Australia, the current range of the species has contracted considerably such that it is now though to be restricted to six discrete areas across northern Australia (Strahan, 1995). While the species does not have highly specific habitat requirements, rocky areas associated with open woodland and open forest are considered optimal habitat for the northern quoll (Hill and Ward, 2010). The preference for rocky habitat may be related to reduced exposure to threatening processes (i.e. vegetation clearing, fire, cane toads, reduced competition with cats) and the diversity of micro-habitats available (Hill and Ward, 2010).	Previously recorded in region (i.e. desktop search extent). Preferred (rocky) habitat generally lacking in the Study Area, however species also known from open woodland habitats. Current distribution mapping for species does not incorporate the Study Area (SEWPAC, 2013). **Unlikely to occur**

Species	EPBC Act status/NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
northern hairy-nosed wombat ***Lasiorhinus krefftii***	endangered/ endangered	✓	WO QM	x	The northern hairy-nosed wombat is currently only known from a 300 ha area of the 3160 ha Epping Forest National Park (scientific) (located approximately 25 km south-east of the south-eastern most part of the Project Area. (SEWPAC, 2013). The current population within the park is estimated at 138 (DEHP, 2013b). Beyond the population occurring at Epping Forest National Park (scientific) (of which a small number have been translocated to a recently established nature refuge near St George), no known/confirmed populations of this species exist. No evidence of this species (i.e. burrows, scats, sightings) was found during field surveys at the Project Area. At Epping Forest National Park (scientific), habitats used by the species are characterised by brigalow (*Acacia harpophylla*) and gidgee (*Acacia cambagei*) scrub intersected by a gully supporting eucalypt woodland on a sandy substrate (SEWPAC, 2013). The ground layer comprises a mix of native and introduced grasses (SEWPAC, 2013). Deep sandy soils are critical for this species for burrow construction – much of Epping Forest National Park (scientific) features heavy clay soils, which preclude habitat utilisation (SEWPAC, 2013). The northern hairy-nosed wombat grazes exclusively on perennial grasses and sedges (Strahan, 1995).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs, however the Study Area is not within current known distribution of this species (i.e. Epping Forest National Park (scientific)). **Unlikely to occur**
greater bilby ***Macrotis lagotis***	vulnerable/ endangered	x	WO	x	The bilby was historically recorded through much of arid and semi-arid Australia however it is now restricted to desert areas of central Australia (Strahan, 1995). In Queensland the species is known from a small area between Birdsville and Boulia in the south-west of the state (Strahan, 1995). The Project Area and surrounding landscape is not within the current known distribution of the species.	Previously recorded in region (i.e. desktop search extent). Suitable habitat generally lacking, and the Study Area is not within current known distribution of this species. **Unlikely to occur**
greater long-eared bat^	vulnerable/ vulnerable	x	x	x	The greater long-eared bat generally inhabits woodland vegetation in arid and semi-arid inland areas (Strahan,	Not previously recorded in region (i.e. desktop search extent) and current

Species	EPBC Act status/NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
Nyctophilus timoriensis					1995). It is more typically known from south-east Australia (especially the Murray-Darling Basin), and is not known north of the Tropic of Capricorn (Strahan, 1995).	known distribution does not incorporate the Study Area. **Unlikely to occur**
koala **(*Phascolarctos cinereus)***	vulnerable/ not listed (Combined populations of Qld, NSW and ACT)	x	WO	✓	In Queensland, the species contains scattered populations throughout moist forests along the coastline, subhumid woodlands in central and southern regions and within Eucalypt woodlands along watercourses within semi-arid areas further west (Melzer *et al*, 2000). The greatest density of koalas occur through central and eastern areas including the Brigalow Belt, Mitchell Grass Downs, Mulga lands and the Desert Uplands (Patterson, 1996).	Previously recorded in region (i.e. desktop search extent). Suitable habitat occurs across much of the Project Area, where remnant vegetation (eucalypt woodland) persists. One individual was confirmed present in eucalypt woodland on within the EPB 1690 project area. **Likely to occur**
Birds						
red goshawk ***Erythrotriorchis radiatus***	vulnerable/ not listed	✓	Not previously recorded	x	The red goshawk is an uncommon bird species of eastern and northern Australia. It prefers landscapes containing a mosaic of habitats including coastal and sub-coastal tall open forest, woodland and rainforest edges (Marchant and Higgins, 1993). Forests of intermediate density are particularly favoured, as are ecotones between variably dense habitats (i.e. ecotone between rainforest and sclerophyll forest) (SEWPAC, 2013). Large bird populations (the primary prey of this species) are also an important determinant of red	Not previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **May occur**

Species	EPBC Act status/NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
					goshawk habitat utilisation (SEWPAC, 2013). It generally avoids open habitats, and is only rarely encountered over agricultural land (Marchant and Higgins, 1993). Nesting occurs in tall trees within one km of permanent water, generally in open, biologically-rich forest or woodland (Marchant and Higgins, 1993). The species occurs at low densities.	
squatter pigeon (southern) ***Geophaps scripta scripta***	vulnerable/ vulnerable	✓	WO BA	✓	The squatter pigeon is locally abundant within the northern part of its range (i.e. Brigalow Belt (North) and Desert Uplands Bioregions) (SEWPAC, 2013). It is considered to be common in grazing country north of the Tropic of Capricorn (SEWPAC, 2013). The species occurs in a wide range of habitats wherever there is a grassy understorey. It is often found within close proximity of water bodies (SEWPAC, 2013).	Previously recorded in region (i.e. desktop search extent). Suitable habitat occurs across much of the Project Area, where remnant vegetation persists. **Confirmed present – two squatter pigeons (southern) were observed immediately adjacent to the Study Area in non-remnant vegetation, and another two were heard calling from riparian-fringing woodland within the Study Area.**
star finch (eastern, southern) ***Neochmia ruficauda ruficauda***	endangered/ endangered	✓	Not previously recorded	x	The distribution of the eastern subspecies of the star finch is poorly known, however it is restricted to eastern Queensland (and is likely to be severely fragmented (SEWPAC, 2013). Areas of permanently occupied habitat or permanent populations have not been identified (SEWPAC, 2013). An estimate (considered to be of low reliability) puts the extant wild population of the subspecies at 50 birds (SEWPAC, 2013). The subspecies has disappeared from much of its former eastern and central Queensland range, with scattered records from the 1990s considered likely to be aviary escapes (Higgins *et al*, 2006). Habitat preferences include grasslands and grassy woodlands near water, sedegelands, swamps and wetlands (Higgins *et al*, 2006; SEWPAC, 2013). The subspecies is also known from disturbed habitats	Not previously recorded in region (i.e. desktop search extent) **.** Uncertainty as to whether subspecies persists in central and eastern Queensland, with lack of recent records and observed disappearance from much of former range. Potentially suitable habitat occurs at Study Area. **Unlikely to occur**

Species	EPBC Act status/NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
					including farmland (Higgins *et al*, 2006; SEWPAC, 2013).	
black-throated finch (southern) ***Poephila cincta cincta***	endangered/ endangered	✓	WO BA	✓	This sub-species has experienced a large reduction in range and population size in recent decades (SEWPAC, 2013). It is now known from three general l areas – Townsville, Ingham and scattered sites in central Queensland. The black-throated finch typically occurs in native grasslands and woodlands along creeks and riverbanks. A mosaic of habitat types that provide sufficient foraging resources (i.e. seed) through the wet season are thought to be required by this species (SEWPAC, 2013).	Previously recorded in region (i.e. desktop search extent) . Suitable habitat occurs in open woodland habitat featuring and understorey of native grasses, where water is locally available. **Confirmed present – One individual black-throated finch was observed in the south-western corner of the Study Area during a targeted water-body watch. This dam is surrounded by relatively low value habitat (i.e. an area of open woodland with a buffel-dominated understorey and low density of native grasses).**
paradise parrot ***Psephotus pulcherrimus***	extinct/ extinct in the wild	x	WO	x	The paradise parrot has not been seen in the wild for at least 90 years (SEWPAC, 2013). It is considered to be extinct.	**This species is considered to be extinct**
Australian painted snipe ***Rostratula australis***	vulnerable; migratory; marine/ vulnerable	✓	Not previously recorded	x	The Australian painted snipe has a scattered distribution across eastern and northern Australia (SEWPAC, 2013). Shallow freshwater wetlands are the main habitat for the Australian painted snipe (Marchant and Higgins, 1993). Such wetlands may include lakes, swamps, claypans, inundated / waterlogged grassland, dams, irrigated crop land and sewage ponds (Marchant and Higgings, 1993). Preferred wetland habitats boast emergent vegetation (including tussocks, grasses, sedges, rushes, reeds, cane grass and/or Melaleuca) (Marchant and Higgins, 1993). Nesting occurs amongst vegetation in or adjacent to wetlands, predominantly in south-east Australia (i.e. Murray-	Not previously recorded in region (i.e. desktop search extent) **.** Potentially suitable habitat occurs within the Study Area, namely associated with large farm dams featuring emergent and bankside vegetation. **May occur**

Species	EPBC Act status/NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
					Darling Basin) (SEWPaC, 2013).	
State Matters of Conservation Significance						
Reptiles						
Ctenotus capricorni	not listed/ near threatened	x	WO	x	This species is has a restricted distribution in western central Queensland. It is known from semi-arid sandy areas featuring spinifex associated with shrub land / woodland (Wilson and Swan, 2008).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. Known distribution does not encompass the Study Area. **Unlikely to occur**
ornamental snake ***Denisonia maculata***	vulnerable/ vulnerable	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species				
yakka skink ***Egernia rugosa***	vulnerable/ vulnerable	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species				
Dunmall's snake ***Furina dunmalli***	vulnerable/ vulnerable	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species				
brigalow scaly-foot ***Paradelma orientalis***	vulnerable/ vulnerable	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species				
golden-tailed gecko ***Strophurus taenicauda***	not listed/ near threatened	x	QM	x	The golden-tailed gecko occurs through south-east and coastal central Queensland – most records of this species are from the Brigalow Belt Bioregion. It inhabits open woodland habitats – namely dry sclerophyll woodland featuring a mix of ironbarks (*Eucalyptus spp.*), brigalow (*Acacia harpophylla*) and cypress pine (*Callitris spp.*)	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. Known distribution does not encompass the Study Area.

Species	EPBC Act status/NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
						Unlikely to occur
Mammals						
little pied bat ***Chalinolobus picatus***	near threatened	x	WO	x	The little pied bat is located through central Queensland and into north-west New South Wales. In central-western Queensland this species reaches its greatest relative abundance in riverine open forest communities (Churchill, 2008). A variety of woodland and open forest habitats are utilised by this species (Churchill, 2008). Roosting habitat includes tree hollows, caves and abandoned buildings and mines (Churchill, 2008).	Previously recorded in region. Suitable habitat occurs within the Study Area. **Likely to occur**
northern hairy-nosed wombat ***Lasiorhinus krefftii***	endangered/ endangered	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species				
greater bilby ***Macrotis lagotis***	vulnerable/ endangered	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species				
greater long-eared bat ***Nyctophilus timoriensis***	vulnerable/ vulnerable	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species				
Birds						
black-necked stork ***Ephippiorhynchus asiaticus***	not listed/ near threatened	x	WO	✓	The black necked-stork occurs throughout eastern and central Queensland, and across much of northern Australia. It favours habitats featuring wetlands, swamps and riverine areas (Marchant and Higgins, 1990). It occasionally occurs in woodland and grassland habitats (Higgins *et al.*, 2006). Nesting usually occurs at the top of tall trees (Higgins *et al.*, 2006).	Previously recorded in region (i.e. desktop search extent). Suitable habitat occurs within the Study Area. **Confirmed present – this species was observed at farm dams in the Study Area.**
red goshawk	vulnerable/	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species				

Species	EPBC Act status/NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
Erythrotriorchis radiatus	endangered					
squatter pigeon (southern) ***Geophaps scripta scripta***	vulnerable/ vulnerable	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species				
square-tailed kite ***Lophoictinia isura***	not listed/ near threatened	x	WO BA	x	This species is patchily distributed through much of coastal Australia, extending inland through central Queensland (Marchant and Higgins, 1993). In inland areas the square-tailed kite generally occurs along timbered watercourses. This species occasionally forages in open habitats but is more generally restricted to woodland and forest habitats supporting high numbers of passerines (a key food source) (Marchant and Higgins, 1993).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
black-chinned honeyeater ***Melithreptus gularis***	not listed/ near threatened	x	WO	x	The black-chinned honeyeater occurs through much of eastern, northern and central Australia. It inhabits eucalypt woodlands and open forests, especially where box and ironbark species are present (Higgins *et al*, 2001). In arid and semi-arid areas the black-chinned honeyeater is often associated with riparian and littoral areas (Higgins *et al.*, 2001).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
star finch (eastern, southern) ***Neochmia ruficauda ruficauda***	endangered/ endangered	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species				
cotton pygmy-goose ***Nettapus coromandelianus***	not listed/ near threatened	✓	Not previously recorded	✓	The cotton pygmy-goose occurs in eastern and central Queensland. It is an almost entirely aquatic species, with a preference for deep, permanent fresh water bodies (Marchant and Higgins, 1990). Habitats featuring floating and submerged vegetation interspersed with open water are favoured (Marchant	Not previously recorded in region (i.e. desktop search extent). Suitable habitat occurs at Project Area. **Confirmed present – this species was observed at farm dams within the**

Species	EPBC Act status/NC Act Status	Predicted to occur[#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
					and Higgins, 1990).	**Study Area.**
black-throated finch (southern) ***Poephila cincta cincta***	endangered/ endangered	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species				
paradise parrot ***Psephotus pulcherrimus***	extinct/ extinct in the wild	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species				
Australian painted snipe ***Rostratula australis***	vulnerable/ vulnerable	Also listed under EPBC Act - refer above for description and likelihood of occurrence assessment of this species				

Predicted to occur within approximately 50 km of the Study Area: SEWPAC Protected Matters Search Tool

* Previously recorded within approximately 50 km of the Study Area: desktop sources including Wildlife Online (WO) / Birds Australia (BA) / Queensland Museum (QM)

^ Included as this species was specifically mentioned in the Project terms of reference

Likelihood of Occurrence Assessment – Commonwealth-listed Migratory Species

Species	EPBC Act status	Predicted to occur #	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
common sandpiper ***Actitis hypoleucos***	migratory (Bonn; CAMBA; JAMBA; ROKAMBA); marine	x	WO	X	This species is more common in northern and eastern Australia and on the west coast. Habitat preferences include shallow, pebbly, muddy or sandy edges of rivers or streams from coastal to far inland areas including dams and lakes. It is a summer migrant to Australia (Aug-May) (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
fork-tailed swift ***Apus pacificus***	migratory (CAMBA; JAMBA, ROKAMBA); marine	✓	WO	X	Habitat preferences include open country from semi-deserts to coasts. Common and widespread across Australia, this species is a summer migrant to Australia (Oct-April) (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
cattle egret ***Ardea ibis***	migratory (CAMBA; JAMBA); marine	✓	Not previously recorded	X	Occurs in stock paddocks, croplands, wetlands, tidal mudflats and drains. Widespread distribution in northern and eastern Australia, summer-Autumn migrant to Qld (Pizzey and Knight, 2007).	Not previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **May occur**
eastern great egret ***Ardea modesta***	migratory (CAMBA; JAMBA, ROKAMBA); marine	✓	WO	✓	Inhabits shallows of rivers, estuaries, tidal mudflats, freshwater wetlands, sewage ponds, irrigation areas and larger dams. This species is widespread throughout Australia (Pizzey and Knight, 2007).	**Confirmed present at Project Area**
sharp-tailed sandpiper ***Calidris acuminata***	migratory (Bonn; CAMBA; JAMBA; ROKAMBA); marine;	x	WO	X	Inhabits tidal mudflats, saltmarshes, mangroves, shallow fresh, brackish and saline inland wetlands, floodwaters and irrigated lands. Widespread distribution,	Not previously recorded in region (i.e. desktop search extent) . Potentially suitable habitat occurs within the Study Area.

Species	EPBC Act status	Predicted to occur [#]	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
					summer migrant to coastal and inland Australia (Aug-April) (Pizzey and Knight, 2007).	**May occur**
curlew sandpiper ***Calidris ferruginea***	migratory (Bonn; CAMBA; JAMBA; ROKAMBA); marine	x	WO	X	Inhabits tidal mudflats, saltmarsh and saline and freshwater wetlands. Also occurs inland around ephemeral and permanent lakes, dams, waterholes and bore drains. Widespread distribution and common summer migrant to Australia (Aug-April) (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
Latham's snipe ***Gallinago hardwickii***	migratory (Bonn; CAMBA; JAMBA; ROKAMBA); marine	✓	WO	X	Habitat preferences include soft wet ground or shallow water with tussocks and other green or dead growth, wet parts of paddocks or near dams, scrub or open woodland. Summer migrant to eastern Australia (arriving July-Aug) (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent) Potentially suitable habitat occurs within the Study Area. **Likely to occur**
white-bellied sea-eagle ***Haliaeetus leucogaster***	migratory (CAMBA); marine;	✓	WO	X	Inhabits coasts, estuaries, large rivers and inland lakes. Occurs around coastal Australia and larger lakes and storages, some far inland (Pizzey and Knight, 2007).	**Confirmed present at Project Area**
white-throated needletail ***Hirundapus caudacutus***	migratory (CAMBA; JAMBA, ROKAMBA); marine	✓	WO	X	Occupies airspace over forests, woodlands, farmlands, plains, lakes and favoured timbered ranges. Summer migrant to eastern Australia (Oct-April) (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
Caspian tern ***Hydroprogne caspia***	migratory (CAMBA; JAMBA); marine	x	WO	X	Inhabits coastal and offshore waters, beaches, estuaries, rivers, creeks, lakes (including ephemeral lakes) some inland and waterholes.	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs

Species	EPBC Act status	Predicted to occur #	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
					Occurs within eastern Australia and coastal WA (Pizzey and Knight, 2007).	within the Study Area. **Likely to occur**
black-tailed godwit ***Limosa limosa***	migratory (Bonn; CAMBA; JAMBA; ROKAMBA); marine	x	WO	X	Widespread summer migrant to eastern Australia (Sept-April), mostly on the coasts but makes use of some inland lakes. (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
rainbow bee-eater ***Merops ornatus***	migratory (JAMBA); marine	✓	WO BA	✓	Inhabits open woodlands with sandy, loamy soil, riverbanks, beaches, cliffs, mangroves, rainforests and woodlands. Common and widespread distribution (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. Also observed within the EPC 1690 project area. **Likely to occur**
spectacled monarch ***Monarcha trivirgatus***	migratory (Bonn); marine	x	x	X	Typically inhabits understorey of densely vegetated areas (rainforests, gullies, riparian areas). Predominantly coastal but range extends inland (Pizzey and Knight, 2007).	Not previously recorded in region (i.e. desktop search extent) . Potentially suitable habitat occurs within the Study Area. **May occur**
black-faced monarch ***Monarcha melanopsis***	migratory (Bonn); marine	x	x	X	Rainforest and open forest, gullies and open woodlands (when migrating). Predominantly coastal but range extends inland (Pizzey and Knight, 2007).	Not previously recorded in region (i.e. desktop search extent) . Potentially suitable habitat occurs within the Study Area. **May occur**
satin flycatcher ***Myiagra cyanoleuca***	migratory (Bonn); marine	✓	Not previously recorded	✓	Inhabits heavily vegetated gullies in forests, taller woodlands, trees in open country and coastal forests along eastern Australia (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area.

Species	EPBC Act status	Predicted to occur #	Previously recorded*	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
						Also observed within the EPC 1690 project area. **Likely to occur**
glossy ibis ***Plegadis falcinellus***	migratory (Bonn; CAMBA); marine	x	WO	X	Inhabits well vegetated wetlands, wet pastures, ricefields, floodwaters, floodplains, brackish or occasionally saline wetlands and occasionally dry grasslands. Most numerous in northern and eastern Australia (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent) Potentially suitable habitat occurs within the Study Area. **Likely to occur**
common greenshank ***Tringa nebularia***	migratory (Bonn; CAMBA; JAMBA; ROKAMBA); marine	x	WO	X	Inhabits mudflats, estuaries, saltmarshes, lake margins, wetlands and claypans. Widespread distribution and summer migrant to Australia (Sept-April) (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
marsh sandpiper ***Tringa stagnatilis***	migratory (Bonn; CAMBA; JAMBA; ROKAMBA); marine	x	WO	X	Inhabits wetlands, bore drains mangroves, tidal mudflats and estuaries. Summer migrant to mainly coastal Australia (Aug-May), widespread but very scattered through inland (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**

Predicted to occur within approximately 50 km of the Study Area: SEWPAC Protected Matters Search Tool

* Previously recorded within approximately 50 km of the Study Area: desktop sources including Wildlife Online / Birds Australia

Bonn: Convention on the Conservation of Migratory Species of Wild Animals

CAMBA: Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment

JAMBA: Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and their Environment

ROKAMBA: Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds

Likelihood of Occurrence Assessment – Commonwealth Listed Marine Species (Does not include those recorded during surveys)

Scientific name	EPBC Act status	Predicted to occur	Previously recorded	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
brown goshawk ***Accipiter fasciatus***	marine	x	WO BA	x	This species is common and widespread throughout Australia. Habitat preferences include open forests, woodlands, scrublands and farmlands (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
magpie goose ***Anseranas semipalmata***	marine	✓	Not previously recorded	x	Distribution of this species extends up to 300 km from the coast in eastern and northern Australia. Habitat preferences include large seasonal wetlands and well vegetated dams with rushes and sedges; wet grasslands and floodplains (Pizzey and Knight, 2007).	Not previously recorded in region (i.e. desktop search extent) . Potentially suitable habitat occurs within the Study Area. **May occur**
shining bronze-cuckoo ***Chalcites lucidus***	marine	x	WO	x	Habitat preferences include rainforests, forests, woodlands and gardens. Distribution throughout eastern Australia (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
black-eared cuckoo ***Chalcites osculans***	marine	x	WO	x	Inhabits dried woodlands, scrublands, mallee, mulga, saltmarsh and riverside thickets. Uncommon distribution through inland and drier coastal environments (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
red-capped plover ***Charadrius ruficapillus***	marine	x	WO	x	Inhabits inland and coastal habitats including broad beach areas and bare margins of saline wetlands and lakes. Widespread distribution (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
whiskered tern	marine	x	WO	x	Habitat preferences include vegetated and open wetlands, saline lakes, irrigated areas and	Previously recorded in region (i.e. desktop search extent).

Scientific name	EPBC Act status	Predicted to occur	Previously recorded	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
Chlidonyias hybrida					saltfields. Migrates to northern Australia in autumn-winter (Pizzey and Knight, 2007).	Potentially suitable habitat occurs within the Study Area. **Likely to occur**
silver gull ***Chroicocephalus novaehollandiae***	marine	x	WO BA	x	Inhabits waters near the coast and extends far inland, town lakes, gardens, sewage ponds, sports fields. Common and widespread distribution (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
cicadabird ***Coracina tenuirostris***	marine	x	WO BA	x	Inhabits canopy of rainforests, eucalypt forests, woodlands, paperbarks and mangroves. Distribution across coastal northern and eastern Australia (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
stubble quail ***Coturnix pectoralis***	marine	x	WO BA	x	Inhabits cereal crops and stubbles, overgrown pastures, grasslands with thistles and weedy margins of wetlands. Occurs in eastern Australia and southern Queensland and can move far inland (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
wandering whistling-duck ***Dendrocygna arcuata***	marine	x	WO	x	Habitat preferences include well vegetated lagoons and swamps, flooded grasslands, river margins, and well-vegetated large dams. Occurs in tropical and subtropical northern Australia (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
little egret ***Egretta garzetta***	marine	x	WO; BA	x	Inhabits tidal mudflats, saltmarshes, mangroves and freshwater wetlands. Common and widespread (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**

Scientific name	EPBC Act status	Predicted to occur	Previously recorded	Recorded at Project Area	Habitat preferences and known distribution	Likelihood of occurrence
white-throated nightjar ***Eurostopodus mystacalis***	marine	x	WO BA	x	Inhabits bare ground on dry ridges with groundcover microhabitats, coastal heath, forests, woodlands and wallum country. Occurs along coastal eastern Australia (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
gull-billed tern ***Gelochelidon nilotica***	marine	x	WO	x	Inhabits fresh, brackish wetlands, beaches, mudflats, inland swamps, lakes, grasslands and agricultural areas. Summer migrant to Australia, widespread distribution (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
black-winged stilt ***Himantopus himantopus***	marine	x	WO BA	x	Inhabits fresh and brackish swamps, shallow river or lake margins, dams, saltmarshes and estuaries. Widespread within suitable habitat (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
red-necked avocet ***Recurvirostra novaehollandiae***	marine	x	WO	x	Inhabits estuaries, tidal mudflats, swamps and lakes, and claypans. Widespread but irregular in southern Australia. Mostly uncommon visitor to parts of northern Australia (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**
Australian white ibis ***Threskiornis molucca***	marine	x	WO	x	Inhabits wetlands, irrigated areas, dam margins, floodplains, tidal mudflats, pasture and orchards. Widespread in east, north-east and west Australia (Pizzey and Knight, 2007).	Previously recorded in region (i.e. desktop search extent). Potentially suitable habitat occurs within the Study Area. **Likely to occur**

Predicted to occur within approximately 50 km of the Study Area: SEWPAC Protected Matters Search Tool

* Previously recorded within approximately 50 km of The Study Area: desktop sources including Wildlife Online / Birds Australia


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Appendix G – Land zone descriptions


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Land zone 3: Quaternary alluvial systems, including floodplains, alluvial plains, alluvial fans, terraces, levees, swamps, channels, closed depressions and fine textured palaeo-estuarine deposits. Also includes estuarine plains currently under fresh water influence, inland lakes and associated dune systems (lunettes). Excludes talus slopes, colluvial deposits and pediments.Includes a diverse range of soils, predominantly Vertosols and Sodosols, also with Hydrosols in higher rainfall areas.

Land zone 4: Cainozoic clay deposits, usually forming level to gently undulating plains above current alluvial systems. Excludes clay plains and downs formed in-situ on bedrock. Mainly Vertosols with gilgai microrelief, but includes small areas of thin sandy or loamy surfaced Sodosols and Chromosols.

Land zone 5: Extensive, uniform near level or gently undulating Cainozoic plains with sandy or loamy soils. Includes dissected remnants of these surfaces. Also includes plains with sandy or loamy soils of uncertain origin, and plateau remnants with deep soils usually overlying duricrust. Excludes Quaternary alluvial deposits (land zone 3), exposed duricrust (land zone 7), and soils derived from underlying bedrock (land zones 8 to 12). Soils are usually Tenosols and Kandosols, also minor deep sandy surfaced Sodosols and Chromosols. There may be a duricrust at depth.

Source: Department of Environment and Heritage Protection, 2012 (http://www.ehp.qld.gov.au/ecosystems/biodiversity/regional-ecosystems/land_zone_definitions.html).


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