Central Queensland Coal Project

Appendix 18 – Draft Offsets Delivery Plan

Supplementary Environmental Impact Statement

Declaration of Accuracy

I declare that:

- 1. To the best of my knowledge, all the information contained in, or accompanying this Central Queensland Coal Project Offset Management Plan <date to be inserted> is complete, current and correct.
- 2. I am duly authorised to sign this declaration on behalf of the approval holder.
- 3. I am aware that:
  - a. Section 490 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading.
  - b. Section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or *the Environment Protection and Biodiversity Conservation Regulations 2000* (Cth) where the person knows the information or document is false or misleading.
  - c. The above offences are punishable on conviction by imprisonment, a fine or both.

Signed

<to be signed on finalisation>

Full Name:

Position:

Organisation:

Date:

Note: This page will be completed prior to submission of the final version

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Abbreviations

Term	Definition
CHPP	Coal handling preparation plant
DAF	Department of Agriculture and Fisheries
DES	Queensland Department of Environment and Science
DotEE	Department of the Environment and Energy
EA	Environmental Authority
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EV	Environmental Value
GDE	Groundwater Dependent Ecosystem
HEV	High Ecological Value
HGTC	High grade thermal coal
LUMP	Land Use Management Plan
MIA	Mining Infrastructure Area
ML	Mining Lease
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
Mtpa	million tonnes per annum
NC Act	*Nature Conservation Act 1992*
OMA	Offset Management Area
OMP	Offset Management Plan
PMAV	Property Map of Assessable Vegetation
QEOP	Queensland Environmental Offsets Policy 2018
RE	Regional Ecosystem
REMP	Receiving Environment Monitoring Program
SEVT	Semi-evergreen Vine Thicket
SSCC	Semi-soft coking coal
TEC	Threatened Ecological Community
TLF	Train load out facility
VM Act	*Vegetation Management Act 1999*

1 Introduction

1.1 Project Description

Central Queensland Coal Proprietary Limited (Central Queensland Coal) and Fairway Coal Proprietary Limited (Fairway Coal) (the joint Proponents), propose to develop the Central Queensland Coal Mine Project (the Project). As Central Queensland Coal is the senior proponent, Central Queensland Coal is referred to throughout this Supplementary Environmental Impact Statement (SEIS). The Project comprises the Central Queensland Coal Mine where coal mining and processing activities will occur along with a train loadout facility (TLF).

The Project is located 130 km northwest of Rockhampton in the Styx Coal Basin in Central Queensland (see Figure 1-1). The Project is located within the Livingstone Shire Council Local Government Area. The Project is generally located on the "Mamelon" property, described as real property Lot 11 on MC23, Lot 10 on MC493 and Lot 9 on MC496. The TLF is located on the "Strathmuir" property, described as real property Lot 9 on MC230. A small section of the haul road to the TLF is located on the "Brussels" property described as real property Lot 85 on SP164785.

The Project will involve mining a maximum combined tonnage of up to 10 million tonnes per annum (Mtpa) of semi-soft coking coal (SSCC) and high grade thermal coal (HGTC). The Project will be located within Mining Lease (ML) 80187 and ML 700022, which are adjacent to Mineral Development Licence (MDL) 468 and Exploration Permit for Coal (EPC) 1029, both of which are held by the Proponent. It is intended that all aspects of the Project will be authorised by a site specific environmental authority (EA).

Development of the Project is expected to commence in 2019 with initial early construction works and extend operationally for approximately 19 years until the depletion of the current reserve, and rehabilitation and mine closure activities are successfully completed.

The overall Project layout is shown at Figure 1-2. The Project consists of two open cut operations that will be mined using a truck and shovel methodology. The run-of-mine (ROM) coal will ramp up to approximately 2 Mtpa during Stage 1 (2019 - 2022), where coal will be crushed, screened and washed to SSCC grade with an estimate 80% yield. Stage 2 of the Project (2023 - 2037) will include further processing of up to an additional 4 Mtpa ROM coal within another coal handling and preparation plant (CHPP) to SSCC and up to 4 Mtpa of HGTC with an estimated 95% yield. At full production two CHPPs, one servicing Open Cut 1 and the other servicing Open Cut 2, will be in operation. Rehabilitation works will occur progressively through mine operation, with final rehabilitation and mine closure activities occurring between 2036 to 2038.

A new TLF will be developed to connect into the existing Queensland Rail North Coast Rail Line. This connection will allow the product coal to be transported to the established coal loading infrastructure at the Dalrymple Bay Coal Terminal.

Access to the Project will be via the Bruce Highway. The Project will employ a peak workforce of approximately 275 people during construction and between 100 (2019) to 500 (2030) during operation, with the workforce reducing to approximately 20 during decommissioning. Central Queensland Coal will manage the Project construction and ongoing operations with the assistance of contractors.

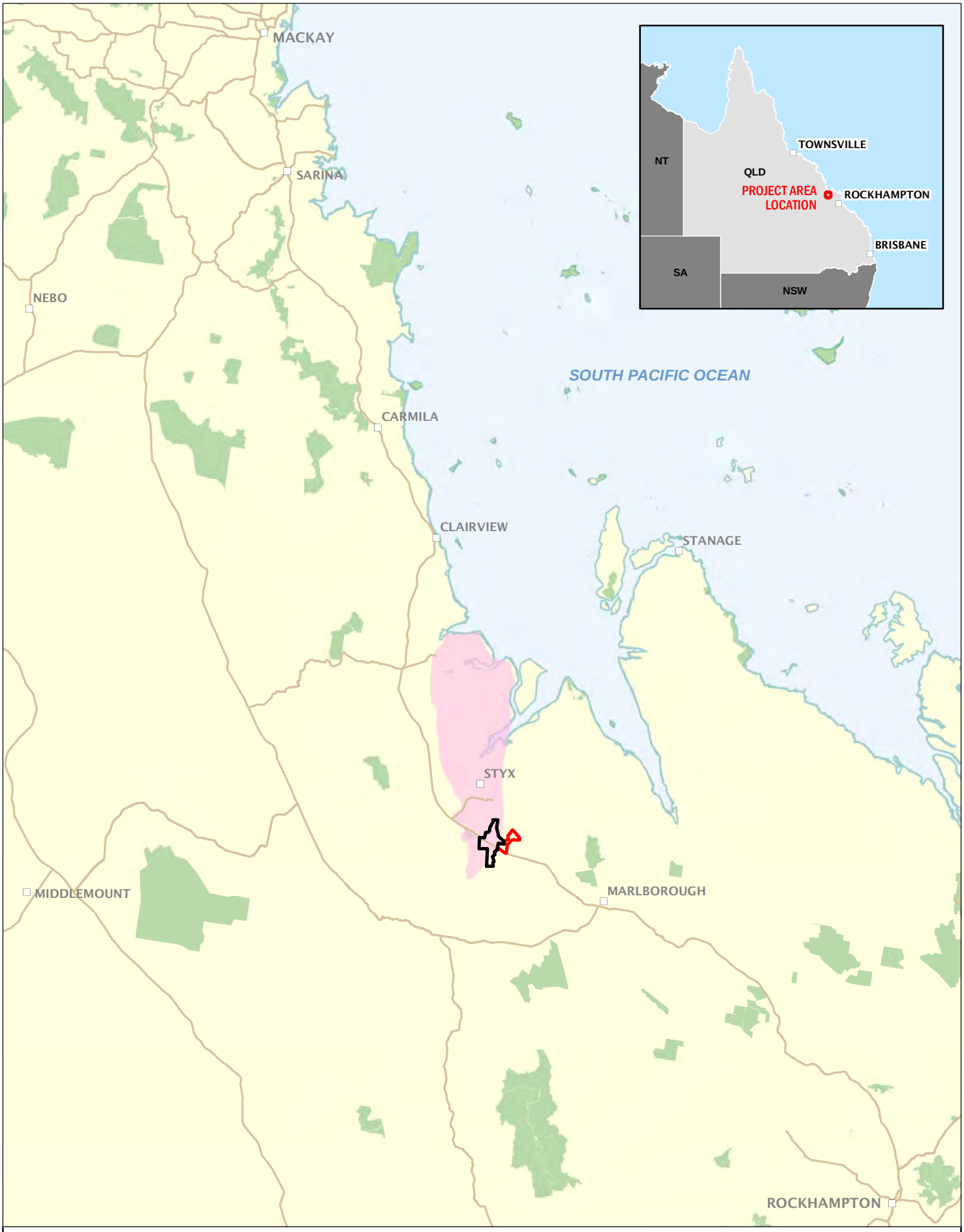


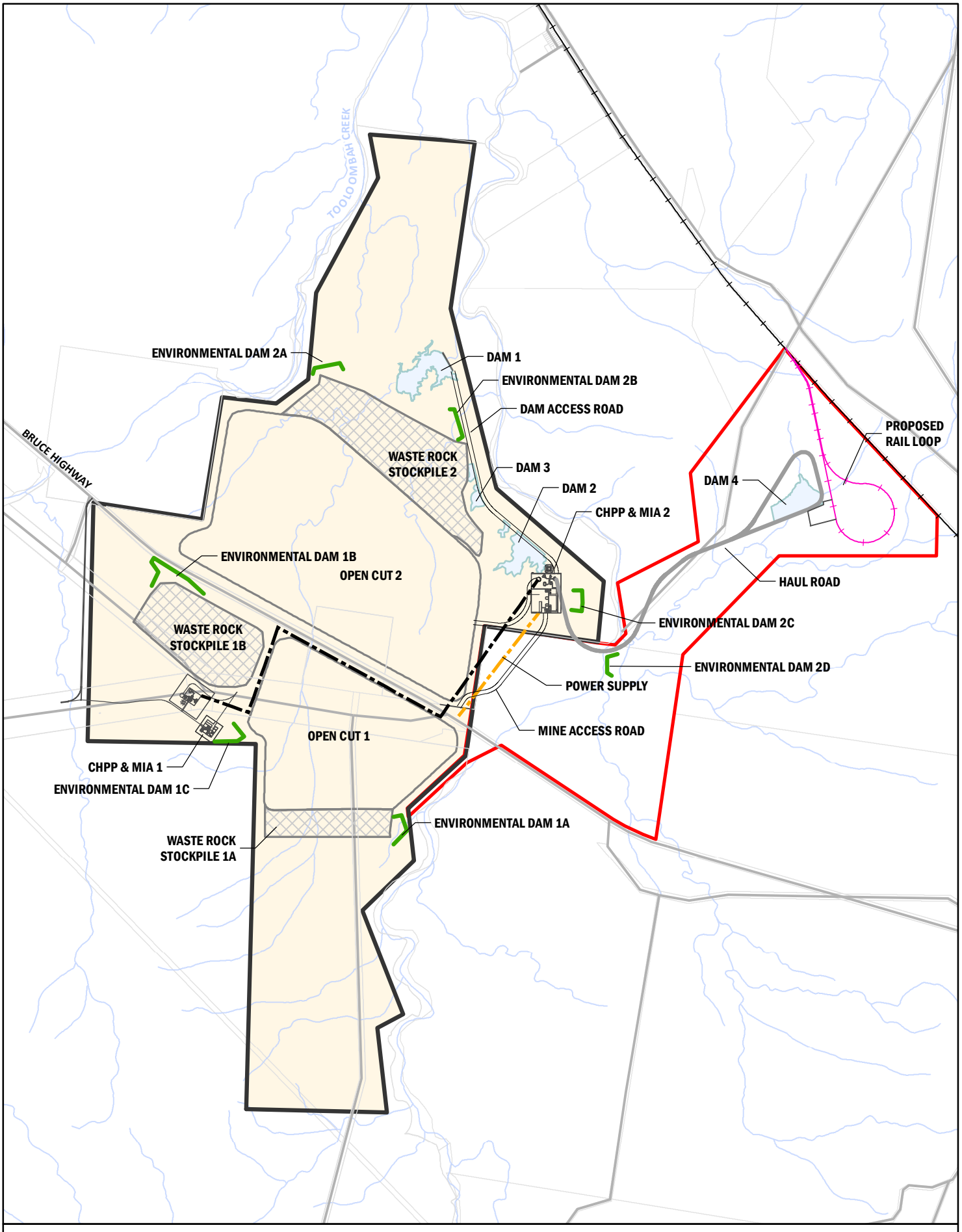
Figure 1-1
Regional Project location

Scale @ A4 1:1,050,000
Date: 21/07/17
Drawn: Gayle B.

DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2017
Geoscience Australia, 2017

CDM Smith

BRUGGEMANNGD B:\BES150160 Styx Coal\GIS\DATA\MXD\FINAL\03 EIS Preparation\BES150160.03-012 R1 project location.mxd 7/21/2017



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Date: 10/10/18
Drawn: Gayle B.

DATA SOURCE
Waratah Coal, 2018
QLD Open Source Data, 2018

Figure 1-2
Project layout

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1.2 Scope and Purpose

The purpose of this document is to outline Central Queensland Coal's commitment to provide environmental offsets that comply with the Commonwealth's Environmental Offsets Policy 2012 as required under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), and the Queensland Environmental Offsets Policy 2018.

The Project received approval from the Commonwealth Department of the Environment and Energy (DotEE) under the EPBC Act (201insert/insert) on <date>. Under Condition <insert condition number> of the approval Central Queensland Coal is required to:

The approval holder must submit an Offset Management Plan for the Ministers written approval. The Offset Management Plan must be prepared in accordance with the Department's Environmental Management Plan Guidelines and include:

- *Details of environmental offsets for the loss of habitat for EPBC Act listed threatened species identified at condition 2;*
- *Details of how environmental offsets comply with the principles of the EPBC Act Environmental Offsets Policy;*
- *< Insert other conditions>*

In addition, the Environmental Authority (EA) for the Project was issued to Central Queensland Coal and took effect on <insert date>. Condition <insert condition number> of the EA requires an Offset Delivery Plan be prepared for the Project <insert relevant timeline/details>.

A number of conservation significant fauna species listed under the Queensland *Nature Conservation Act 1992* (NC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are known or have potential to occur within or near the Project area. Analysis of the Project indicates there will be significant residual impacts on two threatened species as a result of Project impacts.

The purpose of this Offset Management Plan (OMP) is to provide the proposed offset delivery approach to acquit the Project's residual impacts and includes the following:

- Identifies the residual impacts of the Project requiring environmental offsets;
- Identifies the preferred offset property and identified Offset Management Areas (OMAs);
- Provides the results of habitat quality assessments carried out on areas potentially subject to Project impacts and the proposed offset sites;
- Provides the results of outputs from the EPBC Act Offsets Assessment Guide and the suitability of the proposed OMAs to acquit Project impacts; and
- Outlines the management approach for the proposed OMAs.

This is to be regarded as a Draft version of the OMP as the Project has not received final approval and therefore may be subject to further conditions under the Project's Environmental Authority approval (State) and/or EPBC Act approval (Commonwealth).

1.3 Roles and Responsibilities

The roles and responsibilities of the various stakeholders related to the implementation of this OMP are outlined Table 1-1.

Table 1-1 Management and Monitoring Roles and Responsibilities

Role	Responsibility
General Manager – Central Queensland Coal	Provide adequate resources to ensure compliance with the OMP.
Manager Environment and Communities	Coordinate/undertake environmental system and offset compliance audits.
Site Environmental Officer	Manage consultants and contractors, maintain records, carry out environmental inspections and monitoring of the offset sites, monitor and review the effectiveness of the OMP. Oversee maintenance of infrastructure such as fencing and tracks. Oversee presentation of site induction to all site personnel / contractors.
Contractors (general)	Implement OMP control activities and ensure required specifications are met.
All employees	Undertake all work on the Project in compliance with this OMP and related environmental management plans. Complete incident reports for: ▪ Unusual or unauthorised clearing ▪ Outbreaks and sightings of declared plants and animals ▪ Fauna deaths from vehicle collisions, clearing activities or other Project activities.

1.4 Training and Awareness

Central Queensland Coal recognises that training and awareness is an essential part of the Project environmental management approach. Central Queensland Coal will ensure the Site Environmental Officer and other environmental personnel, including outside contractors, are sufficiently experienced and/or trained in their field to carry out the management measures described within this OMP.

Central Queensland Coal will carry out general environmental training and awareness programs for all personnel/contractors working on the site as part of its Project specific site induction and ongoing refresher and toolbox training.

Project environmental personnel will be sufficiently experienced to carry out their duties which will entail environmental compliance procedures, training, audit requirements, reporting requirements, document and record management and compliance tracking including all applicable communications.

1.5 Relevant Project Documents

This OMP describes the actions to be implemented to offset impacts to environmental values associated with the Project activities. The OMP is to be used in concert with other Project associated management plans which may assist with the monitoring, mitigation and recovery from any impacts identified during the impact assessment process, such as:

- Environmental Management Plan (EMP) – incorporates both a Construction EMP and Operation EMP and aims to detail general approach to overall management of Project with regard to general environmental management;

- Significant Species Management Plan (SSMP) – details specific management and mitigation actions required to reduce Project impacts to threatened vegetation communities and fauna species, and other listed fauna species;
- Land Use Management Plan (LUMP) – aims to facilitate and guide management measures throughout the life cycle of the mine such that the present land values of the surrounding area are retained;
- Receiving Environment Monitoring Program (REMP) – to monitor the health of wetlands, streams and riparian vegetation adjacent to the Project for indirect impacts such as water level reductions (in permanent waterholes), dust and surface water contamination;
- Rehabilitation Management Plan (RMP) – detailing all aspects of the progressive rehabilitation of the project's mining areas including landforms, rehabilitation schedule, plant species selections, goals and objectives, and rehabilitation monitoring; and
- Erosion and Sediment Control Plan (ESCP) – detailing approach to managing erosive soils and potential water quality contamination resulting from exposed soils during construction and operation.

2 Legislation and Policies

2.1 Commonwealth Legislation and Policy

2.1.1 EPBC Act Environmental Offsets Policy

The EPBC Act provides a legal framework to protect and manage Matters of National Environmental Significance (MNES) including nationally and internationally important flora, fauna, ecological communities, heritage places and water resources. The EPBC Act establishes a process for assessment and approval of proposed actions which may impact on these MNES.

2.1.2 EPBC Act Environmental Offset Policy (2012)

The EPBC Act's associated Environmental Offset Policy (2012) outlines the Australian Government's approach to the use of environmental offsets under the EPBC Act. Offsets are defined as measures that compensate for the residual impacts of an action on the environment, after avoidance and mitigation measures are taken. Importantly, offsets are only required if residual impacts are considered significant as defined in the *Significant impact guidelines 1.1 – Matters of National Environmental Significance.* Hence, impacts that are not deemed as significant as defined by the guidelines do not require offsetting.

The EPBC Act Environmental Offset Policy includes eight key overarching principles that are applied in determining the suitability of offsets as follows:

- Deliver an overall conservation outcome that improves or maintains viability;
- Be built around direct offsets by may include other compensatory measures;
- Be in proportion to the level of statutory protection that applies;
- Be of a size and scale proportionate to the residual impacts on the protected matter;
- Manage the risks of the offset failing;
- Be additional to what is already required;
- Be efficient, effective, timely, transparent, scientifically robust and reasonable; and
- Have transparent governance arrangements.

The Environmental Offset Policy also provides guidance on the potential means by which required offsets can be achieved and encourages offsets that deliver social, economic and/or environmental co-benefits. Co-benefits can occur when offsets that align with broader strategic objectives such as increasing landscape connectivity, offsets that provide benefits to local Indigenous groups, or offsets that integrate with local rural landholders.

2.2 State Legislation and Policy

This section provides a summary of the current state legislative and policy framework for environmental offsets.

2.2.1 Environmental Offsets Act 2014

The *Environmental Offsets Act 2014* (as amended July 2017) is the primary legislation that establishes a head of power for the State to impose offset conditions and rules around how offsets will be required and delivered. It outlines offsets required to counterbalance a significant residual impact of a prescribed activity on a prescribed environmental matter. Key definitions are established, and it also provides for the making of an Environmental Offsets Policy.

2.2.2 Environmental Offsets Regulation 2014

Environmental Offsets Regulation 2014 (as amended June 2018) is the regulation that defines those prescribed environmental matters that may require an offset and are referred to as 'Matters of State Environmental Significance'. It also sets out the requirements of an Offset Delivery Plan and provisions for advance offsets.

2.2.3 Environmental Offsets Policy 2018 Version 1.5

This policy provides operational detail as to how offsets will be assessed and need to be delivered. The policy includes information on the relationship between Commonwealth and State offsets, criteria that offsets must meet, offset delivery options and staging of offsets.

2.3 Types of Offsets

It is expected the Central Queensland Coal Project will be required to provide environmental offsets as a condition of the Project's approval. Environmental offsets will be required to be established in accordance with the Queensland Government's offset policies and the Australian Government's EPBC Act Environmental Offsets Policy where significant project-related impacts cannot be avoided or mitigated. Current State and Australian Government offset policies permit the delivery of offsets as direct offsets and indirect offsets.

2.3.1 Direct Offsets

Direct offsets are an essential component of a suitable offsets package and involve the identification and securing of land to be managed for conservation purposes. For a direct offset to be considered adequate, the offset area must have similar environmental values, function and habitat and provide a measurable conservation gain for an impacted protected matter. A minimum of 90% of the offset requirements for any given impact must be met through direct offsets.

2.3.2 Indirect Offsets

Indirect offsets are able to be used to supplement direct offsets where the direct offset does not acquit a project's offset requirements. Indirect offsets options are land-based or can be achieved via financial contributions such as management and research funding targeting the impacted environmental values and offsets payments to an approved trust established for land management or nature conservation purposes.

3 Offset Delivery Approach

Central Queensland Coal proposes to offset lands subject to significant residual impacts in accordance with the Commonwealth Environmental Offset Policy 2012 and Queensland Environmental Offsets Policy 2018 (QEOP) using land-based offsets and financial settlement. These offset options are explained in the following sections.

3.1 Land-based Offsets

This is referred to as a type of proponent-driven offset. The offset is to deliver a conservation outcome that achieves an equivalent environmental outcome. It must be of a size and scale proportionate to the significant residual impact on MSES / MNES.

Land-based offsets are to provide EVs as similar as possible to those being lost and may consist of remnant or non-remnant vegetation. Where remnant vegetation is used, management actions are required to demonstrate additional outcomes and enhance the EVs. For example, Endangered and Of Concern RE offsets must be of the same broad vegetation group as the impacted RE, of the same or higher status and within the same bioregion. For flora and fauna species the offset must contain, or be capable of containing, a self-sustaining population of that same impacted species.

The offset site is preferably located in a strategic offset investment corridor closest to the impacted site, and risks of a conservation outcome not being achieved are identified and mitigated. The offset must be legally secured for at least the duration of the impact. The Queensland policy provides a number of options for legal security, specifically:

- Voluntary declaration under the *Vegetation Management Act 1999* (VM Act);
- Nature refuge or other form of protected area under the *Nature Conservation Act 1992* (NC Act);
- Statutory covenant for environmental purposes under the *Land Act 1994* or *Land Title Act 1994*; or
- Designate as an Environmental Offset Protection Area under the *Environmental Offset Act 2014.*

Central Queensland Coal propose to offset all Project associated residual impacts to vegetation / fauna habitat using land-based offsets.

3.2 Financial Settlement

A financial settlement payment can be used to meet an offset requirement for MSES impacted by a development. It must be calculated using the Financial Settlement Offset Calculation Methodology set out in the Queensland Environmental Offsets Policy. A financial settlement must be paid to the offset account administered by the Department of Environment and Science (DES) prior to project commencement. Financial payments are made up of costs associated with on-ground land management, administration and landholder incentive payment.

Central Queensland Coal propose to offset Project associated residual impacts to mapped waterways for fish habitat (MSES) using financial settlement.

4 Project Residual Impacts

Central Queensland Coal has prepared an Environmental Impact Statement (EIS) and Supplementary Environmental Impact Statement (SEIS) which describe the results of ecological surveys and environmental impact assessments for the Project. In accordance with both State and Commonwealth legislation the impact assessment process has sought to:

- Identify potential impacts on ecological values, including MSES and MNES resulting from the Project;
- Where possible apply Project design changes to avoid or reduce such impacts;
- Where impacts cannot be avoided apply mitigation measures to ameliorate Project impacts; and
- Where significant residual impacts to MSES and / or MNES cannot be avoided the Project will apply environmental offsets to compensate and deliver improved environmental outcomes.

Central Queensland Coal issued the initial version of the EIS for comment in November 2017. The original Project footprint, as described in the EIS, predicted an overall impact to 138.41 ha of vegetation considered to be habitat for threatened MNES fauna. Since then several iterations of the Project design have been carried out.

The current Project footprint and design have been designed to avoid or reduce significant environmental impacts, where possible or practicable. Nevertheless, unavoidable and potential future residual environmental impacts have been identified. This section outlines the identified and potential future residual impacts that require environmental offsets.

4.1 Identified Direct Impacts

Potential impacts of the proposed mining activity have been assessed using detailed desktop and onsite ecological investigations that were designed to identify current biodiversity values on and surrounding the Project area. The potential for significant impacts on MNES and MSES have been assessed under the *MNES Significant Impact Guidelines 1.1* (DotE 2013) and the *QEOP Significant Impact Guideline* (EHP 2014) are detailed in EIS Chapter 16 – MNES and Chapter 14 – Terrestrial Ecology.

Identified ground-truthed MNES and MSES within the overall Project area are:

- Two Endangered Regional Ecosystems (REs) (both of which are equivalent to EPBC Act listed Threatened Ecological Communities) (MNES and MSES);
- Known habitat for Squatter Pigeon (*Geophaps scripta scripta*), Koala (*Phascolarctos cinereus*), Greater Glider (*Petauroides volans*) (all listed as Vulnerable under the NC Act and EPBC Act), and bird species listed as Migratory under the EPBC Act (MNES and MSES);
- Potential habitat for Ornamental Snake (*Denisonia maculata*) (Vulnerable under the NC Act and EPBC Act) (MNES and MSES);
- Regulated vegetation mapped under the State (MSES only) including:
  - Two Of Concern REs
  - Linear watercourse features as described on the VM Act Watercourse Map and
  - A single wetland described on the VM Act Wetland Map;

- A single High Ecological Value (HEV) wetland mapped as a Wetland Protection Area (MSES only); and
- Linear features as described on the Waterway Barrier Works for Fish Passage mapping layer (MSES only).

There is no planned direct impacts (i.e. clearing) to Endangered REs / TECs, habitat for Greater Glider, and the two wetlands as they have been avoided during the design phase of the Project. Significant impact assessments were carried out as per the guidelines and with regard to the mitigation measures outlined in the EIS. Significant residual impacts were identified on habitat for Koala and Ornamental Snake. As such, although Commonwealth conditions have not been applied to the Project as yet, it is expected that DotEE will issue conditions requiring environmental offsets for direct impacts to threatened species habitat for Koala and Ornamental Snake.

The QEOP notes the State can only impose a requirement for environmental offset conditions in relation to a Project 'if the same, or substantially the same impact and the same, or substantially the same matter has not been subject to assessment' under the Commonwealth legislation such as the EPBC Act. Impacts to vegetation communities associated with Koala include clearing of RE 11.3.4, 11.3.25, 11.3.27, 11.3.35 and RE 11.4.2. The extent of clearing of each RE and a description are presented in Table 4-1. Two of these communities are also listed as Of Concern under the State VM Act and are therefore MSES (RE 11.4.2 and 11.3.4). A third community is listed as regulated vegetation along a mapped linear watercourse (RE 11.3.25). Therefore, environmental offsets imposed by the Commonwealth on impacts to Koala habitat will be for the same impacts for both Koala habitat and regulated vegetation as considered by the State. As such, additional environmental offsets (for MSES) to those imposed by DotEE under MNES are not be required for the Project.

Table 4-1 Project vegetation clearing - Regional Ecosystem descriptions

RE	VM Act status	Clearing extent (ha)	Description*
11.3.4	Of Concern	0.6	Characterised by a canopy of Forest Red Gum, Poplar Gum with Carbeen (*Corymbia tessellaris*). An understorey is often present and comprised of species such as Swamp Mahogany (*Lophostemon suaveolens*) and Red Ash. The lower shrub layer tends to be dominated by Lantana (*Lantana camara*), although native species present include Coffee Bush (*Breynia oblongifolia*) and Boonaree (*Alectryon diversifolius*). The ground layer tends to be dense and dominated by grasses such as *Bothriochloa* spp., Kangaroo Grass (*Themeda triandra*) and Black Spear Grass (*Heteropogon contortus*). Occurs on shallow black self-mulching clays.
11.3.25	Least Concern	21.27	*E. tereticornis* open forest to woodland. Occurs on fringing levees and banks of major rivers and drainage lines of alluvial plains. Soils are very deep, alluvial, grey and brown cracking clays. Dominated by Forest Red Gum and Weeping Tea Tree (*Melaleuca leucadendra*). A mid-dense lower tree and upper shrub layer is characterised by River She-oak (*Casuarina cunninghamiana*), Weeping Bottlebrush (*Melaleuca viminalis*) as well as White Cedar (*Melia azedarach*) and Red Ash (*Alphitonia exselsa*). Lantana is a common and often dense understorey species.
11.3.27	Least Concern	2.2	Ephemeral wetlands located in topographic depressions. Forest Red Gum and Swamp Box (*Lophostemon suaveolens*) in a sparse canopy. The ground layer includes Cyperus spp. and some native grasses such as *Paspalideum distans* and *Urochloa mutica*, but was dominated by Olive Hymenachne (H*ymenachne amplexicaulis*).

RE	VM Act status	Clearing extent (ha)	Description*
11.3.35	Least Concern	1.4	Occurs on an upper alluvial terraces associated with Deep Creek. Dominated by Poplar Gum, *Corymbia clarksoniana* with scattered Carbeen. A sparse shrub layer includes Red Ash, Turkey Bush (*Grewia retusifolia*), Coffee Bush and *Acacia salicina*. Lantana is sparsely present as an understorey species. A relatively dense ground layer includes native grass species.
11.4.2	Of Concern	82.75	Dominant vegetation community of grassy woodland occurring on Cainozoic clay plains. Dominated by Polar Box and Narrow-leaved Ironbark as well as Poplar Gum, Pink Bloodwood (*Corymbia intermedia*) and Carbeen. The relatively open canopy of this community is evident over the sparse shrub layer and grassy understorey.

The predicted areas of vegetation clearing impacts based on ground-truthed vegetation mapping are presented at Table 4-2 and depicted in Figure 4-1. These matters entirely overlap, and the overall extent of impact encompasses an area of 108.22 ha.

These at risk areas will be subject to vegetation monitoring under the Project Land Use Management Plan (LUMP) and wetland health monitoring and management under the Receiving Environment Monitoring Program (REMP). Where vegetation communities or waterhole habitats are found to be unavoidably impacted by groundwater drawdown these areas will be incorporated into the OMP.

Table 4-2 Identified residual impacts to MNES and MSES

Matter of concern	Description	Impact area (ha)
Identified residual impacts from Project clearing activity		
Habitat for threatened fauna	Ornamental Snake: RE 11.3.25 (where it occurs within gilgais on land zone 4).	20.9
	Koala (based on all eucalypt habitat present): RE 11.3.4, 11.3.25, 11.3.27, 11.3.35 and 11.4.2.	108.22
Regulated vegetation (Of Concern)	RE 11.4.2	82.75
	RE 11.3.4	0.6
Regulated vegetation (watercourse)	Mapped watercourses intersecting remnant vegetation (Least Concern only). Project will impact 1.06 km of 1st or 2nd order streams – distance from defining bank 10m (i.e. 20 m corridor width). Haul road will also intersect 0.19 km of 3rd and 4th order stream – distance from defining bank 25 m (i.e. 50 m corridor width) Overlaps with habitat for Koala.	
	Mine area RE 11.3.25	2.12
	Haul Road RE 11.3.25	0.38
	Total watercourse vegetation	2.5
Overall impact area		**108.22 ha**

There is potential for further MSES to be impacted under the Waterway Barrier Works for Fish Passage mapping layer. Under the current mapping approximately 13.4 km of mapped waterway may be impacted by the Project requiring 6.7 ha to be offset. Central Queensland Coal considers some of these waterways to be incorrectly mapped and are preparing a proposed mapping revision for submission to the Queensland Department of Agriculture and Fisheries (DAF) limiting the impact area to approximately 7 km of waterway (3.5 ha) providing potential fish passage in the Project area. Further discussions with DAF will be ongoing regarding assessment of these water features.

4.2 Potential Future Impacts

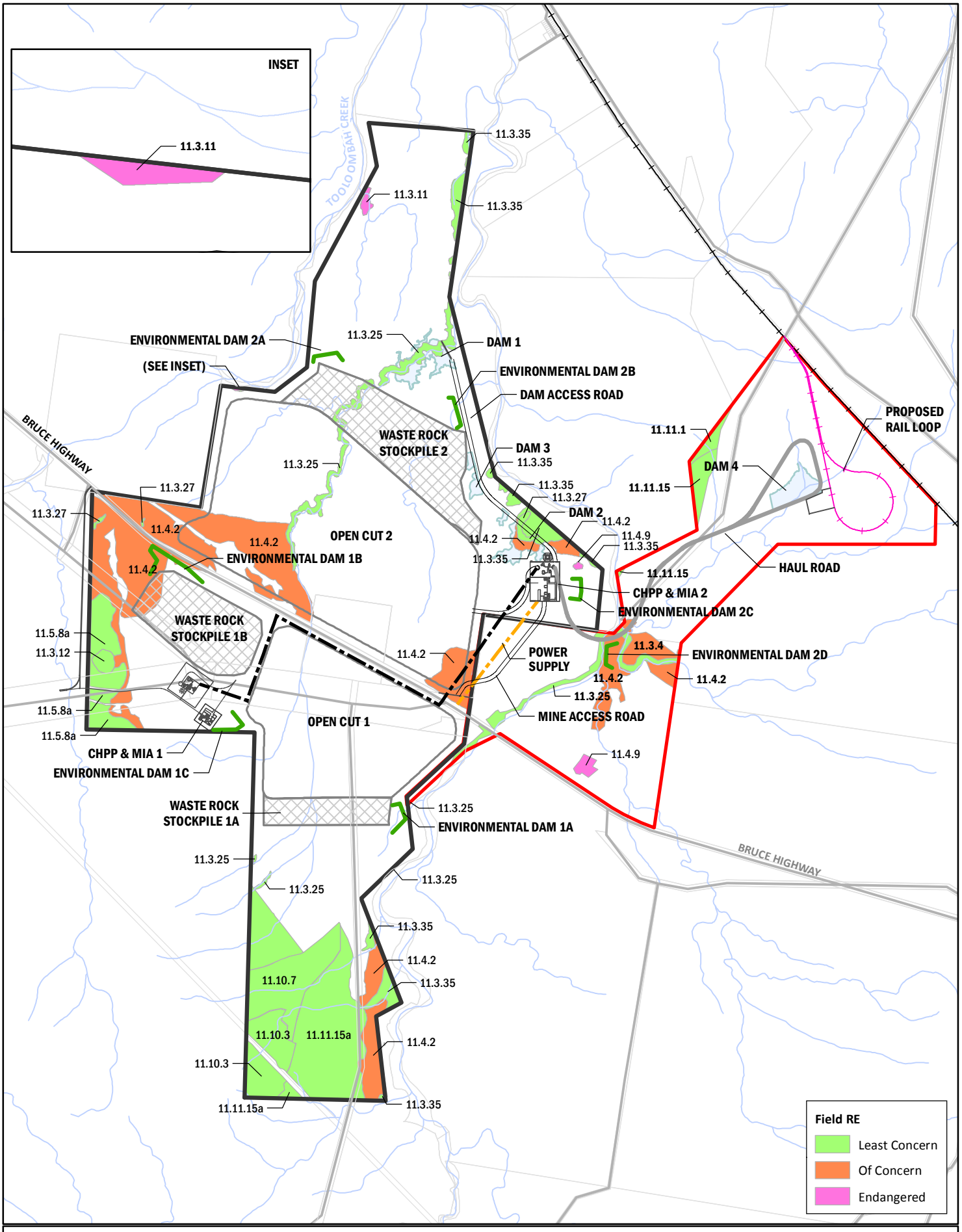
There is further potential in the long-term for impacts to MSES because of possible groundwater drawdown impacts in the vicinity of open cut mining operations which may impact sections of Deep Creek and Tooloombah Creek. This comprises potential impacts to the following:

- A single HEV wetland mapped as a Wetland Protection Area (RE 11.3.12) (MSES only);
- Waterholes in Tooloombah Creek and Deep Creek mapped as 'major' waterways under the Waterway Barrier Works for Fish Passage mapping layer (MSES only); and
- Forest Red Gum (*Eucalyptus tereticornis*) community comprising riparian vegetation (RE 11.3.25) which provides foraging habitat for Koala (MNES and MSES).

The area of impact on the riparian communities is depicted in Figure 4-2 and detailed in Table 4-3. It is uncertain at this stage what level of groundwater drawdown may be required to cause impacts to the vegetation communities. Impacts to Forest Red Gum communities are considered as a 'moderate to high' chance of occurring in areas subject to more than 1 m of predicted groundwater drawdown. These areas will be subject to vegetation monitoring under the Project LUMP and wetland health monitoring and management under the REMP. Where vegetation communities or waterhole habitat are found to be unavoidably impacted by groundwater drawdown these areas will be subject to the OMP.

Table 4-3 Potential impacts to MNES vegetation communities from predicted groundwater drawdown (maximum extent – 10 years following mine closure)

Extent of predicted maximum drawdown	Potential impact area (ha)	
	Tooloombah Creek	Deep Creek
	11.3.25	11.3.25
0.1 m – 0.5 m	29.5	38.0
0.5 m – 1 m	18.46	15.4
> 1 m	1.37	25.6
Total	**49.33**	**79.0**



N

0 0.5 1 km

Scale @ A4 1:50,000
Date: 01/11/18
Drawn: Gayle B.

Legend

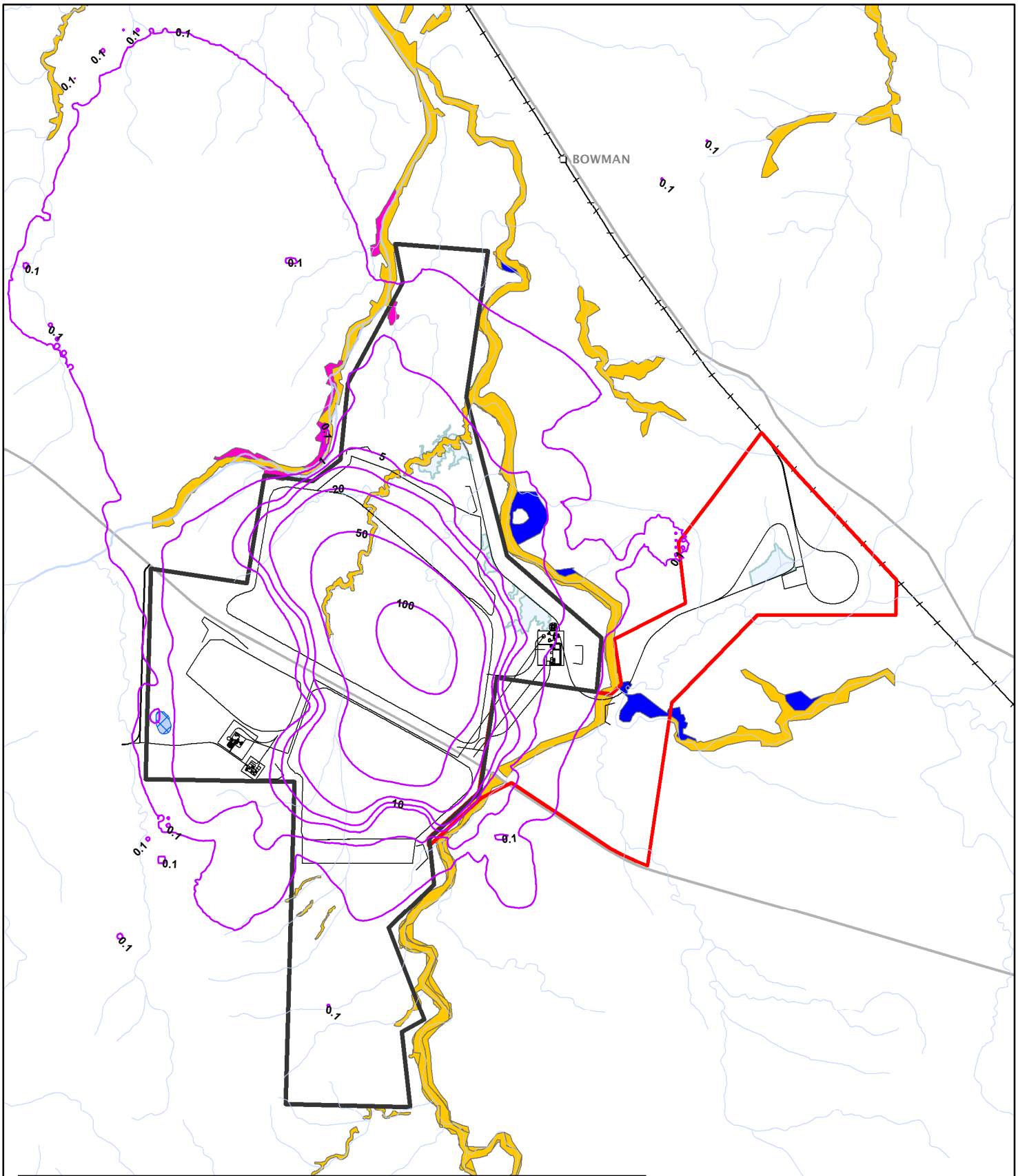
- Haul Road
- Mine infrastructure
- Overland Conveyor
- Power
- Rail Balloon Loop
- Mine Access Road
- ML 80187
- ML 700022
- Cadastral boundary
- Open-cut Mine Pit
- Waste Rock Area
- Environmental Dams
- Main road
- North Coast Rail Line
- Watercourse
- Dam

Figure 4-1
Mine infrastructure layout and ground-truthed remnant vegetation

DATA SOURCE
Waratah Coal, 2018
QLD Open Source Data, 2018

CDM Smith

BRUGGEMANNGD \\brbsvr1\PRO\Project\1000111 - Styx SEIS Post submission work\7Work\3GIS\DATA\MXD\Chapter 14_Supp_Report_Terrestrial Ecology\1000111 general arrangement and field RE__14-9.mxd 11/1/2018



Regional Ecosystem Description

- 11.3.11 - Semi-evergreen vine thicket on alluvial plains
- 11.3.25 - Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines
- 11.3.4 - Eucalyptus tereticornis and/or Eucalyptus spp. woodland on alluvial plains

N

0 0.5 1 km

Scale @ A4 1:60,000
Date: 14/11/18
Drawn: J Parnwell

Legend

- Groundwater drawdown contours
- ML 80187
- ML 700022
- Mine infrastructure
- North Coast Rail Line
- Main Road
- Major watercourse
- Minor watercourse
- Dam
- HEV Wetland

Figure 4-2
Predicted extent of maximum drawdown impact on MNES-associated vegetation communities

DATA SOURCE
Waratah Coal, 2018
QLD Open Source Data, 2018
QLD Department of Environment and Heritage Protection, 2016

CDM Smith

PARNWELLJA \\brbsvr1\PRO\Project\BES170354.01 - Teir 2 Approvals for Styx Coal Mine Project\7Work\3GIS\MXD\BES170354.01-001 Contours Gwater and Veg.mxd 14/11/2018

5 Offset Delivery

Central Queensland Coal have prepared this OMP as an appendix to the SEIS and for review by DotEE as part of the Project approval process. This process has been in accordance with both the QEOP and EPBC Act Environmental Offsets Policy (2012) and has involved the following steps:

- Determination of the residual impact for the MNES and MSES of concern;
- Assessment of the habitat quality index of the residual impact area using methods detailed in EHPs *Guide to determining terrestrial habitat quality V1.2* (April 2017)*;*
- Using the EPBC Act offsets assessment guide to determine the Total Quantum of Impact for MNES values;
- Identification of properties suitable as potential offset areas;
- Assessment of the quality index of the residual offset area using methods in the *Guide to determining terrestrial habitat quality*;
- Based on the quality of the offset area, assess management options of the offset area and determine suitable metrics for parameters such as 'Time to Loss', 'Time to Ecological Benefit', 'Risk of Loss' with and without an offset and 'Future Quality' with and without an offset;
- Prepare a finalised OMP for submission to DotEE for approval by the Minister. The OMP will include information on threats to the offset area and management actions to minimise those threats. The OMP will also contain details of the management actions, reporting requirements and monitoring required to be undertaken until the management outcomes have been achieved; and
- Legally secure the identified offset area.

5.1 Proposed Offset Property

Under the Commonwealth's EPBC Act Offsets Policy it is recognised that direct land-based offsets should comprise a minimum of 90 % of the offset requirements for any given impact. At this stage, the residual significant impacts due to vegetation clearing for the Project is 108.22 ha of habitat for threatened species.

5.1.1 Mamelon Property

Central Queensland Coal owns the Mamelon property, in which the majority of the Project's disturbance footprint is located. Central Queensland Coal will utilise areas outside of the groundwater drawdown disturbance area and within Mamelon for offsetting purposes for predicted residual impacts of the Project. Central Queensland Coal will seek to achieve synergistic habitat and conservation benefits through the retention and improvement of existing vegetation, and the rehabilitation of previously cleared lands on the property.

Central Queensland Coal intends to use areas of the Mamelon property that are outside of the ML for environmental offsetting purposes. The practise of recommending the use of vegetation located within a property but outside the Project footprint for environmental offsetting purposes is not without precedent. The proponents of the Carmichael Coal Mine and Rail Project (Adani Mining) own Moray Downs property on which the northern section of the Project is situated. The Moray Downs property was recommended as providing sufficient values to support the Project's

Environmental Offsets Package (Ecofund 2014). It is noted the Project has been approved without conditions stipulating against the use of the property for offsetting purposes.

The Mamelon property is currently used for cattle grazing; however, this land use will be substantially reduced following approval of the Project and the land within Mamelon will largely be set aside for conservation purposes. Under current Queensland vegetation legislation there is little control as regards the potential clearing of remnant vegetation on the property for 'improved pasture'. Central Queensland Coal considers that, with suitable management of the available lands on the property (outside of the Project disturbance footprint), a conservation benefit can be derived that goes well beyond the immediate direct impacts of vegetation clearing for the Project.

Vegetation regeneration and de-stocking of cattle across the property in general, will in the long-term, contribute to localised surface water quality improvements in the adjacent creek lines, through a reduction in surface erosion and nutrient entrainment during rainfall events. This has follow-on impacts by contributing to improving the water quality entering Broad Sound and the Great Barrier Reef World Heritage Area. Thereby providing a positive contribution to the future of the Great Barrier Reef by reducing localised nutrient and sediment run-off in the Great Barrier Reef lagoon, a key action in improving the health and resilience of the reef (DotEE 2015).

Mamelon encompasses a total area of 6,478 ha of which the Project ML covers 2,275 ha. This leaves a total of 4,203 ha remaining outside of the Project boundary with significant portions remaining as remnant vegetation largely subject to cattle grazing impacts. A summary of the remnant vegetation remaining on the property and outside the Project footprint as mapped under State vegetation mapping is provided at Table 5-1.

5.1.1.1 Remnant Vegetation – Desktop Information

State government (DNRME) vegetation mapping indicates a total of 2,613 ha of remnant vegetation occurs on Mamelon outside of the Project ML (Table 5-1; Figure 5-1). The major direct impact to MSES / MNES as a result of the Project is to habitat for Koala. Current vegetation mapping indicates that up to 728 ha of remnant vegetation is available within Mamelon that provides favoured foraging habitat for Koala and is suitable for Squatter Pigeon and Greater Glider (all species that are known to occur in the area). This includes 74.4 ha of vegetation comprising primary foraging habitat for Koala (RE 11.3.4 and 11.3.25). There is a further 1,799 ha of eucalypt habitat which the species may also utilise and in which it has been recorded during Project surveys (Table 5-1; Figure 5-2). Much of this habitat will also be suitable for other MNES species occurring on the site such as Greater Glider and Squatter Pigeon. In addition, there is currently 4.6 ha of habitat mapped as threatened REs and as EPBC Act-listed TECs: Brigalow (*Acacia harpophylla*) vegetation (RE 11.4.9), and 45 ha of Semi-evergreen vine thicket (SEVT) vegetation. Inspection of aerial imagery indicates this may be a substantial underestimation of the extent of SEVT on the property (with other patches seemingly present on west facing slopes of the rocky hills to the west of the highway).

Within the Project ML itself there are an additional 385 ha of remnant vegetation that will not be impacted under the Project footprint. Ground-truthing vegetation surveys indicate this includes 357 ha of vegetation suitable for Koala (RE 11.3.25, 11.3.35, 11.4.2, 11.5.8a, 11.10.7 and 11.11.15a) and therefore also suitable for potential use as environmental offsets for the project (Figure 5-2).

All of the remnant habitat as described is currently subject to varying degrees of cattle grazing. The majority of the remnant vegetation located outside of the Project ML is Least Concern and under current State legislation is subject to very little control. Central Queensland Coal proposes to remove cattle from the majority of the property and manage the remaining remnant vegetation (through weed and fire management) thereby improving habitat values for fauna on the site.

Table 5-1 Mamelon property - remnant vegetation outside of Project footprint

RE	Area (ha)	Suitability for MNES
Extent of vegetation communities (DNRME) outside of Project ML (80187)		
11.3.4	15.5	Variety of eucalypt species present including Forest Red Gum. Suitable for Koala.
11.3.25	58.9	Canopy dominated by Forest Red Gum. Occurs along creek lines. Suitable for Koala and potentially Ornamental Snake.
11.3.29	125.2	Variety of eucalypt species present over *Melaleuca* understorey. Suitable for Koala.
11.4.2	219.2	Poplar Box dominated woodland. Suitable for Koala.
11.4.9	4.6	Brigalow (TEC). Suitable for Ornamental Snake.
11.5.8a/11.7.2	344.1	Variety of eucalypt species present in 11.5.8a (90% dominance in community polygon) including Forest Red Gum. Suitable for Koala. *Acacia* species dominate 11.7.2 which is generally unsuitable for Koala.
11.10.7	488.6	Narrow-leaved Ironbark dominated woodland. Foraging habitat for Koala.
11.10.7/11.10.1	638.1	Narrow-leaved Ironbark dominated woodland for 11.10.7 (90% dominance in community polygon). Foraging habitat for Koala. 11.10.1 Dominated by Spotted Gum (*Corymbia citriodora*) with other species. Suitable for Koala.
11.11.1	135.0	Narrow-leaved Ironbark dominated woodland. Foraging habitat for Koala.
11.11.15a	538.4	Narrow-leaved Ironbark dominated woodland. Foraging habitat for Koala.
11.11.18	45.6	Semi-evergreen vine thicket (TEC).
Total remnant	2,613	
Extent of ground-truthed vegetation communities within Project ML (outside footprint)		
11.3.4	26.35	Variety of eucalypt species present including Forest Red Gum. Suitable for Koala.
11.3.11	2.5	Canopy dominated by Forest Red Gum. Occurs along creek lines. Suitable for Koala and potentially Ornamental Snake.
11.3.25	5.44	Poplar Box dominated woodland. Suitable for Koala.
11.4.2	70.85	Brigalow (TEC). Suitable for Ornamental Snake.
11.4.9	0.61	Variety of eucalypt species present in 11.5.8a (90% dominance in community polygon) including Forest Red Gum. Suitable for Koala. *Acacia* species dominate 11.7.2 which is generally unsuitable for Koala.
11.5.3b	4.16	Narrow-leaved Ironbark dominated woodland. Foraging habitat for Koala.
11.5.8a	56.3	Narrow-leaved Ironbark dominated woodland for 11.10.7 (90% dominance in community polygon). Foraging habitat for Koala. 11.10.1 Dominated by Spotted Gum (*Corymbia citriodora*) with other species. Suitable for Koala.
11.10.3	36.6	Narrow-leaved Ironbark dominated woodland. Foraging habitat for Koala.
11.10.7	77.24	Variety of eucalypt species present including Forest Red Gum. Suitable for Koala.
11.11.15a	109.42	Canopy dominated by Forest Red Gum. Occurs along creek lines. Suitable for Koala and potentially Ornamental Snake.
Total remnant	385.3	

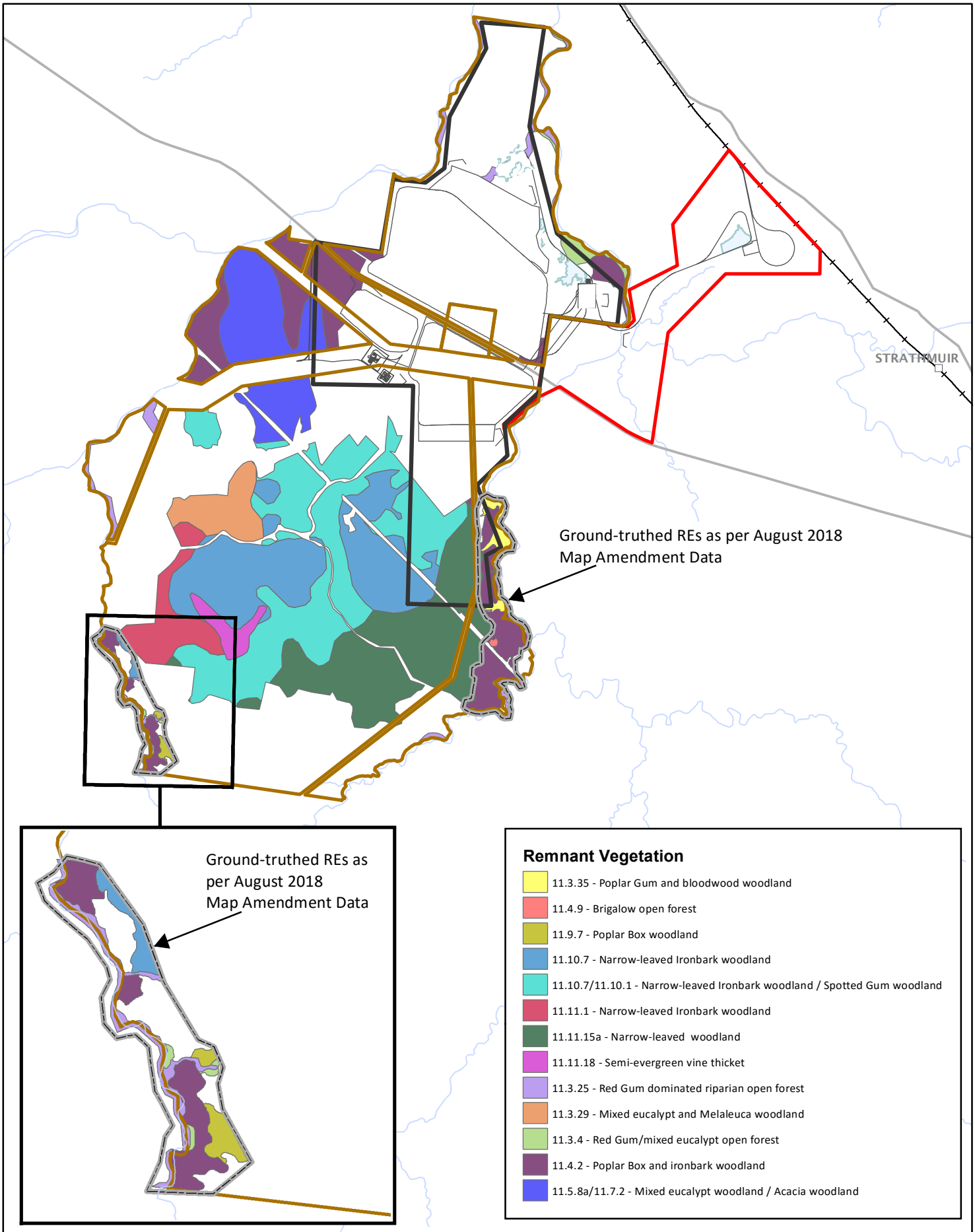


Figure 5-1
Mamelon property – remnant vegetation communities

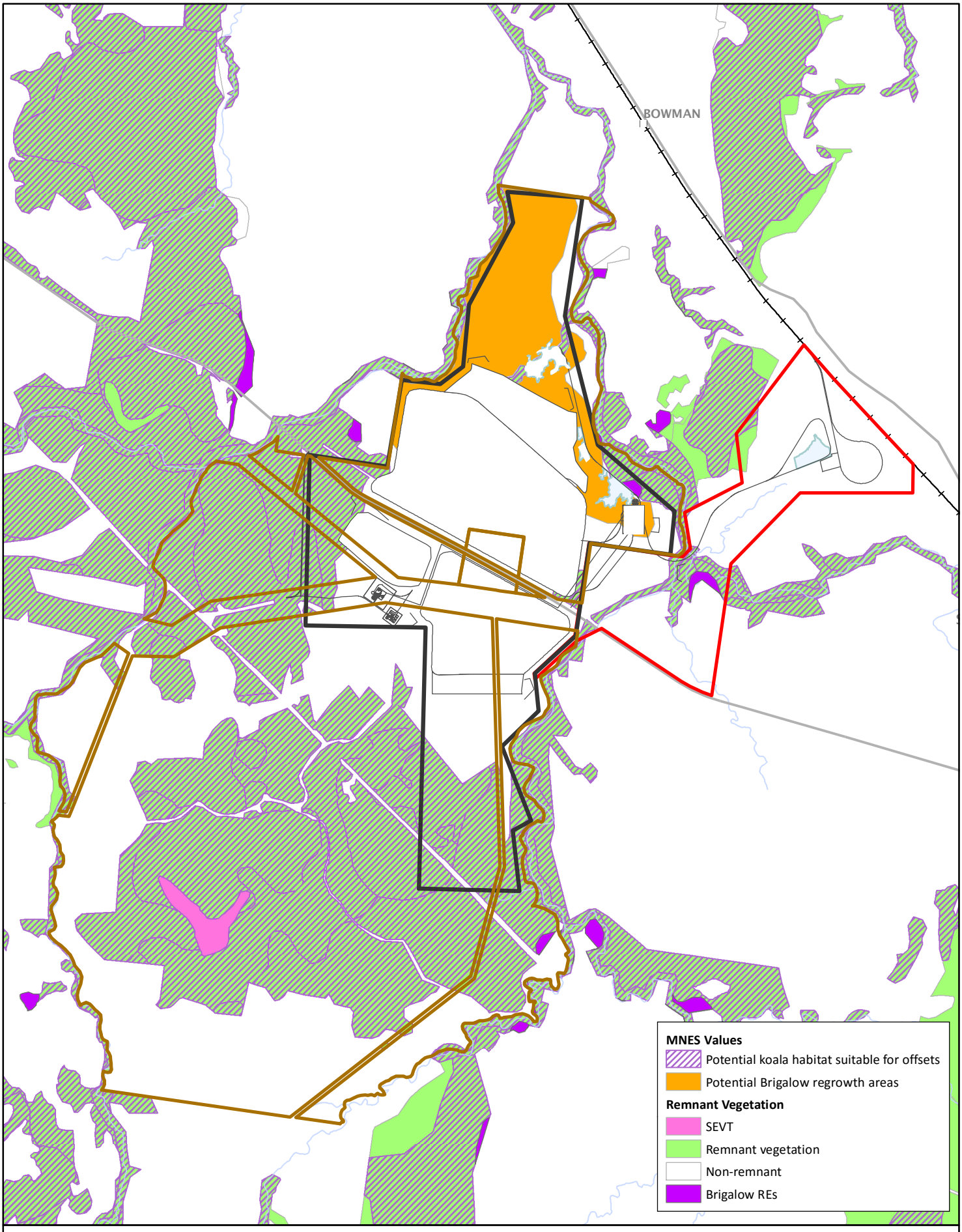


Figure 5-2
Mamelon property – remnant vegetation suitable for MNES habitat offsets

N

0 0.5 1 km

Scale @ A4 1:70,000
Date: 08/11/18
Drawn: Gayle B.

Legend

- ML 80187
- ML 700022
- Mamelon Property
- Mine infrastructure
- Main Road
- North Coast Rail Line
- Watercourse
- Dam

DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2017

CDM Smith

Groundwater drawdown has potential in the future to impact vegetation requiring access to groundwater. The groundwater assessment for the Project has identified the potential for impacts to Groundwater Dependent Ecosystems (GDEs) including MNES-associated vegetation communities (Koala habitat) dominated by Forest Red Gum (RE 11.3.25). Forest Red Gum communities considered as having a 'moderate to high' chance of being impacted (>1 m of predicted groundwater drawdown) encompass 27 ha. These and adjacent areas will be subject to vegetation health monitoring throughout the life of the Project. Should impacts be identified these will require further offsets located outside the boundary of potential groundwater drawdown impacts.

5.1.1.2 Non-remnant Vegetation

There are extensive areas of non-remnant lands previously subject to vegetation clearing / management, outside and within the Project ML (1,590 ha and 587 ha respectively). Cattle grazing will be restricted to approximately 1,000 ha in the south of the property. The remaining cleared areas will be managed so as to allow regeneration of the original vegetation communities (including within the non-remnant areas within the OMAs), thereby extending the availability of threatened fauna habitat in the area by over 1,000 ha, and improving habitat linkages between remnant vegetation patches to the south and north-east of the property.

The northern portion of the Project ML is dominated by cleared habitat or scattered Brigalow regrowth on cracking clay soils. Cleared habitat to the north and east of Project activities will be managed and allowed to regenerate tree cover. Weed management, particularly for existing problem species in the area, will be a necessary part of managing these areas. Similar smaller patches between Deep Creek and Project infrastructure (such as the cleared habitat around CHPP/MIA 2) will also be allowed to regenerate cover. This will have several conservation outcomes in the long-term including:

- Substantial increase in the cover of Brigalow vegetation on the property and in the wider area;
- Increase the width of riparian vegetation along Tooloombah Creek and Deep Creek potentially increasing SEVT cover and preferred Koala habitat trees (Forest Red Gum) and/or providing a vegetated buffer to riparian habitat;
- Substantial increase and improvement of habitat for Ornamental Snake on the property; and
- Improved vegetation connection of Tooloombah Creek to Deep Creek, thereby improving landscape connection to several large habitat patches to the north-east of the property (Figure 5-3).

In the southern portion of the ML regeneration could also be applied to vegetation on and adjacent to sections of Deep Creek (which are relatively thin due to past clearing), and currently cleared habitat to the south of Open Cut 1 and Overburden Stockpile 1a. Allowing these areas to regenerate will increase suitable eucalypt habitat for Koala and Greater Glider.

5.1.1.3 Landscape Connectivity

Within the wider landscape Mamelon is well connected to large remnant habitat patches to the west remaining contiguous with an extensive tract of remnant vegetation, which includes Tooloombah Creek Conservation Park. Habitat to the south and south-west of the property remain relatively patchy but maintain connection to extensive habitat within the Broadsound Range (located to the south and west of the property). The property is less well connected to several large patches to the east and north-east. Broadsound Range is part of a State-wide ecological corridor mapped under the Queensland Biodiversity Planning Assessment process, as are coastal lands to the north and east (Figure 5-3).

The wider area surrounding the property has been substantially impacted by vegetation clearing associated with cattle grazing activity. Connectivity between remaining tracts of vegetation to the north and east is maintained by thin strips of riparian vegetation along creek lines such as Tooloombah Creek and Deep Creek which border the Project.

The property encompasses large tracts of largely eucalypt woodland (Figure 5-1) that may sustain a diverse range of fauna including several MNES species and vegetation communities. Central Queensland Coal believes that with appropriate vegetation restoration and management, including the proposed OMAs, the property will improve regional connectivity linkages to the State-wide ecological corridor to the south and west allowing faunal movement across the wider landscape (Figure 5-3). In particular, the proposed OMA in the north of the property will provide a habitat connection between Deep Creek and Tooloombah Creek which will contribute to providing a habitat connection between the State-wide ecological corridors to the south (Broadsound Range) and the coastal corridor to the north.

5.1.1.4 Summary of Mamelon's Value to MNES Fauna and General Landscape Values

With the management of the majority of the Mamelon property for conservation purposes, including those measures detailed in Section 6 for the OMAs, Central Queensland Coal considers the site has the capacity to improve outcomes for the threatened species of concern (Koala and Ornamental Snake) as well general localised conservation outcomes including the following:

- Improvement in the current values of remnant habitat through management of key attributes such as:
  - Vegetation health management
  - Weed and pest management, particularly with regard to problem weed species known to be present such as Lantana and Rubber Vine (*Cryptostegia grandiflora*)
  - Bushfire management
- In the long-term increase the extent of suitable habitat (through managed regrowth in cleared areas) on the property for both Koala and Ornamental Snake (and other known threatened species in the area such as Squatter Pigeon and Greater Glider) by > 1,000 ha;
- Restore several kilometres of watercourse vegetation that has been cleared in the catchments of both Tooloombah and Deep Creeks;
- Improve the landscape connectivity of vegetation within the property to the south of Deep Creek and to habitat patches to the south-west and west linking to State-wide ecological corridors to the south and west;
- A large extent of Brigalow vegetation (TEC) can be restored to the north of the mine area and several small patches of Brigalow TEC can be allowed to increase in size and connect in the south-east corner of the property; and
- Patches of semi-evergreen vine-thicket TEC along Tooloombah Creek can be allowed to increase in size and connect with adjacent vegetation through assisted regrowth and weed management.

This OMP has been developed with due consideration to species management objectives for Koala and Ornamental Snake as recognised in Commonwealth documents approved and / or recognised under the EPBC Act (refer Section 6).

5.1.2 Proposed Offset Management Areas

Central Queensland Coal proposes three specific Offset Management Areas (OMAs) within Mamelon to manage the significant residual impacts resulting from the Project works as depicted in Figure 4-1. Although it is noted the intention is to manage the entire property for conservation purposes into the future. Vegetation communities identified as potential offset locations on the property, were assessed during vegetation surveys carried out in August 2018. The RE composition of each proposed OMA is detailed in Table 5-2.

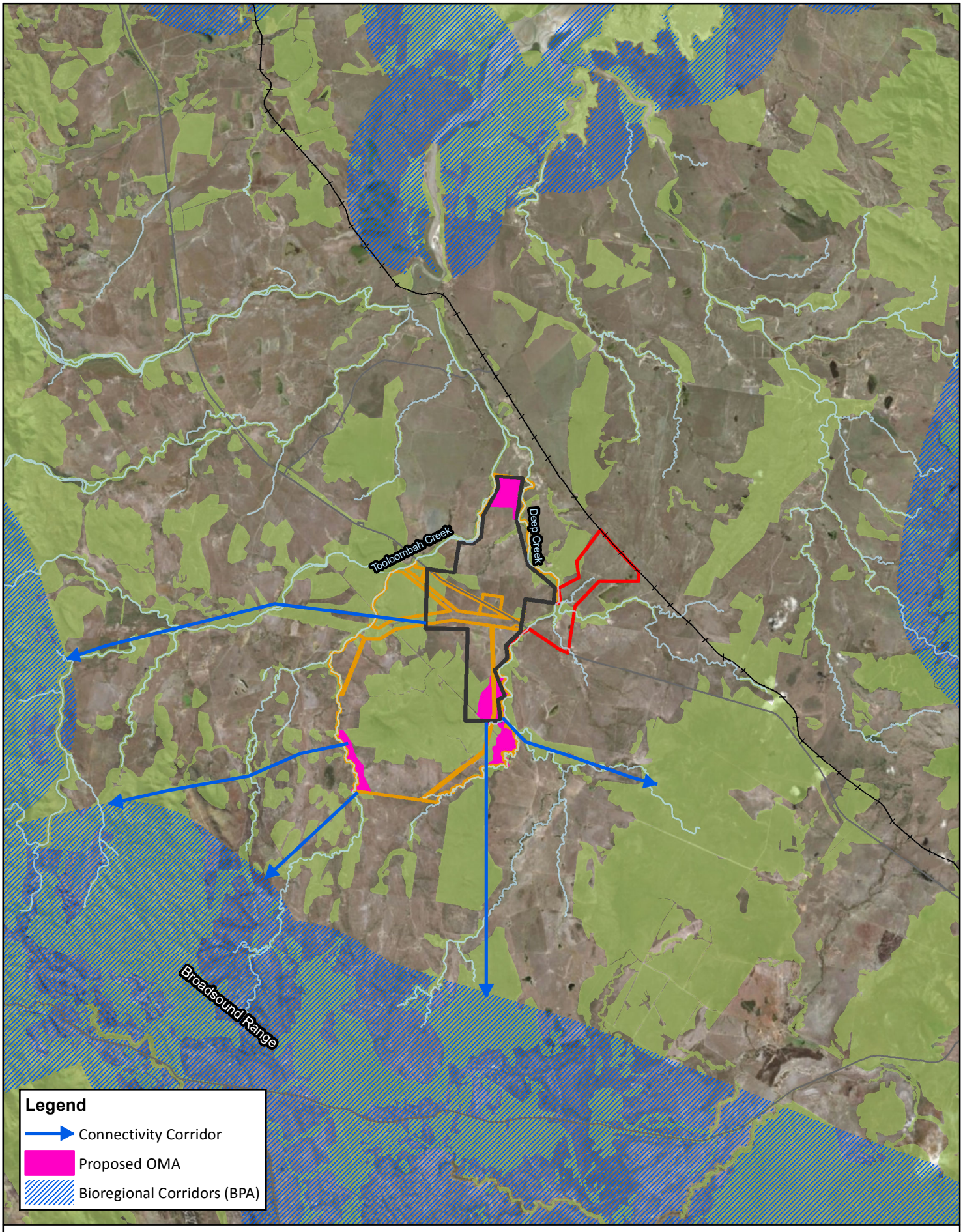
The surveys specifically identified the following REs associated with Project impacts to favoured Koala habitat (Forest Red Gums present) within OMA1 and OMA2:

- RE 11.4.2 - 147.89 ha;
- RE 11.3.4 – 2.12 ha;
- RE 11.3.35 – 129.33 ha; and
- RE 11.3.25 – 22.95 ha.

There is an additional 100.88 ha of remnant vegetation also considered suitable for Koala due to the presence of forage species including Narrow-leaved Ironbark and Poplar Box (RE 11.9.7, 11.10.7 and 11.11.15a). In total OMA 1 and OMA 2 comprise 303.03 ha of remnant habitat suitable for Koala. OMA 3 comprises 128 ha of non-remnant habitat considered suitable to support Ornamental Snake.

Table 5-2 Offset Management Areas – ground-truthed RE composition

RE	Area (ha)	Suitability for MNES
OMA 1		
11.3.25	6.19	Canopy dominated by Forest Red Gum. Suitable for Koala.
11.3.35	29.33	Variety of eucalypt species. Suitable for Koala.
11.4.2	118.9	Narrow-leaved Ironbark / Poplar Box dominated woodland. Suitable for Koala.
11.4.9	2.35	Brigalow (TEC). Suitable for Ornamental Snake.
11.11.15a	84.7	Narrow-leaved Ironbark dominated woodland. Suitable for Koala.
Non-remnant	13.54	Cleared habitat, potentially suitable for Ornamental Snake.
Total area	255.01	
OMA 2		
11.3.4	2.12	Canopy dominated by Forest Red Gum with other eucalypt species. Suitable for Koala.
11.3.25	16.62	Canopy dominated by Forest Red Gum. Suitable for Koala.
11.4.2	28.99	Narrow-leaved Ironbark / Poplar Box dominated woodland. Suitable for Koala.
11.9.7	8.03	Narrow-leaved Ironbark dominated woodland. Marginal foraging habitat for Koala.
11.10.7	8.15	Narrow-leaved Ironbark / Poplar Box dominated woodland. Suitable for Koala.
Non-remnant	37.82	Cleared habitat with partial regrowth. Suitable for restoration of Koala habitat.
Total area	101.73	
OMA 3		
Non-remnant (total area)	128	Cleared gilgai habitat with scattered regrowth Brigalow, suitable for Ornamental Snake and restored as Brigalow TEC.



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Scale @ A4 1:200,000
Date: 12/11/18
Drawn: Gayle B.

Legend

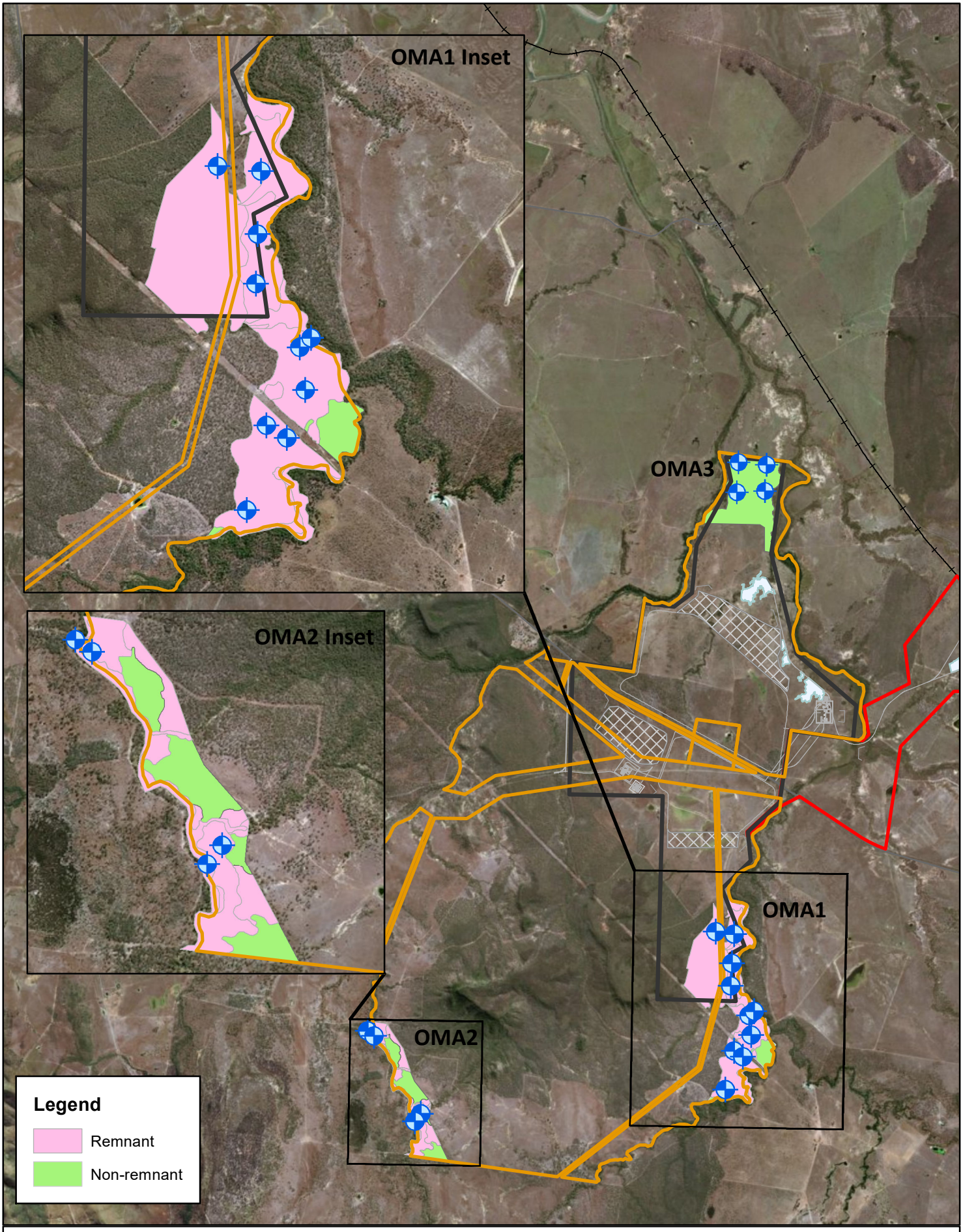
- ML 80187
- ML 700022
- Watercourse
- North Coast Rail Line
- Mamelon
- Remnant vegetation (DNRME)

Figure 5-3

Mamelon Property, OMAs and landscape connectivity corridors

DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2017

CDM Smith



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Scale @ A4 1:90,000
Date: 07/11/18
Drawn: J Parnwell

Legend

- Habitat quality assessment site
- ML 80187
- ML 700022
- Mamelon Property

Figure 5-4
Habitat quality assessment sites - proposed offset management areas

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2017

CDM Smith

5.2 Residual Impact Area, Habitat Quality and Total Quantum of Impact

Land-based offsets under the State and Commonwealth Offsets Policies require the quality of vegetation to be at least similar to that impacted. The quality of the vegetation associated with the Project's OMP (both impacted sites and proposed offset sites) has been assessed using the *Guide to determining terrestrial habitat quality V1.2* (EHP, April 2017) (hereon referred to as the Guide). The assessment methods are based on the BioCondition Assessment Manual (developed by the Queensland Herbarium), and align with the habitat quality measures required for input into the EPBC Act 'Offsets Assessment Guide' thereby determining land-based offset ratios. This allows for a consistent framework for environmental offsets between the State and Commonwealth approval process.

The assessment of habitat quality ensures a proposed offset site is of a suitable quality and extent to achieve a gain that is sufficient to compensate for the loss of ecological values (for MNES) at the Project impact site. The habitat quality of the Project area is summarised below relating to the relevant MNES and whether impacts are direct (vegetation clearing) or potentially indirect (future groundwater drawdown).

5.3 Habitat Quality Assessment – Impact Areas

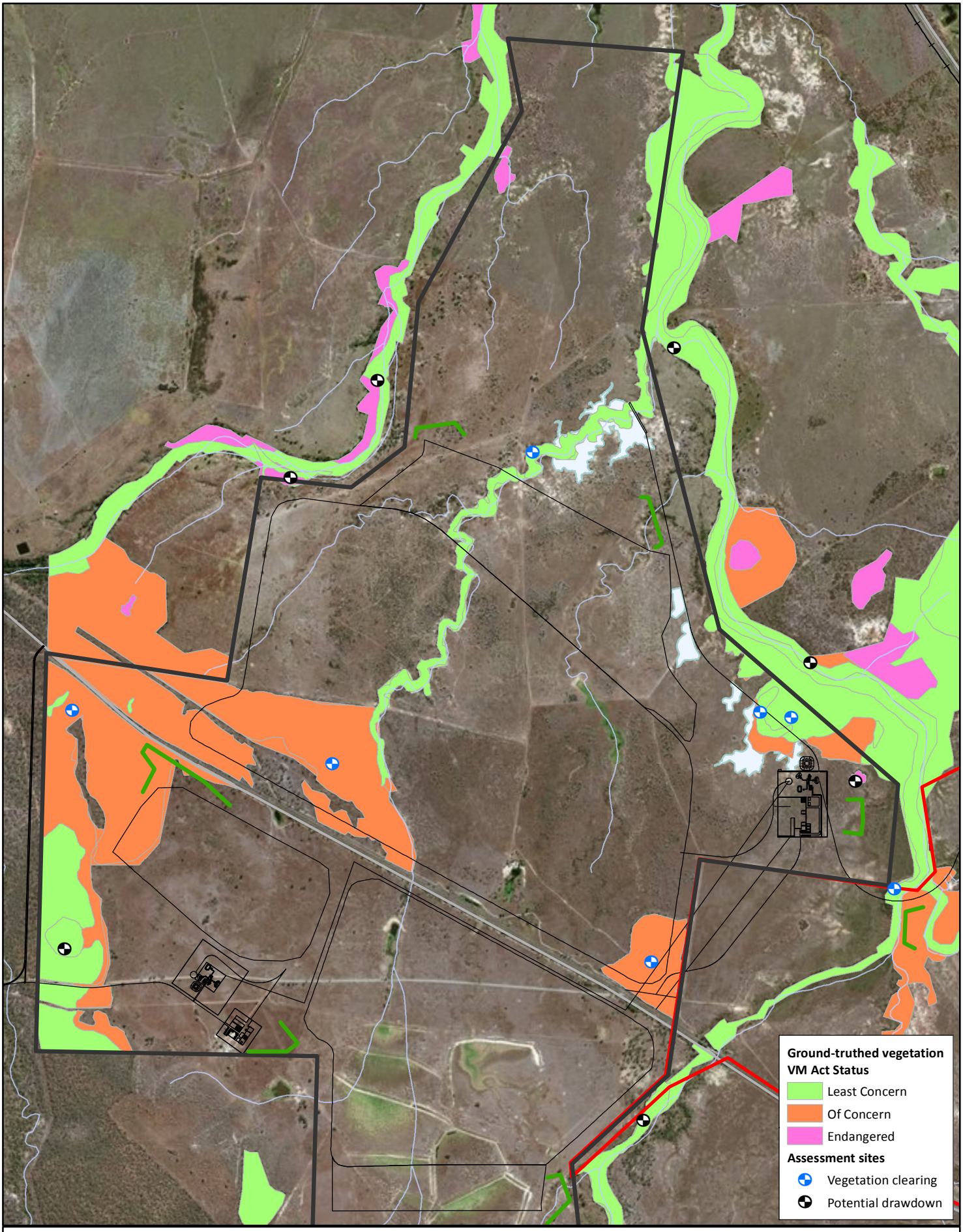
5.3.1 Direct Impacts – Vegetation Clearing

Areas of vegetation on site requiring environmental offsetting due to vegetation clearance comprise:

- Habitat for a MNES threatened species - Koala (comprising RE 11.3.4, 11.3.25, 11.3.27, 11.3.35, 11.4.2); and
- Habitat for a MNES threatened species – Ornamental Snake (comprising areas of RE 11.3.25 – overlaps with above).

State based offset requirements for offsetting 'Of Concern' REs (RE 11.3.4 and 11.4.2) will be discharged by offsetting for species habitat under the EPBC Act.

The habitat quality assessment of impact sites was carried out in July 2018 and comprised 14 assessment sites as shown in . Assessment sites comprised seven sites in vegetation communities associated with Project clearing and seven sites associated with potential future groundwater drawdown impacts. The various blocks of vegetation subject to impact are treated in the following sections as two 'assessment units' as referred to in the Guide i.e. for Koala and Ornamental Snake. Baseline habitat quality assessment site datasheets are provided in Appendix A. Habitat quality scores are tabulated and a summary of how the final score for each assessment unit was defined are provided in Appendix B.



N

0 0.5 1 km

Scale @ A4 1:30,000
Date: 01/11/18
Drawn: J Parnwell

Legend

- ML 80187
- ML 700022
- Mine infrastructure
- Environmental Dams
- Cadastral boundary
- Main Road
- North Coast Rail Line
- Watercourse
- Dam

Figure 5-5
Habitat quality assessment sites – Project impact areas

DATA SOURCE
Waratah Coal, 2018
QLD Open Source Data, 2018
QLD Department of Environment and Heritage Protection, 2016

CDM Smith

Habitat quality was assessed following the attributes detailed in the Offsets Assessment Guide under the EPBC Act Environmental Offsets Policy. Under the EPBC Offset Assessment Guide there are three components to be considered when calculating habitat quality: site condition, site context, and species stocking rate. These differ slightly from the DES' Guide which describes site condition, site context and fauna species habitat (i.e. the ability of an area to support the threatened species in focus). The following habitat quality values (for both impact and offset sites) are provisional and based on precedents set under recent projects. As such, the habitat attributes as measured onsite have been apportioned differently to the method in the DES Guide so as to inform the three habitat components described in the EPBC Offset Assessment Guide.

Site condition and site context are described using 15 and seven attributes respectively (refer Appendix B for more detail). Species stocking rate is considered as a measure of the species presence on the site. For this assessment species stocking rate has been assessed on a scale of 0 – 4 as described in Appendix B. The overall scores (out of 10) for site condition and site context have then been weighted at a 30% contribution each to the overall habitat quality score used in the EPBC Offset Assessment Guide (based on level of importance). The species stocking rate number contributes the remaining 40% of the final habitat quality score (refer Appendix B for more detail).

The habitat quality of the Project area to the Koala is summarised in Table 5-3 and to Ornamental Snake in Table 5-4. Individual habitat value measures associated with individual assessment sites are provided in Appendix B.

Table 5-3 Habitat quality in the Project area for Koala

Attribute	Discussion
Area	Koala has been recorded within or adjacent to the proposed impact areas during surveys for the Project. The overall impact area covers a total of 108.22 ha across six areas. These areas consist of grassy ironbark dominated woodlands subject to cattle grazing, and riparian Forest Red Gum habitat.
Quality	
Site condition	Grassy woodlands encompass 84.15 ha of the overall impact area. These areas are currently subject to cattle grazing. These grassy woodlands comprise a number of eucalypt species suitable for Koala foraging including the dominant Narrow-leaved Ironbark, Poplar Box and Pink Bloodwood. Forest Red Gum open forest (including fringing wetlands) comprises 24.07 ha of the remaining impact area. For the most part these areas exist as a thin degraded strip along a minor waterway and are subject to cattle disturbance. The canopy is dominated by Forest Red Gum and is a favoured forage tree species for Koala. The understorey often comprises shrubby weed species including Lantana and Rubber Vine. Weed cover in riparian REs was well above benchmark conditions. Site assessments indicated tree height and canopy cover in the woodland sites and riparian forest sites are comparable to benchmark sites for the same vegetation communities as set out under the BioCondition benchmarks for the Brigalow Belt (Queensland Herbarium 2016).

Attribute	Discussion	
Site context	Koala occurs as far north as the Atherton Tablelands in north Queensland, into southern Australia, and extends west into central Queensland. The impact sites occupy a very small area within the species overall distribution and is very unlikely to be of importance to the overall population. Given the relatively small area the impact sites occupy across the Koala's wider distribution it is likely the local population plays a very minor role in relation to the overall population. The impact areas are located in a fragmented landscape and are located outside of any ecological corridors (as mapped by DES). Nevertheless, tracts of similar eucalypt woodland habitat occur adjacent to the west and further to the south of the proposed impact areas. Riparian open forest occurs along the eastern boundary and to the north and north-west of the impact area providing habitat connectivity to woodlands to the east and west. Much of the Project impacts already cleared lands and the Project will not further fragment surrounding habitat. The woodland impact sites comprise the majority of the impacted area and lie adjacent to the Bruce Highway, thereby providing an elevated risk of road collisions in these sites. Dingo/wild dog (a known risk to Koala) has been sighted in the Project area on several occasions during Project surveys.	
Species stocking rate	The species has been identified on six occasions during spotlighting in or near the impact sites (four individuals over four separate spotlighting events) and camera trapping further to the south of the Project area (two records). There is no local data as to the species population density in the area. Further west in the Springsure area the species uses an average home range of 38 ha (females) to 80 ha (male) (Melzer 1995). Individuals further north (Blair Athol) occupy larger home ranges of 101 ha (females) to 135 ha (male) (Ellis et al. 2002). Given only individuals have been observed during surveys the species appears occur at low densities across the local area. As such a 'stocking rate' number of 1 has been attributed to the impact sites.	
Assessed habitat quality value	**5**	As per desktop and habitat attributes measured using the DES Guide and species stocking rate as per the EPBC Act Offsets Assessment Guide (refer Appendix B for site attribute details and calculations).
Total quantum of impact (adjusted ha)	54.1	As per the results of the EPBC Act Offsets Assessment Guide (refer Appendix C for output results).

Table 5-4 Habitat quality in the Project area for Ornamental Snake

Attribute	Discussion
Area	Ornamental Snake has been recorded 3 km to the west of the proposed impact areas during surveys for the Project in 2011/2012. The species has not been detected within the Project area. The overall impact area covers a total of 20.9 ha across two areas of riparian Forest Red Gum habitat. located within a matrix of cleared Brigalow habitat with gilgais on cracking clay soils.
Quality	
Site condition	The impact site exists as a thin degraded strip along a minor waterway located within a matrix of cleared Brigalow habitat with gilgais on cracking clay soils. This habitat is subject to cattle disturbance. The understorey comprises a range of SEVT species and shrubby weed species including Lantana and Rubber Vine. Site assessments indicated that suitable habitat factors (presence of coarse woody debris) were well below the benchmark data for the same vegetation community as set out under the BioCondition benchmarks for the Brigalow Belt (Queensland Herbarium 2016). Weed cover was also well above benchmark conditions.

Attribute	Discussion	
Site context	Ornamental Snake occurs as far north as Charters Towers in north Queensland, west to Emerald and the Belyando River and south into the Dawson River floodplain. The species has not been identified on or near the impact sites which occupy a very small area within the species overall distribution. Given the relatively small area the impact sites occupy across the Ornamental Snake's wider distribution it is likely any local population, should one occur in the area, plays a very minor role in relation to the overall population. The impact areas are located in a heavily fragmented and cleared landscape. Extensive similar habitat occurs to the west of Tooloombah Creek where the species was identified in remnant Brigalow habitat in 2011 / 2012. Similar cleared habitat also occurs to the immediate north to the confluence of Deep Creek and Tooloombah Creek, and cleared habitat to the west of Deep Creek. Dingo/wild dog and feral cat have been sighted in the Project area on several occasions during Project surveys and Cane Toad has been sighted on most surveys. The site is subject to invasive weeds which may also impact the values of habitat for the species.	
Species stocking rate	The species has not been identified on the site despite extensive survey effort. The species has been identified 3 km to the west in remnant Brigalow habitat in 2011/2012. There is no data available as to the species population density. Observations elsewhere in central Queensland (the Belyando River floodplain) indicate the species can be common where suitable habitat occurs (pers. Comm. B. Taylor). Given the species has not been identified on the site a 'stocking rate' number of 0 has been attributed to the impact sites.	
Assessed quality value	**3**	As per desktop and habitat attributes measured using the DES Guide and species stocking rate as per the EPBC Act Offsets Assessment Guide.
Total quantum of impact (adjusted ha)	**6.27**	As per the results of the EPBC Act Offsets Assessment Guide.

5.3.2 Indirect Impacts – groundwater drawdown

Groundwater drawdown has potential in the future to impact vegetation requiring access to groundwater. The groundwater assessment for the Project has identified the potential for impacts to GDEs including MNES-associated vegetation communities dominated by Forest Red Gum (RE 11.3.25 and 11.3.4). The maximum predicted extent of impacts from groundwater drawdown (i.e. 10 years following the cessation of mining activities) may impact 42.5 ha of RE 11.3.25 where the drawdown is predicted to exceed more than 1 m (moderate to high chance of impact) and a further 102.7 ha where a drawdown of between 0.1 m and 1 m (low to moderate chance of impact) is predicted. Approximately 14.2 ha of RE 11.3.4 has a low to moderate chance of being impacted where the drawdown is between 0.1 m and 5 m and the water table is above 10 mbgl. These and adjacent areas will be subject to vegetation health monitoring throughout the life of the Project. Should impacts be identified these will require further offsets located outside the boundary of potential groundwater drawdown impacts. This may require environmental offsets located outside the Mamelon property although this will be dependent on the results of ground-truthing vegetation surveys to assess the extent and type of habitats present.

Areas of vegetation on site that may require environmental offsetting due to the predicted effects of groundwater drawdown comprise habitat for a MNES threatened species - Koala (RE 11.3.25). The habitat quality of the Project area to the Koala is summarised in and is based on four assessment sites (Figure 5-5). Individual habitat value measures associated with individual assessment sites are provided in Appendix B.

Table 5-5 Habitat quality for Koala – predicted groundwater drawdown zone

Attribute	Discussion	
Area	Koala has been recorded in the local area during surveys for the Project and is therefore likely to use the Forest Red Gum community (RE 11.3.25) along the adjacent creek lines. The overall potential maximum groundwater drawdown impact area (refer Figure 4-2) covers a total of 159 ha across the two creeks (Table 4-3).	
Quality		
Site condition	These areas exist as a relatively thin degraded strip along Tooloombah Creek. This habitat is more variable along Deep Creek with some areas buffered by adjacent floodplain vegetation. Deep Creek appears less subject to cattle disturbance. The canopy is dominated by Forest Red Gum and is a favoured forage trees species for Koala. Site assessments indicated tree height and canopy cover in the woodland sites and riparian forest sites are comparable to benchmark sites for the same vegetation communities as set out under the BioCondition benchmarks for the Brigalow Belt (DSITI 2016). The understorey often comprises shrubby weed species including Lantana and Rubber Vine. Weed cover in riparian REs was well above benchmark conditions.	
Site context	Koala occurs as far north as the Atherton Tablelands in north Queensland, into southern Australia, and extends west into central Queensland. The site occupies a very small area within the species overall distribution. Given the relatively small area the impact sites occupy across the Koala's wider distribution it is likely the local population plays a very minor role in relation to the overall population. The potentially impacted areas are located in a fragmented landscape. Riparian open forest extends to the north and south. The southern extent of the drawdown area potentially impacting Deep Creek lies adjacent to the Bruce Highway providing an elevated risk of road collisions in these sites. Dingo/wild dog (a known risk to Koala) has been sighted in the Project area on several occasions during Project surveys.	
Species stocking rate	The species has been identified on six occasions during spotlighting in or near the impact sites (four individuals over four separate spotlighting events) and camera trapping further to the south of the Project area (two records). There is no local data as to the species population density in the area. Further west in the Springsure area the species uses an average home range of 38 ha (females) to 80 ha (male) (Melzer 1995). Individuals further north (Blair Athol) occupy larger home ranges of 101 ha (females) to 135 ha (male) (Ellis et al. 2002). Given only individuals have been observed during surveys the species appears occur at low densities across the local area. As such a 'stocking rate' number of 1 has been attributed to the impact sites.	
Assessed habitat quality value	**5**	As per desktop and habitat attributes measured using the DES Guide and species stocking rate as per the EPBC Act Offsets Assessment Guide (refer Appendix B for site attribute details and calculations).
Total quantum of impact (adjusted ha)	**79.5**	As per the results of the EPBC Act Offsets Assessment Guide (refer Appendix C for output results).

5.4 Assessment of Habitat Quality of the Offset Area

A total of 18 assessment sites were established as per the Guide (Figure 5-4). The OMAs were selected based on their potential to acquit the Project's offset requirements. This included 10 sites in OMA1 (Sites 15 – 24, refer Appendix A) and four sites each in OMA2 (Sites 27 – 30, refer Appendix A) and OMA 3 (Sites 31 – 34, refer Appendix A). Surveys within OMA 1 and 2 focused on the equivalent Koala habitat to that being impacted by the Project: RE 11.3.25 (four sites); and RE11.4.2 (nine sites). These surveys assessed the habitat quality of proposed offset areas, and enabled calculations of the habitat value of the proposed area (accounting for averted loss and quality improvements) to be undertaken following the EPBC Act offset calculator.

In general areas dominated by Ironbark/Poplar Box (*Eucalyptus populnea*) (RE 11.4.2 and 11.11.15a) were found to have been impacted heavily by past logging or thinning of large trees which impacted habitat assessment data regarding presence of large trees and tree species diversity compared to benchmark vegetation community data (refer DSITI 2016). Grass and forb species diversity were also lower. Structural elements such as shrub canopy cover and coarse woody debris were also found to be reduced.

Riparian areas (RE 11.3.25) were impacted by a weedy shrub layer with low grass and forb diversity compared to benchmark data (refer Queensland Herbarium 2016). Structural elements such as shrub canopy and grass cover, and in particular coarse woody debris, were also found to be reduced.

OMA 3 is made up of entirely non-remnant vegetation having been subject to past clearing activity. Regrowth Brigalow is patchy across this large area. Nevertheless, the presence of suitable soils with extensive gilgai formations make this area suitable as habitat for the target species – Ornamental Snake. Four sites were selected to encompass the variability of tree canopy cover across the OMA. As expected attributes such as general plant diversity, canopy height, and cover of most structural elements were all heavily reduced compared to benchmark data (refer Queensland Herbarium 2016).

5.4.1 EPBC Act Offset Calculator Inputs

The habitat quality assessment of the offset areas determined the inputs of management parameters for the offsets calculation. The 'Time to Loss', 'Time to Ecological Benefit', 'Risk of Loss' with and without an offset and 'Future Quality' with and without an offset calculator inputs are all directly related to the quality of the offset site in terms of habitat disturbance, presence of pest species, available suitable habitat and presence of prey / forage potential all determine the success of the offset area in achieving the goal of offset which is to improve or maintain the presence of the species in question.

Considering the assessment described above (incorporating current habitat quality of the proposed offset sites, habitat improvement measures and risk of loss), the proposed offset locations will exceed the offset requirements for the Project. The areas of habitat will constitute more than a 'like-for-like' offset provided habitat management practices identified are implemented over the area.

A copy of the offset calculations are provided in Appendix C. Table 5-6 summarises the inputs to the EPBC Act offsets assessment guide for Koala habitat. Both OMA 1 and OMA 2 have been assessed as a combined entity as habitat quality within the areas were considered similar through the results of the habitat quality assessments. Table 5-7 summarises the inputs to the EPBC Act offsets assessment guide for Ornamental Snake habitat associated with OMA 3 (refer Appendix A for site data and Appendix B for habitat quality calculations).

Based on the output from the EPBC Act Offset Assessment Guide (Appendix C) the OMAs will acquit the Project's environmental offset requirements for both species. Given the availability of habitat suitable for Koala on the property (as identified in Table 5-1) is considered likely to be able acquit impacts resulting from groundwater drawdown on Koala habitat in the future should they occur. Offset calculations based on the maximum area of predicted drawdown impact (159 ha) and the habitat attributes detailed in Table 5-6 indicate 407 ha of equivalent lands will be required to acquit this loss. There are extensive areas of eucalypt woodlands remaining on the property which are suitable for Koala and can then be used for further offsets into the future.

Table 5-6 Summary of offset calculations and habitat values for Koala

Attribute	Rating	Discussion
Start habitat quality	5	There are six records of Koala from the property from fauna surveys in 2017 and 2018. Two of these are located 800 m and 300 m (respectively) to the west of OMA 1. Given the proximity of the records to the OMAs the species is expected to occur in these areas. The site assessment observed the woodland areas (RE 11.4.2) had been subject to 'heavy logging' (particularly of ironbark) with few large trees present. The impact of heavy cattle grazing were also noted at assessment sites. The understorey of riparian open forest was noted as having a relatively dense understorey of Lantana at all survey sites. Lantana thickets may restrict Koala movement (DECC 2008) and thereby access to forage trees. OMA 2 and OMA 3 both comprise remnant vegetation that connects vegetation on Mamelon with tracts to the immediate south. The retention and improvement of these areas, along with regeneration of cleared lands elsewhere on the property will improve these connections as well as improving habitat for Koala in the local for the long-term.
Risk of loss (%) without offset	10	Without the establishment of the proposed OMAs there will be continued cattle grazing (through agistment practises as is currently carried out) impacting canopy tree recruitment, associated land management practises, and impacts of unmanaged weeds. Site assessments indicated that past thinning / logging of these areas has occurred in the past to increase productivity of cattle grazing. It is reasonable to assume these management practises would continue into the future, potentially degrading the habitat present further. However, recent changes in the Qld VM Act may decrease the potential for clearing, although thinning activities may still occur. Where other normal land management practices are considered to continue into the future then a 10% risk of loss is considered reasonable.
Future habitat quality without offset	5	Continued cattle grazing in the OMAs will lead to long-term degradation of suitable habitat for Koala including overgrazing and soil compaction. Riparian habitat is also at risk from the proliferation of existing weed species such as dense patches of Lantana which can impact Koala access to forage trees and suppress canopy tree recruitment. Woodland habitat has potential to be impacted by uncontrolled and high intensity bushfires which may cause direct Koala mortality and impact woodland habitat through mortality of mature and juvenile forage trees. Feral dogs/Dingos may impact Koala through predation through direct predation. Nevertheless, it is reasonable to assume that current management practises would continue into the future and therefore the current habitat quality of the subject lands will be retained into the future.
Risk of loss (%) with offset	0	The Mamelon property will be managed for conservation purposes (excluding the mine footprint). The OMAs will be protected under State legislation (as a voluntary declaration under the VM Act) following agreement with DES and DotEE and will remain in perpetuity including after the cessation of the Project. This protection mechanism will preclude development within the designated OMAs for the current landowners (Fairway Coal) and for any future landowners. With intended land management practises to be carried within the OMAs there will be no loss of habitat quality and it is expected there will be improvement over time.

Attribute	Rating	Discussion
Future habitat quality with offset	7	Habitat quality for Koala will be improved by the application of active habitat management across Mamelon property with a specific emphasis on the OMAs. 'Future quality' will be improved and will be represented by an improvement in the habitat quality score as measured by annual habitat and biannual fauna monitoring assessments. An OMP will be developed detailing generic management measures and Koala presence monitoring to be applied across Mamelon and specific management measures for the OMAs. Management actions will be developed and guided by the approved Commonwealth 'Conservation Advice' for the species. There are no recommended threat abatement plans of recovery plans for the species. Management actions will include (but not be restricted to): ▪ Removal of cattle grazing to eliminate degrading processes such as soil compaction, and suppression of native tree regeneration; ▪ Increased tree cover by allowing canopy species recruitment; ▪ Fire management to eliminate the potential for high intensity bushfires which may cause direct Koala mortality, and mortality of canopy trees and and juvenile canopy trees; ▪ Managing problem weed species including Lantana (already known on-site) which can impede Koala access to forage trees and suppress native tree recruitment. Pest and weed management within Mamelon and the OMAs will be integrated with measures within the Project LUMP; and ▪ Managing pest species as part of an integrated including potential predators (e.g. feral Dogs/Dingos).
Confidence in result (%) (habitat quality)	90	There is an inherent risk in restoring ecological communities as present conditions may differ from historic conditions in which the community developed. As a result, it may be difficult to predict with accuracy the direction of restoration development. Nevertheless, with the application of management measures within the OMP including detailed and measurable objectives, and habitat (and species monitoring) monitoring to measure progress, there is a high degree of confidence the future habitat quality score can be realised. This is reflected in a 'confidence' score of 90%.
Confidence in result (%) (averted loss)	90	There is reasonable confidence that without protection and improved land management the area will be subject to continued cattle grazing and continue to decline in habitat quality. The management measures to be applied as part of the OMP are standard methods and widely used. Improvement in habitat quality measures is expected to be gradual but almost certain. Mamelon property including the designated offset areas (excluding the mine footprint) will be protected under State legislation (as a voluntary declaration under the VM Act) following agreement with DES and DotEE and will remain in perpetuity including after the cessation of the Project. This protection mechanism will preclude development within the designated OMAs for the current landowners (Fairway Coal) and for any future landowners.
Time over which loss is averted	20	The Mamelon property will be managed for conservation purposes (excluding the mine footprint). The OMAs will be protected under State legislation (as a voluntary declaration under the VM Act) following agreement with DES and DotEE and will remain in perpetuity including after the cessation of the Project. As such the 'time over which loss is averted' is considered as the maximum available time – 20 years.

Attribute	Rating	Discussion
Time until ecological benefit	15	OMA 1 and OMA 2 comprises 303.03 ha of habitat considered suitable for Koala and the species is likely to occur in the area. Management of the offset will include the removal of cattle, fire and weed and pest management. This will have relatively immediate ecological benefits in the OMAs through the control of introduced predator impacts on the species. Other ecological benefits will take time to provide measurable ecological gains given the dry nature of the habitat in focus. An increase in the habitat quality score within a 15 year period will be achieved through the following: ▪ Reducing degrading processes (particularly soil compaction and canopy tree recruitment) through the removal of cattle; ▪ Managing high intensity bushfires in eucalypt habitat; ▪ Managing problem weed species including Lantana which can suppress canopy tree recruitment and impede access to forage trees where present; and ▪ Managing pest species including potential predators (e.g. feral Dogs/Dingos).
Final % of impact offset	109.9	As per EPBC Act Offset Assessment Guide output (refer Appendix C)

Table 5-7 Summary of offset calculations and habitat values for Ornamental Snake

Attribute	Rating	Discussion
Start habitat quality – OMA 3	3	There are no records of Ornamental Snake from the property. However, the species has been recorded nearby during earlier Project surveys in 2011 / 2012. OMA 3 has been cleared in the past and now comprises non-remnant habitat with patchy Brigalow and Belah regrowth and gilgai formations. The introduced Buffel Grass is prevalent in the ground layer. The offset area is located between Tooloombah Creek and vegetation abutting Deep Creek. Therefore, the offset also provides opportunity to increase Brigalow TEC in the landscape and increase landscape connectivity by creating a vegetation connection between the two creek lines. OMA 1 is considered to present ample opportunity to improve the condition of lands suitable for Ornamental Snake due to the presence of primary habitat features for the species presence – cracking clay soils and gilgai formations.
Risk of loss (%) without offset	20	Without the establishment of the proposed OMA there will be continued cattle grazing (through agistment practises as is currently carried out) and associated land degradation, particularly soil compaction and weed invasion. The vegetation in this area is non-remnant and woody vegetation has been actively suppressed in the past to increase productivity and management of cattle. Therefore, it is reasonable to assume these management practises would continue into the future, further degrading the habitat present through soil compaction, erosion and degradation of water quality, and weed spread. Based on this it is considered that 20% is a reasonable estimated risk of loss of habitat quality without offsetting and improved land management.
Future habitat quality without offset	3	Continued cattle grazing in OMA 3 could lead to further degradation of suitable habitat for Ornamental Snake including overgrazing and soil compaction. Gilgai habitat is also at risk from the proliferation of existing weed species such as Olive Hymenachne which can choke wetlands adversely impacting habitat for prey species (frogs). Feral species may impact Ornamental Snake through direct predation or through wetland habitat degradation by Pigs. Nevertheless, it is reasonable to assume that current management practises would continue into the future and therefore the current habitat quality of the subject lands will be retained into the future

Attribute	Rating	Discussion
Risk of loss (%) with offset	0	The Mamelon property will be managed for conservation purposes (excluding the mine footprint). The OMAs will be protected under State legislation (as a voluntary declaration under the VM Act) following agreement with DES and DotEE and will remain in perpetuity including after the cessation of the Project. This protection mechanism will preclude development within the designated OMAs for the current landowners (Fairway Coal) and for any future landowners. With intended land management practises to be carried within the OMAs there will be no loss of habitat quality and it is expected there will be improvement over time.
Future habitat quality with offset	5	Habitat quality for Ornamental Snake will be improved by the application of active habitat management across Mamelon property with a specific emphasis on the OMAs. 'Future quality' will be improved and will be represented by an improvement in the habitat quality score as measured by annual habitat monitoring assessments. An OMP will be developed detailing generic management measures to be applied across Mamelon and specific management measures for the OMAs. Management actions will be developed and guided by the approved Commonwealth 'Conservation Advice' for the species. There are no recommended threat abatement plans of recovery plans for the species. Management actions will include (but not be restricted to): ▪ Removal of cattle grazing to eliminate degrading processes such as soil compaction, trampling of habitat features that serve as shelter sites (such as fallen timber), and degradation of water quality in gilgais by mobilising sediments during rainfall events. In the long-term removal of cattle will allow OMA 1 to return to remnant vegetation status; ▪ Increased tree cover by allowing Brigalow to recover across the area will in the long-term shade out weed species and provide additional shelter sites in the form of fallen timber; ▪ Fire management to eliminate the potential for high intensity bushfires which may impact Brigalow recruitment and reduce potential shelter sites (fallen timber); ▪ Managing problem weed species including Olive Hymenachne (already known on-site) which can invade and choke wetlands including gilgai habitat. Pest and weed management within Mamelon and the OMAs will be integrated with measures within the Project LUMP; and ▪ Managing pest species as part of an integrated including potential predators (e.g. feral Cats and Red Fox) and species that degrade wetland (gilgai) habitats such as feral Pigs. Methods may include trapping and baiting.
Confidence in result (%) (future habitat quality)	90	There is an inherent risk in restoring ecological communities as present conditions may differ from historic conditions in which the community developed. As a result, it may be difficult to predict with accuracy the direction of restoration development. Nevertheless, with the application of management measures within the OMP including detailed and measurable objectives, and habitat (and species monitoring) monitoring to measure progress, there is a high degree of confidence the future habitat quality score can be realised. This is reflected in a 'confidence' score of 90%.
Confidence in result (%) (averted loss)	90	There is reasonable confidence that without protection and improved land management the area will be subject to continued cattle grazing and continue to decline in habitat quality. The management measures to be applied as part of the OMP are standard methods and widely used. Improvement in habitat quality measures is expected to be gradual but almost certain. Mamelon property including the designated offset areas (excluding the mine footprint) will be protected under State legislation (as a voluntary declaration under the VM Act) following agreement with DES and DotEE and will remain in perpetuity including after the cessation of the Project. This protection mechanism will preclude development within the designated OMAs for the current landowners (Fairway Coal) and for any future landowners.

Attribute	Rating	Discussion
Time over which loss is averted (years)	20	The Mamelon property will be managed for conservation purposes (excluding the mine footprint). The OMAs will be protected under State legislation (as a voluntary declaration under the VM Act) following agreement with DES and DotEE and will remain in perpetuity including after the cessation of the Project. As such the 'time over which loss is averted' is considered as the maximum available time – 20 years.
Time until ecological benefit (years)	10	OMA 3 comprises 128 ha of habitat considered suitable for Ornamental Snake and the species is likely to occur in the area. Management of the offset will include the removal of cattle, and weed and pest management. This will have relatively immediate ecological benefits in the OMA through the reduction of known threatening processes on the species and assisted recruitment of tree cover. An increase in the habitat quality score is likely within a 5 - 10 year period and will be achieved through the following: ▪ Reducing degrading processes (particularly soil compaction and browsing of vegetation) through the removal of cattle; ▪ Increased tree cover by allowing Brigalow to recover across the area; ▪ Managing high intensity bushfires that may eliminate Brigalow regrowth and fallen timber; ▪ Managing problem weed species including Olive Hymenachne which can invade and choke wetlands including gilgai habitat; and ▪ Managing pest species including potential predators (e.g. feral Cats and Red Fox) and species that degrade wetland habitats such as feral Pigs.
Final % of impact offset	464.69	As per EPBC Act Offset Assessment Guide output (refer Appendix C)

Considering the assessment described above (incorporating current habitat quality of the proposed offset sites, habitat improvement measures and risk of loss), the proposed OMA 1 and OMA 2 will acquit the offset requirements for impacts to Koala habitat as a result of Project activities. The areas of habitat will constitute a like-for-like offset provided habitat management practices identified are implemented over the area. The proposed OMA 3 will substantially exceed the offset requirements for Ornamental Snake habitat and in the long-term will provide an expansion in the extent of suitable and improved habitat for the species in the local area.

5.5 Legally Secure the Offset Area

All offsets must be secured by a legally binding mechanism. The identified offset areas will be legally secured to ensure the offset area is protected in perpetuity. In addition, any agreements to manage the offset site with, for example, landowners, Indigenous groups or other third-parties, will form part of a legally binding contract that outlines the approval and management conditions and how the offset will be managed to meet those conditions.

The offset area will be secured using one of the legally binding mechanisms on title that are available to ensure the protection of the offset and implementation of the Offset Area Management Plan (OAMP). These legally binding mechanisms are:

- An environmental offset protection area under section 30 of the *Environmental Offsets Act 2014* (Qld);
- An area declared as an area of high nature conservation value under section 19F of the VM Act (Qld), where it is secured for the purposes of an environmental offset;
- Declared as a nature refuge under section 46 of the NC Act (Qld), where it is secured for the purposes of an environmental offset;
- Declared as a protected area under section 29(1) of the NC Act, where it is secured for the purposes of an environmental offset; or
- Secured as a statutory covenant for environmental purposes under the *Land Act 1994* (Qld) or *Land Title Act 1994* (Qld).

These mechanisms adopted to secure offsets will ultimately depend upon the mechanisms available and agreed to by the relevant parties. It is anticipated that any offset will be secured by a Voluntary Declaration as an area of 'high nature conservation value' under the VM Act. Once this has been registered on the title, the offset area will be mapped as a Category A area on a Property Map of Assessable Vegetation (PMAV). Category A areas on PMAVs are red in colour and are described as 'Areas subject to compliance notices, offsets and voluntary declarations'.

5.6 MSES Impacts - Financial Settlement

Approximately 13.4 km of waterways mapped under the Waterway Barrier Works for Fish Passage mapping layer occurs within the Project area, much of which will be impacted by components of the Project. This represents the sole impact to MSES not covered under impacts to MNES described previously. This covers an approximate impact area of 6.7 ha subject to environmental offsets under the QEOP. Central Queensland Coal considers some of these waterways to be incorrectly mapped.

Central Queensland Coal proposes to acquit the final agreed area of impact (following discussions with DAF) under the Waterway Barrier Works for Fish Passage mapping layer via the option of financial settlement. An estimate of the required payment (using an estimated ground-truthed area of impact of 3.5 ha) has been carried out using DES 'financial settlement offset calculator' and is provided in Appendix D.

6 Offset Area Management Plan

Central Queensland Coal will implement a management and monitoring approach for all vegetation to increase the overall vegetation coverage and connectivity of such communities across the Mamelon property, and improve the health of existing vegetation communities, particularly with regard to problem weed species. The management methods included as part of the OMP will be applied in concert with those of the LUMP which will be applied across the entire property.

The final Project OMP will detail Central Queensland Coal's approach to managing environmental offsets on the property should this approach be taken. The central aspects that will comprise the management control plans include:

- Vegetation Management;
- Pest Flora and Fauna Management; and
- Bushfire Management.

The final OMP will encompass, but not be restricted to, these matters. The management and monitoring approach is outlined in the following sections and control plans, including the long-term objective of managing each matter, and annual performance objective/s related to improving future habitat quality within the OMAs in line with the values used in the EPBC offsets assessment guide (refer Appendix C).

Management of the OMP has been developed with due regard to Commonwealth (DotEE) recognised policy documents associated with the threatened species of concern including adopted Recovery Plans, Threat Abatement Plans, and / or species Conservation Advice. Establishment of the OMAs and their associated land management practises and objectives (including the lands across the wider property) is considered to address specific goals listed within the Conservation Advice as 'priority management actions' and / or 'research priorities' identified to support the recovery of the species. How these are addressed are identified in Table 6-1.

Table 6-1 OMA management approach and Commonwealth policy documents

Species	Policy document	Research Priorities / Priority Management Actions	OMP management approach
Koala	Conservation Advice (TSSC 2012) Note: there are no adopted recovery plans or threat abatement plans for this species	*Develop and implement a management plan to control the adverse impacts of predation on koalas by dogs in……..rural environments*	Feral dog/Dingo has been detected in the area. Management will include a pest control plan (refer Table 6-3) including monitoring, surveys and control programs that will include feral dog/Dingo.
		Development plans should explicitly address ways to mitigate risk of vehicle strike when development occurs adjacent to, or within, koala habitat	The entire Project area, including the OMAs will be subject to speed limits to minimise impacts to Koala and threatened species in general. The site induction for all site personnel will highlight threats to the Koala population from vehicle strike.
		Identify populations of high conservation priority	There is no information available on the status of the local Koala population. Monitoring surveys associated with the OMAs (Table 6.2) and additional fauna-associated actions associated with the wider Project EMP will add to the knowledge of the local population in the area.
		Investigate formal conservation arrangements, management agreements and covenants on private land…….	The OMAs will be protected under formal conservation arrangements (Section 5.6). This may be extended to the wider property in the future.
		Manage any other known, potential or emerging threats such as Bell Miner Associated Dieback or Eucalyptus rust	Vegetation management within the OMAs and surrounding property will be ongoing including health assessments (Table 6-2). The OMP will use an adaptive management approach that will allow for the identification and management of previously unknown threats to the habitat values of the OMAs and surrounds.
		Develop and implement options of vegetation recovery and re-connection in regions containing fragmented koala populations, including…….coastal regions where development pressures have isolated koala populations	The OMAs and surrounding property are located within a heavily fragmented landscape. OMA 1 will maintain a landscape connection to the east. OMA 2 will improve a landscape connection to the south-west. OMA 3 will in the long-term provide a local habitat connection between Tooloombah and Deep Creek which is now largely cleared. The long-term restoration of habitat across the wider property will improve landscape connection to habitat to the west and north-west.

Species	Policy document	Research Priorities / Priority Management Actions	OMP management approach
Ornamental Snake	Conservation Advice (TSSC 2014) Note: there are no adopted recovery plans or threat abatement plans for this species	*Design and implement a monitoring program in key habitat……*	The species has been detected in the wider area surrounding the property and suitable habitat occurs within OMA 3 and the wider property. A monitoring program will be developed and implemented as part of OMA management (Table 6.2). There will be additional fauna-associated actions associated with the wider Project EMP.
		Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary	Vegetation management within the OMAs and surrounding property will be ongoing including health assessments (Table 6-2). The OMP will use an adaptive management approach that will allow for the identification and management of previously unknown threats to the habitat values of the OMAs and surrounds.
		Investigate formal conservation arrangements, management agreements and covenants on private land…….	The OMAs will be protected under formal conservation arrangements (Section 5.6). This may be extended to the wider property in the future.
		Minimise adverse impacts from land use at known sites	Vegetation management of OMA 3 (Table 6-2) and management on the wider property will remove cattle from the majority of the property including all habitat suitable for Ornamental Snake.
		Control introduced pests such as pigs to manage threats at known sites	Feral pig has been detected frequently on the property. Management will include a pest control plan (refer Table 6-3) including monitoring, surveys and control programs that will include feral pig.

6.1 Vegetation and Fauna Habitat Management

Vegetation management activities within the OMAs will be a combination of passive tree regeneration within the OMAs, vegetation monitoring, and targeted threatened fauna monitoring activities. Cattle will be removed and vegetation within the OMAs will be allowed to regenerate naturally. This will include the regeneration of approximately 51 ha of cleared non-remnant/regrowth eucalypt woodland habitat in OMA 1 and OMA 2. This area is additional to the calculations included in Section 5.4.

Vegetation clearing within the OMAs will be restricted to clearing necessary for the removal of non-native weeds, to establish and maintain fencing around the boundary of the OMA, or establish and maintain firebreaks. Any vegetation clearing will follow best practice management methods, and any applicable legislative requirements. No forestry, cultivation, ploughing, contour banking, construction of irrigation, earthworks and stockpiling will be allowed within the OMA. Stockproof fencing will be established to assist in managing grazing around the OMAs.

Any vegetation clearing will be overseen by the Project Site Environmental Officer in accordance with clearing mitigation measures carried out for the Project under the LUMP. Quarterly inspections will monitor and document clearing that has occurred for an approved purpose. Any unapproved occurrences will be documented and corrective actions developed (such as revegetation).

The Project LUMP includes monitoring of riparian vegetation communities along Tooloombah Creek and Deep Creek and the HEV wetland located within close proximity to mine infrastructure. This will be undertaken to identify whether indirect impacts are occurring as a result of mine run-off contamination and/or groundwater drawdown. The monitoring methods required as part of this OMP will also be utilised within the LUMP for the vegetation monitoring surveys and are detailed in the following sections.

Habitat Assessment Monitoring Surveys

There will be annual monitoring of 'habitat quality' within vegetation communities within the OMAs. Monitoring methods will follow the methods detailed in the *Guide to determining terrestrial habitat quality V1.2* (EHP 2017) as used to establish baseline habitat quality measures within the OMAs. Monitoring locations will be those established for the habitat quality baseline survey as depicted in Figure 5-4. Further sites may be required to be established to ensure coverage across the entirety of the propose OMAs. The results of the habitat assessment will allow a revised calculation following the EPBC Act Offset Assessment Guide calculator to compare the OMA over the term of the offset and measure any improvement in condition. These are site based, and quantitative, and therefore repeatable over the life of the offset.

- Assess how the offset area is progressing against target criteria detailed in the OMP over time;
- Identify and manage potential risks to achieving the OMP objectives; and
- Assist in developing corrective management actions to improve progress towards achieving the OMP objectives.

Vegetation Health Monitoring and Photo Monitoring Surveys

Photo and visual assessment monitoring points will be established within the OMAs at the habitat monitoring sites and at other sites considered as representative of the vegetation communities present. CQC will engage a suitably qualified person to monitor condition at each site annually, to

assess visual changes over time. The visual assessment will record parameters relating to vegetation health such as:

- Foliar discolouration;
- Partial defoliation;
- Evidence of pathogenic attack; and
- Tree death.

Where decline in tree health becomes apparent, mitigation measures will be developed with the aid of an experienced professional (e.g. arborist) on an adaptive management basis.

Fauna Monitoring

Surveys will be carried out twice per year for the target threatened fauna for each OMA: Koala for OMA 1 and OMA 2; and Ornamental Snake for OMA 3. Surveys will be repeatable across years and will use methods recommended under DotEE guidelines (where available).

Survey effort for Koala is not prescribed under the *EPBC Act referral guidelines for the vulnerable Koala* (DotE 2014) due to the variability of habitat conditions and population densities (which may be low on the site). The guidelines recommend a number of both direct and indirect methods that may be used to detect the species (refer Table 2 and Table 3 in DotE 2014). Surveys for Koala should be conducted between August and January when activity is at a peak. It is noted that Koala has been detected within the Project area during surveys informing the EIS process using spotlighting transects and remote sensor activated cameras.

Survey effort recommended for Ornamental Snake is outlined in the *Draft referral guidelines for the nationally listed Brigalow Belt reptiles* (SEWPaC 2011). Surveys for Ornamental Snake will include nocturnal surveys during periods of frog activity (i.e. after rainfall events between October to March). Where possible timing should be flexible to coincide with rain events and suitable conditions for the species. Survey effort and methods suitable for OMA 3 include:

- One-off diurnal searches – 1.5 hrs/ha over minimum three days;
- Targeted spotlighting – 1.5 hrs/ha over minimum three days; and
- Pitfall and funnel trapping carried out over four days (refer Table 3 in SEWPaC 2011 for further detail).

The final OMP will detail the proposed survey methods and survey sites/transects for both species.

Specific vegetation /fauna management actions within the OMAs is outlined in Table 6-2.

Table 6-2 Draft vegetation and fauna management control plan

OAMP Aspect – vegetation and fauna			
Long-term Objective			
Long-term increase in native vegetation cover across OMAs suitable for threatened species – Koala and Ornamental Snake			
Annual Objective/s			
OMA 1 and OMA 2 ▪ In cleared areas - 10% increase in native vegetation cover and height over first 5 years, 10% increase in native vegetation height thereafter ▪ In vegetated areas – 5% increase in native vegetation cover ▪ Koala recorded within the OMA			
OMA 3 ▪ 10% increase in native vegetation cover and height over first 5 years, 10% increase in native vegetation height thereafter ▪ Ornamental Snake recorded within the OMA			
General ▪ No decline detected during vegetation health surveys ▪ No unauthorised clearing or other activities detected within OMA			
Performance Criteria			
Vegetation health inspections carried out every three months and corrective management actions enacted where required			
Actions			
No.	**Actions Required**	**Staff Responsible**	**When**
1	Detailed vegetation and fauna management strategy prepared which will identify baseline monitoring approach including: ▪ Revegetation/exclusion areas ▪ Permanent habitat quality assessment plots and photo monitoring points ▪ Survey methods/transects for Koala (OMA 1 and OMA 2) and Ornamental Snake (OMA 3)	Site Environmental Officer Contractors	Year 1
Monitoring			
No.	**Actions Required**	**Staff Responsible**	**When**
1	Habitat quality assessment surveys	Site Environmental Officer Contractors	Annually (years 1 – 5) Five yearly (years 10, 15 and 20)
2	Vegetation photo monitoring surveys	Site Environmental Officer	Biennially
3	Vegetation health surveys	Site Environmental Officer Contractors	Biennially
4	Targeted Koala / Ornamental Snake surveys	Site Environmental Officer	Annually
5	General inspections of OMA for unauthorised clearing and site infrastructure maintenance (e.g. tracks and fencing).	Site Environmental Officer	Quarterly
Reporting			
No.	**Actions Required**	**Staff Responsible**	**When**
1	Collated habitat monitoring report as part of overall OMA monitoring report	Manager Environment and Communities	Five yearly (years 5, 10, 15 and 20)
Corrective Action			
No.	**Actions Required**	**Staff Responsible**	**When**
1	Where vegetation health is recorded as declining engage experienced professional (e.g. arborist) and implement corrective actions.	Site Environmental Officer Contractors	When required
2	Where vegetation health is recorded as declining engage experienced professional and review management actions in OMP.	Site Environmental Officer Contractors	When required

6.2 Weed and Pest Management

Weeds pose a significant threat to native flora and fauna within the Project area. Much of the habitat already contains a high proportion of introduced grass species and woody weeds (Lantana and Rubber Vine) because of the long farming history within the Project area. Olive Hymenachne was observed at several wetland sites including in gilgais following wet weather. This species can invade and choke wetlands, thereby deleteriously impacting potential habitat for frogs (prey species for Ornamental Snake). Lantana was observed in riparian areas of OMA 1 and OMA 2 forming patches of dense stands that may impede Koala access to preferred forage trees and reduce canopy tree recruitment success. Rubber Vine is present on the property and was commonly observed in OMA 3. This species can smother native vegetation (particularly riparian). Similar to Lantana the species forms dense thickets that can impede animal movements. Other problem weed species such as Parthenium (*Parthenium hysterophus*), also toxic to cattle, have been recorded on the property.

Any potential unmitigated weed introductions, or spread of existing weeds and pests as a result of Project activities may therefore pose a significant risk to the productive capacity of the adjacent land-use, to less developed vegetated areas of the site, and surrounding areas which include Tooloombah Creek Conservation Park. The transportation and operation of vehicles and equipment has the potential to introduce pests and weeds into the Project area and wider surrounds.

General weed strategies that will be in place as part of the Project LUMP will include:

- Implementation of sediment control mechanisms to minimise the risk of weed seed washing into waterways;
- Selective cattle grazing may be utilised to minimise weed grass proliferation;
- Implement weed control strategies outlined in the DAF weed fact sheets and other relevant government biosecurity management strategies;
- Vehicle wash down procedures;
- Minimise the use of off-road vehicle movements; and
- Monitoring and weed inspections particularly in response to reported outbreaks or from complaints or adjacent property owners.

Specific weed control management actions within the OMAs is detailed in Table 6-3.

Table 6-3 Draft weed control plan

OAMP Aspect - weeds			
Objective			
Reduction in the presence of existing weeds within all OMAs and no new weed introductions			
Annual Objective/s			
All OMAs ▪ 10% decrease in the incidence of State / Commonwealth listed weed species within OMA with a focus on Lantana and Rubber Vine			
Performance Criteria			
Weed inspections carried out every three months and control methods enacted where required			
Actions			
No.	**Actions Required**	**Staff Responsible**	**When**
1	Detailed weed mapping carried out within OMAs including extent and density.	Site Environmental Officer Contractors	Annually
2	Target weed species established and weed control strategies enacted.	Site Environmental Officer Contractors	Annually
Monitoring			
No.	**Actions Required**	**Staff Responsible**	**When**
1	General weed inspections carried out within OMAs	Site Environmental Officer	Every three months
2	Detailed weed mapping carried out within OMAs including extent and density.	Site Environmental Officer Contractors	Annually
Reporting			
No.	**Actions Required**	**Staff Responsible**	**When**
1	Results of weed mapping and monitoring report.	Site Environmental Officer	Annually
2	Collated weed mapping and monitoring report as part of overall OMA monitoring report	Manager Environment and Communities	Five yearly (years 5, 10, 15 and 20)
Corrective Action			
No.	**Actions Required**	**Staff Responsible**	**When**
1	Where weed outbreaks are detected (either new or existing species) during weed inspections control strategy enacted on outbreak	Site Environmental Officer Contractors	When required

Feral fauna may pose a significant threat to the protected fauna matters on the site. Ornamental Snakes almost solely eat frogs and thereby consume Cane Toads (*Rhinella marina*). The species is generally not found in areas with high numbers of Cane Toads. Introduced predators such as feral Cats (*Felis catus*) and Red Fox (*Vulpes vulpes*) prey on smaller species such as Ornamental Snake. Feral dogs/Dingos are known to occur and pose a threat to Koala through direct predation. Feral Pigs can impact wetland habitat (such as gilgais) resulting in damage to habitat for prey species (frogs) for Ornamental Snake. Chital (*Axis axis*) is known to occur onsite and may damage native vegetation through browsing activity.

Feral fauna species will be surveyed within the OMAs using a variety of methods including baited camera traps and recording of scats and tracks as well as direct observations. Incidental observations by Project staff will also be documented with all pest sightings recorded on a fauna register associated with the wider Project.

General pest strategies that will be in place as part of the Project LUMP will include:

- Implement control strategies outlined in the DAF pest animal fact sheets and other relevant government biosecurity management strategies;
- Onsite waste disposal strategies (particularly for food wastes) to be employed that will not encourage the presence of pest fauna;
- Strategies for the storage of construction and operation materials / equipment to be employed that will not encourage the presence of resident pest fauna;

- Regular onsite inspections of site infrastructure / equipment for resident pest fauna and establishment of register for pest sightings; and
- Monitoring and pest inspections particularly in response to reported outbreaks or from complaints or adjacent property owners.

Specific pest control management actions within the OMAs are detailed in Table 6-4.

Table 6-4 Draft pest control plan

OAMP Aspect - pests			
Objective			
No increase in the presence of existing pests within all OMAs and no new pest introductions			
Annual Objective/s			
All OMAs ▪ 10% decrease in the reported incidence of problem pest species within OMA with a focus on feral dog/Dingo, feral pigs and Cane Toads			
Performance Criteria			
Pest surveys carried out every six months and control methods enacted where required			
Actions			
No.	**Actions Required**	**Staff Responsible**	**When**
1	Target pest species established - survey and pest control strategies enacted.	Site Environmental Officer Contractors	Annually
Monitoring			
No.	**Actions Required**	**Staff Responsible**	**When**
1	General pest inspections carried out within OMAs.	Site Environmental Officer	Quarterly
2	Detailed pest surveys carried out within OMAs.	Site Environmental Officer Contractors	Bi-annually
Reporting			
No.	**Actions Required**	**Staff Responsible**	**When**
1	Results of pest surveys and monitoring report.	Site Environmental Officer	Annually
2	Collated pest monitoring report as part of overall OMA monitoring report	Manager Environment and Communities	Five yearly (years 5, 10, 15 and 20)
Corrective Action			
No.	**Actions Required**	**Staff Responsible**	**When**
1	Where target pest species are detected (either new or existing species) during inspections/incidental observations then control strategy enacted	Site Environmental Officer Contractors	When required

6.3 Fire Management

Fire management is an essential component to all coal mining operations and as such, control measures will be incorporated into the OMP and integrated with similar measures within the Project LUMP. Uncontrolled high-intensity bushfires have the potential to cause direct mortality of fauna, mature trees, and regrowth/seedlings impacting the conservation and habitat quality improvement aims of the OMAs and the wider property.

Fire management measures appropriate to the region will be developed by a suitably qualified person and will be overseen by the Project Environmental Officer. Fire will, where possible, be excluded from the OMA by maintaining firebreaks (co-locating firebreaks with existing tracks and fence lines where possible), and not using fire as a tool for regrowth management. Quarterly inspections will document evidence of wild fire and document if controlled burns have occurred. Any unapproved occurrences will be documented and corrective actions developed (including repairing firebreaks and reassessing fuel load management practices).

Strategic 'low intensity' burning and/or selective cattle grazing may be required to minimise fuel loads and form fire breaks across the landscape. The burning regime will seek to maintain ecological diversity through the development of a mosaic presenting a range of patches of varying burning history across the OMAs and wider Property. This will serve to reduce the potential for intense dry-season bushfires by reducing fuel loads. Any 'low intensity' fuel reduction burning will be subject to a risk assessment to assess the potential for impacting habitat quality within the OMAs with a focus on the presence of small vegetation (woody) regrowth and fallen woody debris (where Ornamental Snake is likely to occur).

General bushfire management strategies that will be in place as part of the OMP and Project LUMP will include:

- Regular inspections within and surrounding the OMAs for fuel hazard assessment;
- Weather conditions and current bushfire risk will be assessed prior to any proposed burning activity;
- Road access across the property and OMAs will be maintained appropriately for fire management access including for any management initiated burns;
- Onsite burning of any material will be managed via a Risk Assessment;
- All fuel-reduction burn carried out will be recorded and integrated with fire management across the property and Project LUMP;
- Access to water supply on the property (dams or creek line waterholes) will be maintained in a trafficable condition at all times;
- Fire-fighting equipment will be aligned with the local rural fire service, will be regularly maintained and adequate staff training will be implemented, including joint training sessions with the Local Rural Fire Service. Training and equipment will address fighting wildfires, as well as for fighting fires around facilities;
- Weed management to prevent potential increased fire risk (such as Lantana); and
- Quarterly inspections will document evidence of wild fire and document if controlled burns have occurred. Any unapproved occurrences will be documented and corrective actions developed (including repairing firebreaks and reassessing fuel load management practices).

Specific pest control management actions within the OMAs are detailed in Table 6-5.

Table 6-5 Draft bushfire control plan

OAMP Aspect - bushfires			
Objective			
No instances of extreme bushfire events within all OMAs			
Annual Objective/s			
OMA 1 and OMA 2 ▪ No instances of bushfire events of sufficient intensity to cause mortality of tall trees			
OMA 3 ▪ No instances of bushfire events of sufficient intensity to cause mortality of regrowth and destruction of fallen woody debris			
Performance Criteria			
Fire evidence inspections carried out every three months and fire management reviewed where required			
Actions			
No.	**Actions Required**	**Staff Responsible**	**When**
1	Detailed fire management strategy prepared in consultation with Rural Fire Service. Strategy will identify at a minimum: ▪ Fire exclusion areas (e.g. revegetation areas) ▪ Procedures/timing for controlled burns ▪ Protocols for uncontrolled bushfire emergency	Site Environmental Officer Rural Fire Service	Year 1
2	Controlled burns carried out as per timing in finalised bushfire management strategy	Site Environmental Officer Contractors	N/A
3	Ongoing consultation with the Rural Fire Service	Site Environmental Officer Rural Fire Service	Ongoing
Monitoring			
No.	**Actions Required**	**Staff Responsible**	**When**
1	Inspection of OMAs following controlled burns	Site Environmental Officer	N/A
2	General inspections carried out within OMAs to record fuel hazard load and record instances of unplanned bushfire in and surrounding OMAs.	Site Environmental Officer	Quarterly
Reporting			
No.	**Actions Required**	**Staff Responsible**	**When**
2	Collated bushfire monitoring report as part of overall OMA monitoring report.	Manager Environment and Communities	Five yearly (years 5, 10, 15 and 20)
Corrective Action			
No.	**Actions Required**	**Staff Responsible**	**When**
1	Where uncontrolled wild fire outbreaks occur review bushfire management strategy.	Site Environmental Officer Contractors	When required

6.4 Risk Assessment

This OMP should effectively account for and manage the risks of the offset failing to achieve the conservation outcome for each impacted prescribed environmental matter. This includes any potential risks that will compromise delivery of the management actions specified in this plan.

There are a number of potential risks, or situations where preliminary performance indicators and completion criteria might not be achieved. The key risk of the OMP not succeeding relates to the management of threats such as weeds and pests. The use of reference sites will assist in identifying whether observations from monitoring are able to be addressed by modifying management actions, or if they are due to broader conditions that can't be controlled such as climatic and seasonal factors (e.g. drought and cyclones).

A list of potential situations where biodiversity conservation objectives of this OMP may not be met is provided in Table 6-6 along with potential corrective actions which may be applied to ameliorate these situations.

Table 6-6 Risks and recommended corrective action measures

Potential Risks	Recommended Corrective Actions
General Management	
Unauthorised stock access	Identify access points and repair fences appropriately; and Communicate with adjacent landholders to emphasise that no stock are to have access to the Offset Management Areas.
Infestations of noxious and / or environmental weeds are increasing or new species detected.	Adapt weed management program and modify strategies accordingly.
Infestations of pest animals are increasing or new species detected.	Adapt pest management program and modify strategies accordingly.
Risk to Success of Regeneration/Revegetation of Offset Management Areas	
No regeneration of plants, or indicator species missing	Assess fencing and ensure there is no unauthorized stock access; Control exotic weeds and pest animals to reduce competition; and If deemed necessary, instigate active regeneration techniques including direct seeding or tubestock planting, following appropriate ground preparation.
Low species diversity or species diversity not consistent with target community	Targeted weed control; and Instigate active revegetation techniques including direct seeding or tubestock planting, following appropriate ground preparation such as weed control, ripping and auguring.
Low or no tree cover	Plant / direct seed trees at appropriate rate using minimal disturbance.
Tree dieback (from insect pressure, herbicide drift, water stress)	Revegetate with dense shrubs to increase diversity and attract insectivorous birds; Avoid using defoliants near woodlands when windy; and Increase patch size through revegetation.
Patches of perennial / annual grass weeds occurring	Spot spray or dig out small clumps; Investigate suitability of strategic conservation grazing periodically for weed suppression and to stimulate native pasture; and Monitor and maintain control.
Dense stands of colonizing tree or shrub species dominate regeneration or revegetation areas	Assess whether thinning is necessary; Leave if patches are small and plants are native; and Thin manually if appropriate.
Scarcity of key habitat features present in relation to reference sites	Add habitat features such as logs or branches; Control feral predators; Increase the number of vegetation layers in the patch; and Establish nest boxes for target species.

6.4.1 Risk Assessment

A risk analysis has been carried out on the potential risks to the successful implementation of the OMP and is provided in the following tables. The risk assessment seeks to define the risk of any adverse outcome and considers the elements within the hazard analysis including the identified hazards, consequence and the likelihood. This risk assessment rates these consequence and likelihood findings and applies a risk matrix to prescribe a risk.

6.4.1.1 Likelihood Assessment

A qualitative assessment of the possible event frequency was undertaken to assess the likelihood of an impact occurring and rated based on the ratings included in Table 6-7.

Table 6-7 Likelihood of risk occurring

Likelihood	Qualitative description	Quantitative description
Almost certain	The event is expected to occur in most circumstances	May occur once a month or more frequently
Likely	The event will probably occur in many circumstances	May occur once every year
Possible	Identified factors indicate the event could occur at some time	May occur once every 2 or 3 years
Unlikely	The event could occur at some time but is not expected	May occur once every 5 years
Rare	The event may occur only in exceptional circumstances	May occur once every 10 years

6.4.1.2 Risk Matrix

The risk matrix adopted for the assessment is included in Table 6-8. The colour shading refers to the qualitative bands of risk level. The final risk assessment table is structured to show the results of the unmitigated risk profile and residual risk profile (Table 6-9). For the purposes of this risk assessment, risk levels are defined as follows:

- Extreme – Requires immediate action (within 1 week);
- High – Requires priority action (within 2 weeks);
- Moderate – Requires moderate action (within 1 month); and
- Low – Requires routine action.

Table 6-8 Qualitative risk matrix

RATING	CONSEQUENCES	LIKELIHOOD				
		Rare - 1	Unlikely - 2	Possible - 3	Likely - 4	Almost certain - 5
5	**Severe** - Permanent and/or very long term damage to areas of significant value, e.g. permanent loss of vegetation through pest invasion.	H	H	E	E	E
4	**Major** - Significant and/or long term damage to areas of high value, e.g. significant loss of vegetation through pest invasion.	M	M	H	H	E
3	**Moderate** - Moderate or medium term damage to areas of value, e.g. moderate loss of vegetation through pest invasion.	M	M	M	H	H
2	**Minor** - Minor and/or short term damage to areas of low value, e.g. minor loss of vegetation through pest invasion.	L	M	M	M	H
1	**Insignificant** - Insignificant or very short term damage to areas of very low or negligible value, e.g. insignificant loss of vegetation through pest invasion.	L	L	L	M	M

Table 6-9 Draft Project risk matrix

Risk	Risk rating (likelihood x consequence)	Actions to reduce risk	Residual risk rating (likelihood x consequence)
Unapproved grazing occurs in the offset management areas	3x4 = H	Offset areas will be managed through stock fencing/exclusion Proponent has committed to remove grazing from majority of wider property	1x4 = M
Pest weed and fauna incursion in the offset management area	3x3 = M	Weed and pest control measures will be incorporated into the Project LUMP to control the introduction and spread of weed species across the Project area. A feral pest and weed control program will be developed by a Suitably Qualified Person appointed by the Landholder.	2x3 = M
High intensity wildfire in the offset management area	3x4 = H	Fire management will take place in OMAs and wider property including fire breaks and low intensity control burns	2x4 = M
Unable to secure offset property under legal agreement	3x4 = H	Proponent owns the property - able to commit to legal agreement	1x4 = M
Offset area values do not achieve required conservation outcomes	3x3 = M	Detailed habitat quality assessment surveys already undertaken on property Monitoring of offset areas will be carried out following same methodology Wider property contains additional habitat values which could be used if required to supplement offset management areas	2x3 = M

6.5 Reporting

To summarise the outputs from the offset monitoring activities, Central Queensland Coal will prepare offset monitoring reports and proposes to submit the reports to the administering authority every 5 years for the life of this plan. Additional monitoring relating to water quality, groundwater and vegetation health in potential groundwater drawdown areas is summarised in the Central Queensland Coal Project Supplementary EIS.

6.6 OMP Implementation Schedule

A checklist summarising the OMP actions and their schedule for implementation for the first five years is provided in Table 6-10. The checklist provides an overview of the key actions described in the OMP and the timeframe for which the actions are to occur.

Table 6-10 Checklist / implementation schedule for the Central Queensland Coal offset site and OMP

Actions/Targets	Timeframes
General Management and Improvement Actions	
Install necessary boundary fencing and signage for the Offset Management Areas.	To be established in Year 1.
Remove stock grazing activities from the Offset Management Areas.	To be established in Year 1. Authorised strategic conservation grazing may be adopted for ecological restoration and fuel load management purposes
Establish an annual weed and pest control programs.	To be established in Year 1.
Undertake weed and pest control activities.	Ongoing life of mine
Routine inspection and maintenance of tracks and fences by site environmental officers	Six monthly

Actions/Targets	Timeframes
Active revegetation activities	Will only commence if necessary after a minimum of three years trial with assisted natural regeneration. The need for active revegetation within the Offset Management Areas will be assessed at each five year revision of the OMP.
Monitoring Actions	
Establish a suitable monitoring program to assess the success of ongoing management and improvement strategies	To be established in Year 1.
General inspections across the Offset Management Areas by environmental officers.	Biannually from Year 1.
Habitat quality assessment surveys	Annually (years 1 – 5) the five yearly (years 10, 15 and 20)
Vegetation photo monitoring surveys	Biennially
Vegetation health surveys	Biennially
Targeted Koala / Ornamental Snake surveys	Biennially
General inspections of OMA for unauthorised clearing and site infrastructure maintenance (e.g. tracks and fencing).	Quarterly
General weed inspections carried out within OMAs	Quarterly
Detailed weed mapping carried out within OMAs including extent and density.	Annually
General inspections carried out within OMAs to record fuel hazard load and record instances of unplanned bushfire in and surrounding OMAs.	Quarterly
Reporting and Documentation Actions	
Accurate records are being maintained substantiating all activities and monitoring relating to implementation of the OMP	Ongoing from Year 1.
Collate data on actions implemented and results of inspections and monitoring into the Annual Review.	Annually from Year 1.
Ecological Monitoring Report	Within three months of the completion of each monitoring survey event, commencing Year 1 (
Collated habitat monitoring, weed and pest species report as part of overall OMA monitoring report	Five yearly (years 5, 10, 15 and 20)
Update OMP, including a revision of management actions, performance indicators and completion criteria.	Every five years from commencement (earlier if deemed necessary).

7 Adaptive Management

Adaptive management of the OMP will be responsive to any new and relevant data that may arise through the various offset monitoring activities described in Section 6, legislative changes, or any other studies completed at the Project site (external to the OMAs). This will enable a flexible approach to management commitments, allowing ongoing feedback and refinement of the OMP.

Adaptive management will be a key mechanism to address the risks to the successful implementation of the OMP. Adaptive management steps include regular review of the OMP, including adaptation of targets and performance indicators, recognising potential risks to the successful implementation of the OMP and having a framework in place for corrective actions.

7.1 OMP Review

The OMP will undergo internal review and revision every five years, commencing Year 5 of the Project to refine and make improvements to the management strategies and to assess their performance against preliminary performance indicators and completion criteria. The five yearly review will look for opportunities to improve the management strategies and further develop and forecast the longer term performance indicators and completion criteria.

Updates of the OMP in response to adaptive management and continual improvement requirements that are consistent with the conditions of approval are required to be submitted to DotEE or DES for approval. Where material changes to the OMP are deemed necessary, approval of the updated OMP will be sought from DotEE and / or DES.

7.2 Review of Targets and Performance Indicators

The performance indicators and completion criteria outlined in Section 6 are preliminary and apply to the first five years of the OMP implementation. The five yearly review will reassess the targets and performance indicators and will be:

- Adapted and changed as targets are met and new challenges arise;
- Will be assessed and redeveloped as appropriate in response to monitoring outcomes; and
- Will be assessed for the success of the management and improvement strategies.

Modifications to the targets and performance indicators will be recorded in a revised OMP.

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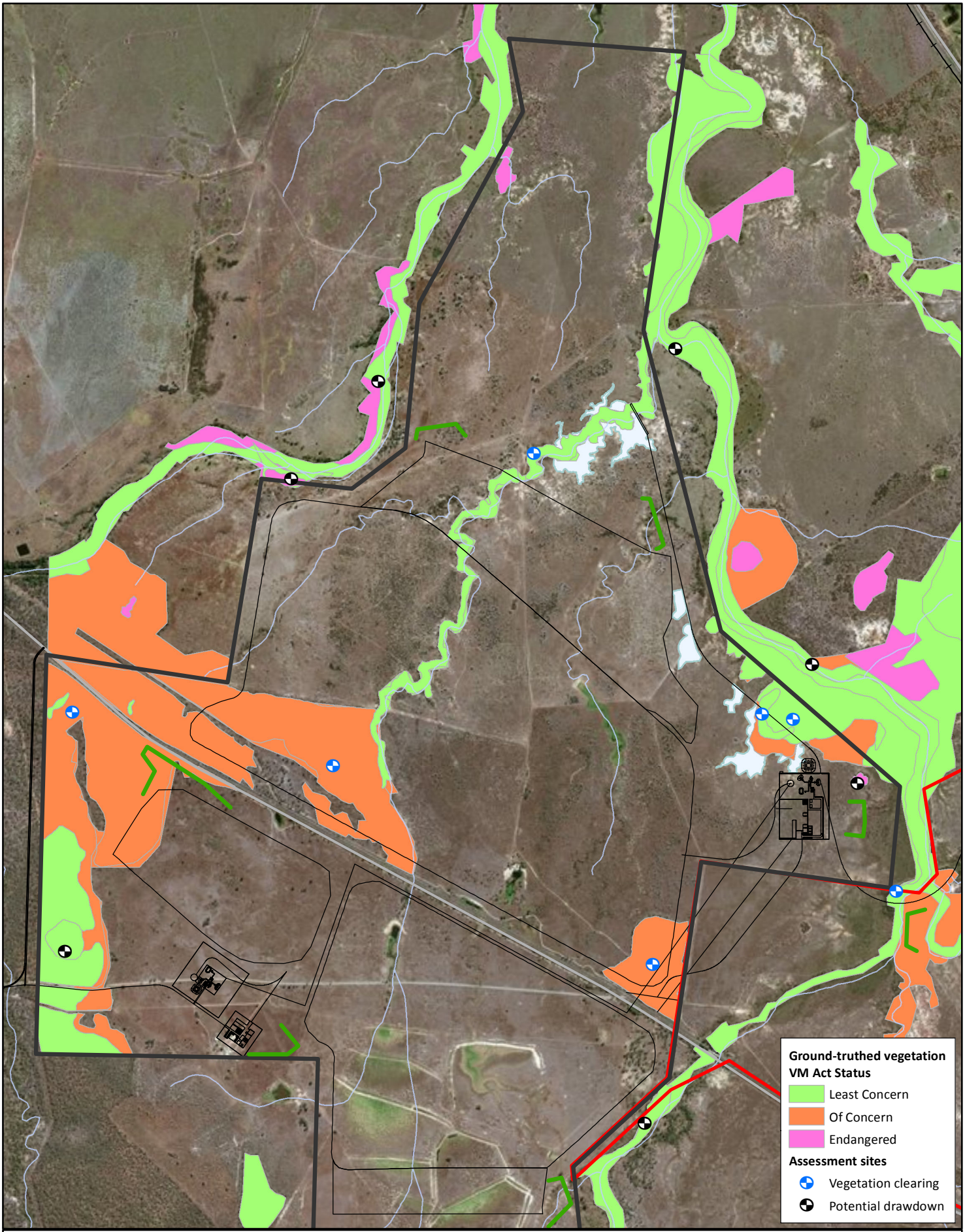
Appendix A Site Habitat Quality Assessment Datasheets

Central Queensland Coal Project

Habitat Quality Assessment Datasheets

Impact Sites



N

0 0.5 1 km

Scale @ A4 1:30,000
Date: 01/11/18
Drawn: J Parnwell

Legend

- ML 80187
- ML 700022
- Mine infrastructure
- Environmental Dams
- Cadastral boundary
- Main Road
- North Coast Rail Line
- Watercourse
- Dam

Figure 1
Habitat quality assessment sites – Project impact areas

DATA SOURCE
Waratah Coal, 2018
QLD Open Source Data, 2018
QLD Department of Environment and Heritage Protection, 2016

CDM Smith

Biocondition Site 1
Regional Ecosystem: 11.4.2
Mapped Regional Ecosystem (DNRME): 11.4.2
Location Start: -22.70957° E149.67046°
Location End: -22.70871° E149.67063°

Landform / Soil: Broad flat, weakly incised plain formed on silty loam with minor surface gravel

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 19 / 22
T2 Median Height / Cover (m/%): 13 / 19
S1 Median Height / Cover (m/%): 3 / <5

Tree Cover	T1 Interval (m)	T2 interval	T1 intercept (m)	T2 Intercept	height (m)
Eucalyptus populnea	0 - 5		5		19
Eucalyptus crebra	32 - 41		9		19
Eucalyptus crebra		41 - 46		5	13
Eucalyptus crebra	52 - 55		3		19
Eucalyptus crebra		58 - 62		4	9
Eucalyptus molluccana	67 - 72		5		15
Eucalyptus crebra		74 - 79		5	9
Eucalyptus molluccana		93 - 98		5	9
Totals			**22**	**19**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**
Bare	90	10	22.5	15	15
Leaf	7.5	40	40	50	47.5
Themeda triandra	2.5	30	25	20	20
Aristida calycina		10			
Cyoerus gracillis		5	10	5	
Eriachne glabrata		5			
Glycine tabacina			2.5		
Heteropogon contortus				10	15
Cyperus polystachyos					2.5
Total	**100**	**100**	**100**	**100**	**100**

Large Trees	**Threshold Size: 39cm DBH**
Eucalyptus populnea	1
Eucalyptus molluccana	4
Eucalyptus crebra	1
Total	**6**

Additional Species:

Trees:

Shrubs: Grevillea striata, Myoporum acuminatum, Maytenus cunninghamii,

Forbs: Eremophila debilus, Pterocaulon sphacelatum, Laxmannia gracilus, Enchylaena tomentosa

Exotic species: Urochloa mosambicensis*, Sida spinosa*

Summary		
Canopy Cover T1 / T2 %	21	
Shrub cover (S1/S2) %	<5	
Canopy Height - Median (m	19	
No of Canopy Species Recr	100	3 out of 3 canopy trees recruiting
Large Tree Count	6	
Tree Species Richness	3	
Shrub Species Richness	3	
Grass Species Richness	4	
Forb Species Richness	7	
Native Grass Cover (%)	13.75	
Leaf Litter Cover (%)	18.5	
Non-native plant cover (%)	<1	
Coarse Woody Debris (m)	19	

Biocondition Site 2
Regional Ecosystem: 11.3.25
Mapped Regional Ecosystem (DNRME): 11.3.25
Location Start: -22.70534° E149.68475°
Location End: -22.70495° E149.68562°

Landform / Soil: Incised drainage line. Fluvial sands and silts in channel

Structural Formation: Open Forest

T1 Median Height / Cover (m/%): 25 / 69
T2 Median Height / Cover (m/%): 14 / 12
S1 Median Height / Cover (m/%): 3 / <5

Tree Cover	T1 Interval (m)	T2 interval	T1 intercept (m)	T2 Intercept	height (m)
Melaleuca leucadendra	0 - 12		12		27
Melaleuca leucadendra		13 - 18		5	19
Casuarina cunninghamiana		22 - 26		4	16
Melaleuca leucadendra	28 - 35		7		23
Melaleuca leucadendra	40 - 52		12		21
Melaleuca leucadendra	48 - 86		38		28
Melaleuca leucadendra		97 - 100		3	13
Totals			**69**	**12**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**
Bare	10	57.5	20	25	60
Leaf	12.5	20	20	5	30
Imperata cylindrica	70		30		
Sida cordifolia*	2.5		5		
Ageratum conyzoides*	2.5				
Praxelis clematidea*	2.5	5			
Panicum larcomianum		10	15		
Urena lobata*		1.5			
Emilia sonchifolia*		1			
Paspalideum distans		5			
Lomandra longifolia				10	
Cyperus polystachyos			10		
Chrysopogon fallax				60	
Leersia hexandra(?)					10
Total	**100**	**100**	**100**	**100**	**100**

Large Trees	**Threshold Size: 49cm DBH for Eucs; 29cm for non-Eucs**
Melaleuca leucadendra	22
Melaleuca trichostachya	2

Corymbia clarksoniana	5
Corymbia tessellaris	2
Eucalyptus camaldulensis	4
Total	**35**

Additional Species:

Trees: Lophostemon suaveolens

Shrubs: Flueggea virosa, Mallotus philippensis, Lysiphyllum caronii, Ficus opposita

Forbs: Eustrephis latifolia, Ludwigia octovalvis, Cyperus gracillis, Eremophila debilus, Cyanthilium cinereum

Exotic species: Urochloa mosambicensis*, Sida spinosa*, Macroptileum atropurpureum*, Xanthium occidentale*, Megathyrsus maximus var. trichoglume*, Lantana camara*, Asclepias curassavica

Summary		
Canopy Cover T1 / T2 %	69	
Shrub cover (S1/S2) %	<5	
Canopy Height - Median (m)	25	
No of Canopy Species Recruiting (	60	3 out of 5 canopy trees recruiting
Large Tree Count Eucs	11	
Large Tree Count - Non-eucs	24	
Tree Species Richness	6	
Shrub Species Richness	5	
Grass Species Richness	5	
Forb Species Richness	5	
Native Grass Cover (%)	20	
Leaf Litter Cover (%)	8.75	
Non-native plant cover (%)		10 (on account of Lantana shrub cover on margins of plot)
Coarse Woody Debris (m)	64	

Biocondition Site 3
Regional Ecosystem: 11.3.25
Mapped Regional Ecosystem (DNRM): 11.3.25
Location Start: -.22.71827° / 149.67016°
Location End: -22.71905° / 149.66979°
Structural Formation: Open Forest

T1 Median Height / Cover (m/%): 22 / 53
T2 Median Height / Cover (m/%): 17 / 14
S1 Median Height / Cover (m/%): 3 / <5

Landform / Soil: Incised drainage line. Fluvial sands and silts in channel

Tree Cover	T1 Interval (m)	T2 interval	T1 intercept (m)	T2 Intercept	height (m)
Casuarina cunninghamiana		0 - 6		6	12
Melaleuca fluviatilis		7 - 14.	7		17
Casuarina cunninghamiana		14 - 21.		7	13
Melaleuca leucadendra		21 - 31	10		22
Eucalyptus tereticornis		31 - 40	9		32
Corymbia tessellaris		48 - 55	7		20
Melaleuca leucadendra		54 - 60	6		21
Lophostemon suaveolens		60 - 65	5		18
Melaleuca leucadendra		65 - 74	9		21
Lophostemon grandiflorus**		5			5
Melaleuca leucadendra			84 - 88	4	17
Melaleuca leucadendra			91 - 97	6	15
Lophostemon suaveolens**		2			7
Totals			**53**	**17**	

**** = S1 cover value**

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**
Bare	10	15	50	7.5	7.5
Leaf	50	65	10	70	55
Lomandra longifolia	25		40	10	15
Panicum larcomianum	10				
Themeda triandra	2.5				
Sida cordifolia*		1			
Glycine tabacina	2.5				
Eustrephis latifolius		1.5			
Imperata cylindrica		15			15
Cyanthileum cinereum		2.5			
Praxelis clematidea				2.5	2.5
Chionachne cyathopoda				10	
Macroptileum atropurpureum*					2.5
Cyperus polystachyos					2.5
Total	**100**	**100**	**100**	**100**	**100**

Large Trees	Threshold Size: 49cm DBH for Eucs; 29cm for non-Eucs	
Melaleuca leucadendra	14	
Lophostemon grandiflorus	3	
Eucalyptus tereticornis	4	
Total	**21**	

Additional Species:

Trees:

Shrubs: Melaleuca viminalis, Planchonea careya, Melaleuca trichostachya, Lysiphyllum cunninghamii, Acacia polystachya??, Flueggea virosa, Ficus opposita
Forbs: Cissus sp.,

Exotic species: Cryptostegia grandiflora, Crotolaria sp., Lantana camara

Summary		
Canopy Cover T1 / T2 %	53	
Shrub cover (S1/S2) %	7	
Canopy Height - Median (m)	22	
No of Canopy Species Recruiting (	80	4 out of 5 canopy trees recruiting
Large Tree Count Eucs	7	
Large Tree Count - Non-eucs	14	
Tree Species Richness	6	
Shrub Species Richness	7	
Grass Species Richness	4	
Forb Species Richness	3	
Native Grass Cover (%)	3.25	
Leaf Litter Cover (%)	25	
Non-native plant cover (%)	5	
Coarse Woody Debris (m)	89	

Biocondition Site 4
Regional Ecosystem: 11.4.2
Mapped Regional Ecosystem (DNRM): 11.4.2
Location Start: -22.69900° / 149.65137°
Location End: -S22.69866° / 149.65052°

Landform / Soil: Broad flat, weakly incised plain formed on silty loam with minor surface gravel

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 20 / 45
T2 Median Height / Cover (m/%): 11 / 15
S1 Median Height / Cover (m/%): 3 / <5

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Grevillea striata			6 - 9.			3	4
Eucalyptus crebra		15 - 19			4		9
Eucalyptus crebra	33 - 55			22			22
Eucalyptus crebra		56 - 59			3		11
Maytenus cunninghamii			62 - 63			1	4
Eucalyptus crebra	64 - 76			12			19
Eucalyptus crebra	76 - 84			8			17
Eucalyptus crebra		90 - 93			3		8
Corymbia clarksoniana	97 -100			3	5		22
Totals				**45**	**15**	**4**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	15	12.5	59	55	25	
Leaf	58	20	13	10	38	13.85
Heteropogon contortus	20	15	15			
Borthriochloa sp.??		50	10	30	25	
Aristida sp.					10	17.5
Glycine tabacina	2.5	2.5				
Grewia retusifolia	2.5				2.5	
Cyperus gracillis	1					
Brunoniella australis	1		1			
Cyperus sp.			2	2.5		
Stylosanthes humilis				2.5		
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 39cm DBH**
Eucalyptus platyphylla	1
Eucalyptus Crebra	15
Total	**16**

Additional Species:

Trees: Eucalyptus platyphylla

Shrubs: Atalaya hemiglauca, Alphitonia excelsa, Pogonolobus reticulatus, Melaleuca viridiflora, Melaleuca nervosa

Grass: Cymbopogon refractus, Enteropogon acicularis, Eriachne glabrata, Leptochloa decipiens, Eragrostis leptostachya, Themeda triandra

Forbs:

Exotic species:

Summary		
Canopy Cover T1 / T2 %	45	
Shrub cover (S1/S2) %	4	
Canopy Height - Median (m)	20	
No of Canopy Species Recru	60	2 out of 3 canopy trees recruiting
Large Tree Count	16	
Tree Species Richness	3	
Shrub Species Richness	6	
Grass Species Richness	7	
Forb Species Richness	6	
Native Grass Cover (%)	17.5	
Leaf Litter Cover (%)	13.85	
Non-native plant cover (%)	<1	
Coarse Woody Debris (m)	47	

Biocondition Site 5
Regional Ecosystem: 11.4.2
Mapped Regional Ecosystem (DNRM): 11.4.2
Location Start: -22.69631° / 149.63593°
Location End: -22.69549° / 149.63621°

Landform / Soil: Broad flat, weakly incised plain formed on silty loam with minor surface gravel

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 19 / 35
T2 Median Height / Cover (m/%): 11 / 10
S1 Median Height / Cover (m/%): 3 / <5

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Eucalyptus populnea	8.5 - 19			10.5			19
Eucalyptus populnea	35 - 41			6			17
Eucalyptus crebra	45 - 58			10			21
Eucalyptus populnea	63 - 74			9			21
Corymbia dallachiana		69 - 74			5		8
Eucalyptus crebra	77 - 86						22
Corymbia clarksoniana	88 - 97				5		15
Totals				**35.5**	**10**	**0**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	40	35	43	17.5	64	
Leaf	25	31.5	40	40	10	14.65
Eragrostis leptostachya	5	15				
Heteropogon contortus	10				10	
Bothriochloa sp.	15	2.5	2.5	40	10	
Eriachne glabrata	5	10				
Microleana stipoides		2.5				
Lachnogrostis filiformis			2.5			13
Stylosanthes humilis*		2.5				
Brunoniella australis		1		2.5		
Cyperus sp.			10		5	
Glycine tabacina			2.5		1	
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 39cm DBH**
Eucalyptus platyphylla	4
Eucalyptus Crebra	5
Total	**9**

Additional Species:

Trees: Eucalyptus platyphylla

Shrubs: Capparis mitchellii

Grass: Aristida calycina, Cymbopogon refractus, Enteropogon acicularis, Eriachne glabrata, Leptochloa decipiens, Eragrostis leptostachya, Enteropogon acicularis

Forbs:

Exotic species: Urochloa mosambicensis*, Sporobolus sp.*

Summary		
Canopy Cover T1 / T2 %	35	
Shrub cover (S1/S2) %	<5	
Canopy Height - Median (m)	19	
No of Canopy Species Recruiting (%)	60	3 out of 5 canopy trees recruiting
Large Tree Count	9	
Tree Species Richness	5	
Shrub Species Richness	7	
Grass Species Richness	7	
Forb Species Richness	6	
Native Grass Cover (%)	13	
Leaf Litter Cover (%)	14.65	
Non-native plant cover (%)	<1	
Coarse Woody Debris (m)	39	

Biocondition Site 6
Regional Ecosystem: 11.3.25
Mapped Regional Ecosystem (DNRM): 11.3.25
Location Start: -22.68167° / 149.66291°
Location End: -22.68135° / 149.66376°

Landform / Soil: Incised drainage line. Fluvial sands and silts in channel

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 23 / 41
T2 Median Height / Cover (m/%): 11 / 25
S1 Median Height / Cover (m/%): 5 / <10

Tree Cover	T1 Interval (m)	T2 interval	T1 intercept (m)	T2 Intercept	height (m)
Eucalyptus tereticornis	0 - 18		18		23
Alphitonia excelsa**		13 - 19.			8
Corymbia tessellaris	22 - 31		9		25
Eucalyptus tereticornis		37 - 41	4		23
Corymbia tessellaris		44 - 54	10		25
Eucalyptus tereticornis			62 - 70	8	16
Acacia harpophylla			72 - 80	8	11
Eucalyptus tereticornis			89 - 100	9	15
Totals			**41**	**25**	

**** = S1 cover value**

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**
Bare	25	25	3.5	90	85
Leaf	30	65	90		15
Paspalideum distans	25	10	2.5		
Urochloa mutica*	20			10	
Sida cordifolia*			1.5		
Stylosanthes humilis*			2.5		
Total	**100**	**100**	**100**	**100**	**100**

Large Trees	**Threshold Size: 49cm DBH for Eucs; 29cm for non-Eucs**
Acacia harpophylla	3
Corymbia tessellaris	2
Eucalyptus tereticornis	6
Total	**11**

Additional Species:

Trees: Flindersia australia, Acacia harpophylla

Shrubs: Mallotus philippensis, Diospyros humilis, Capparis mitchelli, Bridelia leichardtii,

Notelaea microcarpa, Geijera parviflora, Cupaniopsis anacardioides, Trophis scandens

Forbs: Eustrephis latifolius, Jasminum simplicifolium

Grass: Arundinella nepalensis

Exotic species: Cryptostegia grandiflora, Bidens bipinnata, Lantana camara

Summary		
Canopy Cover T1 / T2 %	41	
Shrub cover (S1/S2) %	6	
Canopy Height - Median (m)	23	
No of Canopy Species Recrui	100	2 out of 2 canopy trees recruiting
Large Tree Count Eucs	8	
Large Tree Count - Non-eucs	3	
Tree Species Richness	3	
Shrub Species Richness	7	
Grass Species Richness	1	
Forb Species Richness	2	
Native Grass Cover (%)	3.75	
Leaf Litter Cover (%)	20	
Non-native plant cover (%)	5	
Coarse Woody Debris (m)	137	

Biocondition Site 7
Regional Ecosystem: 11.3.11
Mapped Regional Ecosystem (DNRM): 11.3.25
Location Start: -22.68332° / 149.64861°
Location End: S22.68319° / 149.64814°

Landform / Soil: Broad flat, weakly incised plain formed on silty loam with minor surface gravel

Structural Formation: Vine Thicket

Emergent Median Height / Cover: 34
T1 Median Height / Cover (m/%): 13 / 80
S1 Median Height / Cover (m/%): 6/ 20

Tree Cover	T1 Interval (m)	S1	Emergent I	T1 intercept (m)	S1	Emergent Ir	Height
Bursaria incana		0 - 2			2		8
Polyscias elegans	0 - 5			5			15
Notelaea microcarpa		5 - 6.			1		6
Notelaea microcarpa		6 - 10.			4		6
Bursaria incana	11 - 16.			5			14
Psydrax oleifolius	16 - 19.			3			12
Bursaria incana	19 - 25			6			10
Cryptocarya macdonaldii	23 - 30			7			15
Cleistanthus cunninghamii	30 - 33			3			12
Exocarpos latifolius		29 - 32			3		7
Pouteria cotinifolia	37 - 40			3			10
Capparis mitchellii		40 - 45			5		7
Ellatostachys xylocarpa	46 - 49			3			14
Pouteria cotinifolia	47 - 51			4			13
Notelaea microcarpa	49 - 52			3			11
Diospyros humilis	50 - 53			3			11
Elaeodedendron australe	53 - 57			4			15
Bridelia leichardtii	57 - 63			6			15
Croton insularis	66 - 70			4			11
Bridelia leichardtii		75 - 80			5		6
Eucalyptus tereticornis			72 - 80			8	34
Ficus obliqua	81 - 87			6			17
Apananthe philippensis	83 - 88			5			18
Mischocarpus anodontus	88 - 90			2			16
Pleiogynium timorense	91 - 93			2			13
Apananthe philippensis	93 - 98			5			15
Brachychiton rupestris			98 - 100			2	27
Totals			**79**	**20**		**10**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**
Bare	20	20	15	15	90

Leaf	80	70	70	70	10
Megathyrsus maximus var. trichoglume		10	15		
Rivina humilis				5	
Arundinella nepalensis				10	
Total	**100**	**100**	**100**	**100**	**##**

Large Trees	**Threshold Size: Non eucalypt trees 20cm DBH (arbitrary-no benchmark);**
	Eucalyptus sp: 50
Eucalyptus tereticornis	1
Rainforest	36
Total	**37**

Additional Species:

Trees: Gossia acmenoides, Mallotus philippensis

Shrubs: Melodinus australis, Trophis scandens, Murraya paniculata, Austrosteneesia blackii, Carrisa ovata, Pavetta australis, Streblus brunonianus

Grass:

Forbs:

Exotic species: Lantana camara

Summary		
Canopy Cover T1 / T2 %	79	
Shrub cover (S1/S2) %	20	
Canopy Height - Median (m)	13	
No of Canopy Species Recruiti	60	2 out of 18 canopy trees recruiting
Large Tree Count	37	
Tree Species Richness	29	
Shrub Species Richness	12	
Grass Species Richness	1	
Forb Species Richness		
Native Grass Cover (%)	0.1	
Leaf Litter Cover (%)	40	
Non-native plant cover (%)	5	
Coarse Woody Debris (m)	13	

Biocondition Site 8
Regional Ecosystem: 11.3.25
Mapped Regional Ecosystem (DNRM): 11.3.25
Location Start: -22.67790° / 149.65363°
Location End: -22.67870° / 149.65384°

Landform / Soil: Incised drainage line. Fluvial sands and silts in channel

Structural Formation: Open Forest

T1 Median Height / Cover (m/%): 22 / 19
T2 Median Height / Cover (m/%): 11 / 7
S1 Median Height / Cover (m/%): 6/ 33

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Melaleuca fluviatilis		0 - 3			3		12
Casuarina cunninghamiana		15 - 19			4		11
Melaleuca trichostachya			17 - 19			2	6
Mallotus philippensis			21 - 24			3	5
Corymbia tessellaris	32 - 44			12			26
Melaleuca viminalis			48 - 51				28
Leucaena leucocephala*			63 - 68			5	6
Melaleuca leucadendra			73 - 76			3	6
Melaleuca viminalis			76 - 82			6	6
Leucaena leucocephala*			82 - 87			5	6
Melaleuca viminalis			89 - 93			4	6
Melaleuca viminalis			85 - 90			5	6
Eucalyptus tereticornis	93 - 100			7			22
Totals				**19**	**7**	33	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	83	81	65	48	28	
Leaf	7		8	30	22	6.7
Panicum maximum var. trichogl	10	15	15	20	50	
Sida cordifolia*		2				
Leucaena leucocephala*		2				
Lomandra longifolia			10			
Bidens pilosa*			2			
Lantana camara*				2		
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 49cm DBH for Eucs; 29cm for non-Eucs**

Casuarina cunninghamiana	13
Melaleuca leucadendra	4
Lophostemon grandiflorus	3
Acacia harpophylla	1
Corymbia tessellaris	2
Eucalyptus camaldulensis	5
Total	**28**

Additional Species:

Trees: Lophostemon grandiflorus, Acacia harpophylla

Shrubs: Flueggea virosa, Diospyros geminata, , Ficus opposita

Forbs: Eustrephis latifolia, Ludwigia octovalvis, Cyperus gracillis

Exotic species: Cynodon dactylon*, Cryptostegia grandiflora*, Urena lobata*, Xanthium occidentale, Leonotis nepetifolia*

Summary		
Canopy Cover T1 / T2 %	19	
Shrub cover (S1/S2) %	33	
Canopy Height - Median (m)	22	
No of Canopy Species Recruiting	100	5 out of 5 canopy trees recruiting
Large Tree Count Eucs	7	
Large Tree Count - Non-eucs	21	
Tree Species Richness	6	
Shrub Species Richness	3	
Grass Species Richness	0	
Forb Species Richness	0	
Native Grass Cover (%)	0	
Leaf Litter Cover (%)	6.7	
Non-native plant cover (%)	10 (on account of rubber vine cover on margins of plot)	
Coarse Woody Debris (m)	89	

Biocondition Site 9
Regional Ecosystem: 11.3.25
Mapped Regional Ecosystem (DNRM): 11.3.25
Location Start: -22.69297° / 149.67957°
Location End: -22.69334° / 149.68040°

Landform / Soil: Incised drainage line. Fluvial sands and silts in channel

Structural Formation: Open Forest

T1 Median Height / Cover (m/%): 35 / 38
T2 Median Height / Cover (m/%): 18 / 53
S1 Median Height / Cover (m/%): 6 / 22

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Casuarina cunninghamiana		0 - 7			8		8
Melaleuca viminalis		7 - 10.			3		9
Casuarina cunninghamiana		16 - 24			8		18
Sannantha sp.			24 - 27.			3	5
Melaleuca trichostachya			35 - 41			6	6
Casuarina cunninghamiana		41 - 53			12		18
Melaleuca viminalis			47 - 52			5	6
Melaleuca viminalis			58 - 63			5	6
Casuarina cunninghamiana		59 - 64			5		17
Melaleuca leucadendra		69 - 78			9		18
Eucalyptus tereticornis	62 - 89			27			36
Casuarina cunninghamiana		88 - 96			8		20
Corymbia tessellaris	89 - 100			11			35
Melalecua leucadendra			96 - 99			3	7
Totals				**38**	**53**	**22**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	50	25	90	12.5	15	
Leaf	20	10	5	60	5	10
Chrysopogon fallax	20				10	
Imperata cylindrica		40				
Cyperus polystachys	10		5	25		
Lomandra longifolia		25			40	
Xanthium occidentale					10	
Urena lobata				2.5		
Chionachne cyathopoda					20	
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 49cm DBH for Eucs; 29cm for non-Eucs**

Melaleuca leucadendra	22
Melaleuca trichostachya	2
Corymbia clarksoniana	5
Corymbia tessellaris	2
Eucalyptus camaldulensis	4
Total	**35**

Additional Species:

Trees: Lophostemon suaveolens

Shrubs: Mallotus philippensis, Ficus opposita

Grass: Arundinella nepalensis

Forbs: Eustrephis latifolia, Ludwigia octovalvis, Cyperus gracillis

Exotic species: Macroptileum atropurpureum*, Lantana camara*, Asclepias curassavica, Crotolaria sp*., Asclepias curassavica

Summary		
Canopy Cover T1 / T2 %	38	
Shrub cover (S1/S2) %	22	
Canopy Height - Median (m)	35	
No of Canopy Species Recruitin	100	2 out of 2 canopy trees recruiting
Large Tree Count Eucs	7	
Large Tree Count - Non-eucs	8	
Tree Species Richness	6	
Shrub Species Richness	4	
Grass Species Richness	4	
Forb Species Richness	3	
Native Grass Cover (%)	7	
Leaf Litter Cover (%)	10	
Non-native plant cover (%)		5 (on account of Lantana shrub cover on margins of plot)
Coarse Woody Debris (m)	102	

Biocondition Site 10
Regional Ecosystem: 11.3.35
Mapped Regional Ecosystem (DNRM): 11.4.9
Location Start: -22.69601° / 149.67847°
Location End: -22.69641° / 149.67752°

Landform / Soil: Upper alluvial terrace of Deep Creek. Dissected loamy alluvial plain

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 16 /54
T2 Median Height / Cover (m/%): 11 / 13
S1 Median Height / Cover (m/%): 6/ <5

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Corymbia clarksoniana		0 - 7			7		12
Corymbia clarksoniana	13 - 19			6			14
Eucalyptus platyphylla	26 - 34			8			18
Corymbia clarksoniana	34 - 41			7			14
Eucalyptus platyphylla	45 - 56			11			15
Corymbia clarksoniana			57 - 58			1	6
Eucalyptus platyphylla	68 - 90			22			15
Corymbia tessellaris		70 - 76			6		8
Corymbia clarksoniana		42 - 45			3		8
Corymbia clarksoniana		47 - 50			3		8
Totals				**54**	**13**	**1**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	5	5	5	0	5	21
Leaf	25	50	70	15	50	
Aristida sp.	25		10			
Heteropogon contortus					5	
Aristida calycina	15	10			5	
Arundinella nepalensis	5			70	10	
Bothriochloa sp.		10				165
Praxelis clematidea	10	10		2.5	5	
Sida cordifolia*		10	2.5	5	5	
Lantana camara	5					
Cyperus gracillis	10	5	10	5	5	
Crotolaria sp.*				2.5		
Scleria laevis			2.5		10	
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 44cm DBH**
Eucalyptus platyphylla	4

Eucalyptus Crebra	5
Total	**9**

Additional Species:

Trees: Cassia brewsteri**,** Eucalyptus tereticornis**.,** Lophostemon suaveolens

Shrubs: Grewia retusifolia, Alphitonia excelsa, Alphitonia excelsa, Acacia salicinia, Breynia oblongifolia

Grass: Cymbopogon refractus, Eriachne glabrata, Leptochloa decipiens

Forbs: Eustrephis latifolius

Exotic species: Crotolaria sp*.,

Summary		
Canopy Cover T1 / T2 %	54	
Shrub cover (S1/S2) %	<5	
Canopy Height - Median (m)	16	
No of Canopy Species Recru	80	4 out of 5 canopy trees recruiting
Large Tree Count	7	
Tree Species Richness	5	
Shrub Species Richness	7	
Grass Species Richness	7	
Forb Species Richness	2	
Native Grass Cover (%)	16.9	
Leaf Litter Cover (%)	21	
Non-native plant cover (%)	<5	
Coarse Woody Debris (m)	75	

Biocondition Site 11
Regional Ecosystem: 11.3.27
Mapped Regional Ecosystem (DNRM): 11.4.9
Location Start: -22.69574° / 149.67665°
Location End: -22.69663° / 149.67679°

Landform / Soil: Drainage depression between T2 alluvial terrace and older Pleistocene age loamy plain

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 28 /38
T2 Median Height / Cover (m/%): 10 /37
S1 Median Height / Cover (m/%): NA

Tree Cover	T1 Interval (m)	T2 interval	T1 intercept (m)	T2 Intercept	height (m)
Eucalyptus tereticornis	0 - 7		7		32
Lophostemon suaveolens		8 - 11.		3	10
Lophostemon suaveolens		15 - 28		13	9
Lophostemon suaveolens		38 - 47		9	10
Lophostemon suaveolens		56 - 68		12	10
Eucalyptus tereticornis	61 - 84		23		29
Eucalyptus tereticornis	92 - 100		8		26
Totals			**38**	**37**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**
Bare	15	85			
Leaf	80	15	25	57.5	19
Cyperus polystachyos				40	80
Paspalideum distans				2.5	
Cyperus sp.	2.5		75		
Arundinella nepalensis					1
Urochloa mutica	2.5				
Total	**100**	**100**	**100**	**100**	**100**

Large Trees	**Threshold Size: 49cm DBH**
Eucalyptus tereticornis	6
Total	**6**

Additional Species:

Trees:

Shrubs: Alphitonia excelsa, Acacia salicinia

Forbs: Persicaria attenuata, Ludwigia octovalvis, Spartothamnella juncacea

Exotic species: Ageratum conyzoides*, Hymenachne amplexicaulis

Summary		
Canopy Cover T1 / T2 %	38	
Shrub cover (S1/S2) %	0	
Canopy Height - Median (m)	28	
No of Canopy Species Recruit	100	2 out of 2 canopy trees recruiting
Large Tree Count	6	
Tree Species Richness	2	
Shrub Species Richness	2	
Grass Species Richness	2	
Forb Species Richness	0	
Native Grass Cover (%)	<1	
Leaf Litter Cover (%)	19.65	
Non-native plant cover (%)	<1	
Coarse Woody Debris (m)	16	

Note: Leaf litter is likely to Hymenachne amplexicaulis*

Biocondition Site 12
Regional Ecosystem: Non-remnant (RE 11.4.9 below threshold patch size of 1ha)
Mapped Regional Ecosystem (DNRM): Non-remnant
Location Start: -22.69945° / 149.68234°
Location End: -22.69916° / 149.68263°

Landform / Soil: Vertosol with gilgai on plain above flood level

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 19 /38
T2 Median Height / Cover (m/%): 10 /20
S1 Median Height / Cover (m/%): 6 / 38

Note: Due to resticted patch size, biocondition plot was reduced to 50m x 10m plot with tree and debri counts extrapolated.

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Acacia harpophylla		0 - 6			10		10
Acacia harpophylla			6 - 8.			2	5
Acacia harpophylla	8 - 15.			7			23
Acacia harpophylla	17 - 24			7			19
Senna sp.			24 - 27			3	2
Pittosporum spinescens			27 - 30			3	2.5
Acacia harpophylla		28 - 35					8
Geijera parviflora			28 - 32				4
Geijera salicifolia			35 - 39			4	3
Acacia harpophylla	45 - 50			5			17
Geijera parviflora			41 - 45			4	4
Acacia harpophylla			45 - 48			3	4
Totals				**19**	**10**	**19**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	17.5	15	12	5	63	
Leaf	20	85	78	86.5	5	27.45
Carissa ovata	50		10			
Paspalideum caespitosum	2.5			5	30	
Ancistrachne uncinullata	10					4.75
Unid. Weed*				2.5		
Brunoniella australis				1		
Sarcostemma sarcostemmoides					2.5	
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 28cm DBH**
Eucalyptus platyphylla	4

Eucalyptus Crebra	5
Total	**9**

Additional Species:

Trees:

Shrubs: Carissa ovata, Capparis mitchellii, Denhamia oleaster, Psydrax odorata, Santalum lanceolatum, Alectryon diversifolius

Grass: Arundinella nepalensis

Forbs: Tylophora sp., Enchylaena tomentosa, Spartothamnella juncacea

Exotic species: Abutilon grandiflorum*

Summary		
Canopy Cover T1 / T2 %	38	
Shrub cover (S1/S2) %	38	
Canopy Height - Median (m)	19	
No of Canopy Species Recruiting (%)	100	1 out of 1 canopy trees recruiting
Large Tree Count	38	(extrapolated over 0.25 ha plot)
Tree Species Richness	1	
Shrub Species Richness	11	
Grass Species Richness	3	
Forb Species Richness	4	
Native Grass Cover (%)	4.75	
Leaf Litter Cover (%)	27.45	
Non-native plant cover (%)	<1	
Coarse Woody Debris (m)	225	

Biocondition Site 13
Regional Ecosystem: 11.3.25
Mapped Regional Ecosystem (DNRM): 11.3.25
Location Start: -22.67579° / 149.67115°
Location End: -22.67618° / 149.67192°

Landform / Soil: Loamy upper bench above Incised drainage line. Alluvial silts

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 28 /49
T2 Median Height / Cover (m/%): 10 /43
S1 Median Height / Cover (m/%): 6 / 13

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Corymbia tessellaris	0 -3			3			28
Eucalyptus tereticornis	3- 8.			5			29
Eucalyptus tereticornis		8 - 13.			5		18
Mallotus philippensis			5 - 11.			6	7
Eucalyptus tereticornis	13 - 29			16			34
Mallotus philippensis		16 - 26			10		10
Polyscias elegans		28 - 35			7		10
Corymbia tessellaris	33 - 41			8			22
Mallotus philippensis		42 - 51			9		9
Alstonia constricta			51 - 53			2	7
Mallotus philippensis			54 - 59			5	7
Eucalyptus tereticornis	59 - 65			6			30
Alectryon tomentosa		66 - 69			3		10
Polyscias elegans		67 - 73			6		16
Eucalyptus tereticornis	71 - 82			11			29
Mallotus philippensis			82 - 88			6	7
Eucalyptus tereticornis	97 - 100				3		18
Totals				**49**	**43**	**13**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	0	0	5	5	0	
Leaf	92.5	100	85	90	87.5	45.5
Drypetes deplanchei	2.5					
Rivina humilis*	5		10	5	5	
Passiflora suberosa*					5	
Poaceae sp.					2.5	
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 49cm DBH for Eucs; 29cm for non-Eucs**
Rainforest Trees	8
Corymbia tessellaris	1

Eucalyptus camaldulensis	15
Total	**24**

Additional Species:

Trees: Melia azaderach

Shrubs: Cryptocarya macdonaldii, Apananthe philippensis, Geijera salicifolia, Drypetes deplanchei, Ficus opposita , Pavetta australe, Alectryon diversifolius, Cupaniopsis anacardioides, Diospyros humilis, Capparis arborea

Grass:

Forbs:

Exotic species: Lantata camara*, Panicum maximum var. trichoglume*

Summary		
Canopy Cover T1 / T2 %	49	
Shrub cover (S1/S2) %	13	
Canopy Height - Median (m)	28	
No of Canopy Species Recruiting (%)	100	5 out of 5canopy trees recruiting
Large Tree Count Eucs	16	
Large Tree Count - Non-eucs	8	
Tree Species Richness	5	
Shrub Species Richness	11	
Grass Species Richness	1	
Forb Species Richness	0	
Native Grass Cover (%)	<1	
Leaf Litter Cover (%)	45.5	
Non-native plant cover (%)	5	(on account of Lantana shrub cover on margins of plot)
Coarse Woody Debris (m)	118	

Biocondition Site 14
Regional Ecosystem: 11.3.12
Mapped Regional Ecosystem (DNRM): 11.5.8a
Location Start: -22.70944° / 149.63572°
Location End: -22.70855 / 149.63560°

Landform / Soil: Broad drainage depression in loamy plain

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 10 /35
T2 Median Height / Cover (m/%): NA
S1 Median Height / Cover (m/%): 6 / 13

Tree Cover	T1 Interval (m)	T2 interval	T1 intercept (m)	T2 Intercept	height (m)
Melaleuca viridiflora		0 - 3		3	6
Melaleuca viridiflora		6 - 11.		5	7
Melaleuca viridiflora	13 - 15		2		8
Melaleuca viridiflora	27 - 30		3		9
Melaleuca viridiflora	32 - 38		6		9
Melaleuca viridiflora	51 - 57		6		11
Melaleuca viridiflora	61 - 70		9		8
Melaleuca viridiflora	84 - 89		9		5
Melaleuca viridiflora		90 - 92			4
Totals			**35**	**8**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**
Bare	10	60	40	30	60
Leaf					
Poaceae sp.	90				
Eleocharis sp.		40	40	70	30
Hymenachne amplexicaulis			20		10
Total	**100**	**100**	**100**	**100**	**100**

Note: Ground cover has been recorded as living even though it is dessicated / dead

Large Trees	**Threshold Size: 20cm DBH - Note No Benchmark Data for this RE**
Melaleuca viridiflora	44
Total	**44**

Additional Species:

Trees: Corymbia dallachiana

Shrubs:

Forbs: Persicaria attenuata, Ludwigia octovalvis, Dendrobium tattonianum

Exotic species: Ageratum conyzoides*, Hymenachne amplexicaulis

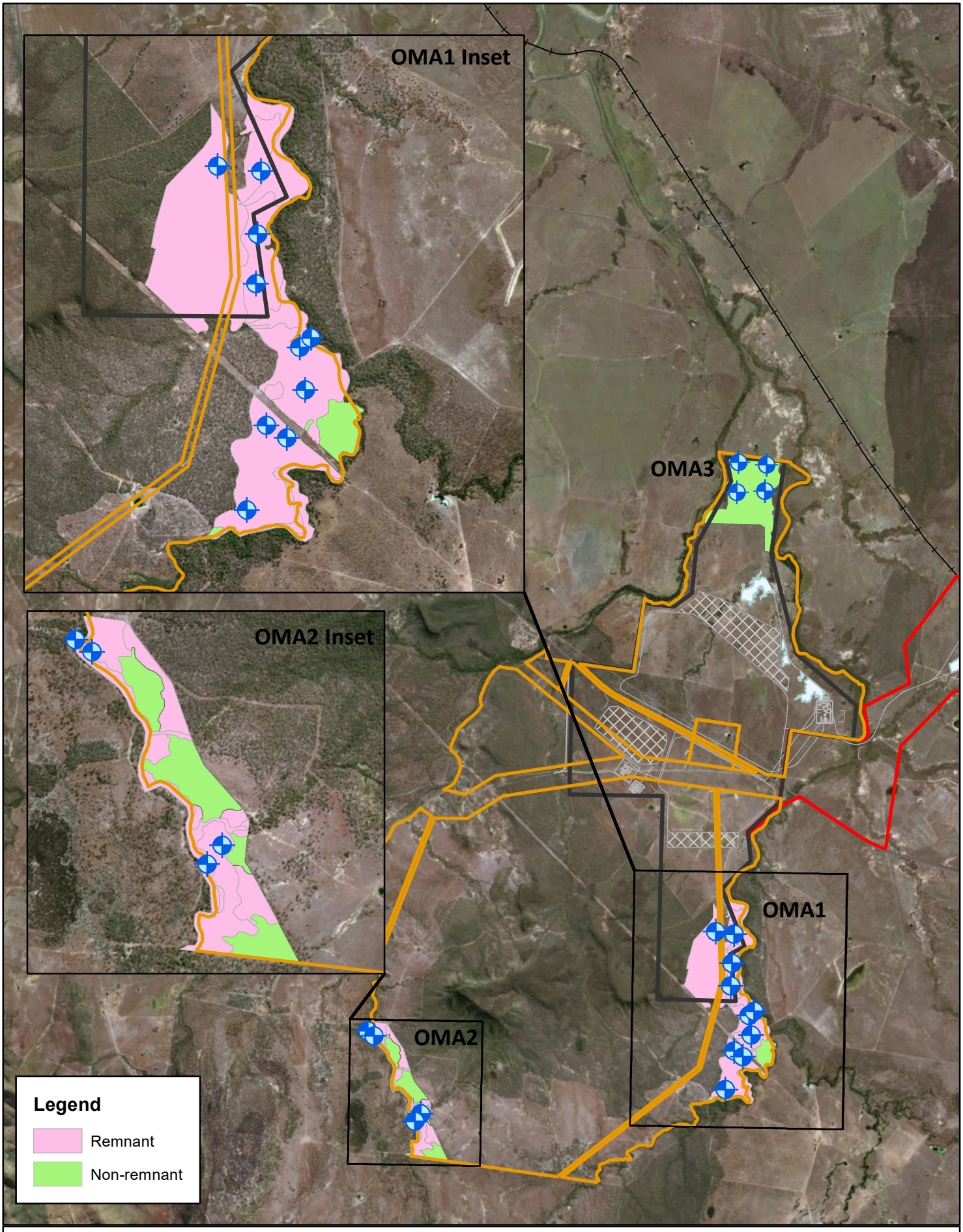
Summary		
Canopy Cover T1 / T2 %	35	
Shrub cover (S1/S2) %	0	
Canopy Height - Median (m)	10	
No of Canopy Species Recruiting (%)	100	1 out of 1 canopy trees recruiting
Large Tree Count	44	
Tree Species Richness	2	
Shrub Species Richness	0	
Grass Species Richness	1	
Forb Species Richness	3	
Native Grass Cover (%)	9	
Leaf Litter Cover (%)	0	NB: Groundcover normally attributed to leaf litter as it is totally dry
Non-native plant cover (%)	<5	
Coarse Woody Debris (m)	18	

Note: Leaf litter is likely to Hymenachne amplexicaulis*

Central Queensland Coal Project

Habitat Quality Assessment Datasheets

Offset Sites



0 1 2 km

Scale @ A4 1:90,000
Date: 07/11/18
Drawn: J Parnwell

Legend

- Habitat quality assessment site
- ML 80187
- ML 700022
- Mamelon Property

Figure 2
Habitat quality assessment sites - Styx Project Offset Management Areas

DATA SOURCE
QLD Department of Environment and Heritage Protection, 2016;
QLD Spatial Catalogue (QSpatial), 2017

CDM Smith

PARNWELLJA \\brbsvr1\PRO\Project\1000111 - Styx SEIS Post submission work\7Work\3GIS\DATA\MXD\Chapter 14_Supp_Report_Terrestrial Ecology\Figure 14-X R1 Chapter Biocondition Sites Southern.mxd 7/11/2018

Biocondition Site 15 (offset)
Regional Ecosystem: 11.10.7
Mapped Regional Ecosystem (DNRM): 11.11.15a
Location Start: -22.73728° E149.660607°
Location End: -22.737947° E149.660068°

Landform / Soil: Gently sloping colluvial plain / apron formed on sedimentary rocks.

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 19 /51
T2 Median Height / Cover (m/%): 14 /8
S1 Median Height / Cover (m/%): 6 / <5

Tree Cover	T1 Interval (m)	T2	T1 intercept (m)	T2	S1	height (m)
Eucalyptus crebra	0 - 5		5			19
Eucalyptus crebra	7 - 13.		6			21
Eucalyptus crebra	16 - 20		4			21
Eucalyptus crebra	26 - 34		8			17
Eucalyptus crebra	40 - 46		6			21
Eucalyptus crebra	48 - 51		3			19
Eucalyptus crebra	61 - 66		5			21
Eucalyptus crebra	66 - 69			3		15
Eucalyptus crebra	71 - 76			5		15
Eucalyptus crebra	74 - 84		10			21
Alphitonia excelsa	88 - 92				4	6
Eucalyptus crebra	96 - 100		4			21
Totals			**51**	**8**	**4**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**
Bare	10	10	9	27.5	10
Leaf	74	85	60	40	70
Sida cordifolia	10	2.5	5	2.5	
Cyperus sp.	2.5			5	5
Eriachne glabrata	2.5		20	15	2.5
Glycine tabacina	1		1		
Entolosia stricta		2.5			
Aristida sp.			5	10	2.5
Leptochloa digitata					10
Total	**100**	**100**	**100**	**100**	**100**

Large Trees	**Threshold Size: No Benchmark. Default trees > 44cm DBH**
Eucalyptus crebra	1
Total	**1**

Additional Species:

Trees:

Shrubs: Pogonolobus reticulatus, Acacia crassa, Maytenus cunninghamii, Petalostigma pubescens, Breynia oblongifolia

Forbs: Eremophila debilus, Pterocaulon sphacelatum, Laxmannia gracilus, Enchylaena tomentosa

Grass: Eragrostis elongata, Aristida calycina

Exotic species: Lantana camara*, Sida cordifolia*

Summary		
Canopy Cover T1 %	51	
Shrub cover (S1/S2) %	<5	
Canopy Height - Median (m)	19	
No of Canopy Species Recruiting (%)	100	1 out of 1 canopy trees recruiting
Large Tree Count	1	
Tree Species Richness	1	
Shrub Species Richness	6	
Grass Species Richness	6	
Forb Species Richness	1	
Native Grass Cover (%)	12.4	
Leaf Litter Cover (%)	65.8	
Non-native plant cover (%)	30	Dense cover of lantana although very dry at time of survey
Coarse Woody Debris (m)	32	

Additional Notes: Heavily logged with removal of ironbark

Biocondition Site 16 (offset)
Regional Ecosystem: 11.4.2
Mapped Regional Ecosystem (DNRM): 11.11.15a
Location Start:-22.737656° / 149.663858°
Location End: -22.738515° / 149.663619°

Landform / Soil: Upper terrace of Deep Creek above current flood level. Flat terrace formed on silty clay loam. Margins of terrace incised with no evidence of basement rock in gully incisions.

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 20 /37
T2 Median Height / Cover (m/%): 11 /23
S1 Median Height / Cover (m/%): NA

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Corymbia dallachiana		0 - 3			3		10
Eucalyptus crebra		4 - 18.			14		15
Eucalyptus crebra	18 - 25			7			22
Eucalyptus crebra	27 - 33			6			22
Eucalyptus crebra	35 - 44			9			21
Corymbia dallachiana		50 - 54			4		12
Eucalyptus crebra		65 - 67			2		8
Eucalyptus crebra	81 - 88			7			19
Eucalyptus crebra	92 - 100			8			21
Totals				**37**	**23**	**0**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	5	51.5	17.5	15	40	
Leaf	45	40	16.5	20	20	28.3
Aristida calycina	40			10		
Eragrostis elongata	5		40	40	15	
Eriachne glabrata	5	5	15		5	
Glycine tabacina		1				
Brunoniella australis			5			
Stylosanthes humilis*		2.5	1			
Cyperus gracilis				5	5	
Heteropogon contortus				5	10	
Grevillea parallela					5	
Sida cordifolia*			5	5		
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 39cm DBH Eucalyptus / 24cm DBH non-Eucalyptus**
Petalostigma pubescens	2
Grevillea parallela	2
Eucalyptus platyphylla	2

Eucalyptus Crebra	2	
Total	**4**	**4**

Additional Species:

Trees: Eucalyptus populnea, Eucalyptus platyphylla, Corymbia clarksoniana

Shrubs: Acacia disparrima, Acacia leiocalyx, Acacia crassa, Acacia salicinia, Maytenus cunninghamii, Capparis lasiantha

Grass: Aristida personata

Forbs: Alternanthera sp., Desmodium macrocarpum(?),

Exotic species: Lantana camara

Summary		
Canopy Cover T1 / T2 %	37	
Shrub cover (S1/S2) %	5	
Canopy Height - Median (m)	20	
No of Canopy Species Recruiting (%)	60	2 out of 3 canopy trees recruiting
Large Tree Count	8	
Tree Species Richness	4	
Shrub Species Richness	8	
Grass Species Richness	5	
Forb Species Richness	4	
Native Grass Cover (%)	39	
Leaf Litter Cover (%)	28.3	
Non-native plant cover (%)	<1	
Coarse Woody Debris (m)	20	

Additional Notes: Heavily logged with removal of ironbark

Biocondition Site 17 (offset)
Regional Ecosystem: 11.4.2
Mapped Regional Ecosystem (DNRM): 11.11.15a
Location Start:--22.746182° / 149.663486°
Location End: -22.746997°/ 149.663882°

Landform / Soil: Upper terrace of Deep Creek above current flood level. Flat terrace formed on silty clay loam. Margins of terrace incised with no evidence of basement rock in gully incisions.

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 19 /35
T2 Median Height / Cover (m/%): 13 /12
S1 Median Height / Cover (m/%): 3 / <5

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Eucalyptus crebra		0 - 5			5		15
Eucalyptus crebra	7 - 14.			7			17
Eucalyptus crebra		15 - 18			3		10
Eucalyptus crebra	28 - 34			6			21
Eucalyptus crebra	52 - 59			7			22
Eucalyptus populnea	62 - 71			9			18
Eucalyptus populnea	73 - 77						21
Eucalyptus crebra	82 - 88			6			18
Eucalyptus crebra	92 - 97				4		14
Totals				**35**	**12**	**0**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	30	20	5	40	38	
Leaf	20	50	77.5	30	20	39.5
Aristida sp.	50	25	5	5	20	29
Eragrostis elongatus			5	2.5		
Heteropogon contortus				15	10	
Aristida personata				5		
Eriachne glabrata				2.5		
Eremophila debilis			7.5			
Stylosanthes humilis*		2.5				
Brunoniella australis		2.5			2.5	
Cyperus gracilis					10	
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 39cm DBH Eucalyptus / 24cm DBH non-Eucalyptus**
Eucalyptus populnea	2
Eucalyptus Crebra	1
Total	**3**

Additional Species:

Trees: Eucalyptus platyphylla, Corymbia dallachiana

Shrubs: Acacia disparrima, Alphitonia excelsa, Psydrax odorata, Maytenus cunninghamii, Grevillea parallela, Atalaya hemiglauca, Acacia crassa, Acacia leiocalyx

Grass and graminoids: Lomandra multiflora, Cyperus sp.

Forbs: Desmodium macrocarpum(?), Glycine tabacina

Exotic species: Lantana camara*, Opuntia stricta*,

Summary		
Canopy Cover T1 / T2 %	35	
Shrub cover (S1/S2) %	5	
Canopy Height - Median (m)	19	
No of Canopy Species Recruiting (%)	50	2 out of 4 canopy trees recruiting
Large Tree Count	3	
Tree Species Richness	4	
Shrub Species Richness	8	
Grass Species Richness	5	
Forb Species Richness	4	
Native Grass Cover (%)	29	
Leaf Litter Cover (%)	39.5	
Non-native plant cover (%)	<1	
Coarse Woody Debris (m)	29	

Additional Notes: Heavily logged with removal of ironbark

Biocondition Site 18 (offset)
Regional Ecosystem: 11.4.2
Mapped Regional Ecosystem (DNRM): 11.11.15a
Location Start:-22.742437° / 149.663623°
Location End: -22.743245°/ 149.664038°

Landform / Soil: Upper terrace of Deep Creek above current flood level. Flat terrace formed on silty clay loam. Margins of terrace incised with no evidence of basement rock in gully incisions.

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 19 /53
T2 Median Height / Cover (m/%): 10 /43
S1 Median Height / Cover (m/%): 7 / 10

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Eucalyptus crebra		0 - 2.5			2.5		8
Corymbia dallachiana		4 - 7.		.	7		7
Eucalyptus crebra	17 - 30			13			21
Eucalyptus populnea	37 - 43			6			17
Eucalyptus crebra	51 - 57			6			22
Eucalyptus populnea	70 - 85			15			19
Eucalyptus crebra	85 - 91			6			17
Eucalyptus crebra	93 - 100			7			21
Totals				**53**	**9.5**	**0**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**		
Bare	32.5	40	25	50	40		
Leaf	40	39	30	25	22.5		26.8
Paspalideum distans					25		
Heteropogon contortus	10	2.5			10		
Eragrostis elongata	5	15	20				
Aristida calycina				10			
Eriachne glabrata	10	2.5					
Glycine tabacina		1					
Chloris divaricata				5			23.2
Fimbristylis sp.			5				
Cyperus gracilis	2.5						
Brunoniella australis					2.5		
Cyperus sp.			20	10			
Total	**100**	**100**	**##**	**100**	**100**		

Large Trees	**Threshold Size: 39cm DBH Eucalyptus / 24cm DBH non-Eucalyptus**
Eucalyptus populnea	2
Eucalyptus Crebra	2
Total	**4**

Additional Species:

Trees:

Shrubs: Grevillea parallela, Atalaya hemiglauca, Alphitonia excelsa, Parsonsia eucalyptifolia

Grass and graminoids: Eragrostis sp

Forbs: Pterocaulon sphacelatum

Exotic species: Stylosanthes humilis*, Sida cordifolia*

Summary		
Canopy Cover T1 / T2 %	53	
Shrub cover (S1/S2) %	<5	
Canopy Height - Median (m)	19	
No of Canopy Species Recruiting (%)	100	2 out of 2 canopy trees recruiting
Large Tree Count	4	
Tree Species Richness	3	
Shrub Species Richness	4	
Grass Species Richness	7	
Forb Species Richness	2	
Native Grass Cover (%)	23.2	
Leaf Litter Cover (%)	26.8	
Non-native plant cover (%)	<1	
Coarse Woody Debris (m)	15	

Additional Notes: Heavily logged with removal of ironbark

Biocondition Site 19 (offset)
Regional Ecosystem: 11.4.2
Mapped Regional Ecosystem (DNRM): 11.11.15a
Location Start:-22.750991° / 149.666807°
Location End: -22.750449°/ 149.666043°

Landform / Soil: Upper terrace of Deep Creek above current flood level. Flat terrace formed on silty clay loam. Minor drainage depression passes through centre of the plot. Margins of terrace incised with no evidence of basement rock

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 19 /34
T2 Median Height / Cover (m/%): 11 /8
S1 Median Height / Cover (m/%): 3 / 2

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Eucalyptus crebra	0 - 3			3			16
Eucalyptus crebra	5 - 12.			7			19
Eucalyptus crebra	20 - 26						22
Eucalyptus crebra	28 - 35			7			16
Eucalyptus crebra		46 - 49			3		12
Eucalyptus populnea	52 - 61			9			16
Eucalyptus crebra		64 - 67			3		9
Eucalyptus populnea	70 - 78			8			19
Eucalyptus populnea		70 - 72			2		14
Atalaya hemiglauca			91 - 93			2	3
Eucalyptus populnea	96 - 100			4			
Totals				**34**	**8**	**2**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	34	31.5	32.5	17.5	28	
Leaf	30	30	25	15	26	25.2
Acacia salicinia	10					
Paspalideum distans	10					35
Chloris divaricata	10					
Themeda triandra	5	20	20	60	10	
Aristida personata		15				
Eriachne glabrata			10			
Aristida calycina					15	
Lomandra filiformis		2.5			5	
Sida spinosa*		1				
Cyperus gracilis			10	5	10	
Brunoniella australis			2.5		2.5	
Eriachne glabrata						
Glycine tabacina	1			2.5	3.5	

Total	**100**	**100**	**100**	**100**	**100**

Large Trees	**Threshold Size: 39cm DBH Eucalyptus / 24cm DBH non-Eucalyptus**
Eucalyptus populnea	2
Eucalyptus Crebra	4
Total	**6**

Additional Species:

Trees:

Shrubs: Psydrax odorata, Grevillea parallela, Maytenus cunninghamii, Atalaya hemiglauca, Breynia oblongifolia, Grewia retusifolia, Ehretia membranifolia, Capparis canensens, Acacia bidwillii, Alphitonia excelsa

Grass and graminoids: Heteropogon contortus

Forbs:

Exotic species: Opuntia tomentosa, Lepidium bonariense

Summary		
Canopy Cover T1 / T2 %	34	
Shrub cover (S1/S2) %	<5	
Canopy Height - Median (m)	19	
No of Canopy Species Recruiting (%)	100	2 out of 2 canopy trees recruiting
Large Tree Count	6	
Tree Species Richness	2	
Shrub Species Richness	10	
Grass Species Richness	7	
Forb Species Richness	2	
Native Grass Cover (%)	35	
Leaf Litter Cover (%)	25.2	
Non-native plant cover (%)	<1	
Coarse Woody Debris (m)	45	

Additional Notes: Heavily logged with removal of ironbark

Biocondition Site 20 (offset)
Regional Ecosystem: 11.3.25
Mapped Regional Ecosystem (DNRM): 11.3.25
Location Start: -22.750269° / 149.667665°
Location End: -22.750835° / 149.668447°

Landform / Soil: Incised drainage line. Fluvial sands and silts in channel. No bedrock exposed in stream channel.

Structural Formation: Open Forest

T1 Median Height / Cover (m/%): 32 /27
T2 Median Height / Cover (m/%): 13 /46
S1 Median Height / Cover (m/%): 6 / 24

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Melaleuca leucadendra	0 - 6			6			32
Mallotus philippensis			20 - 25			5	7
Casuarina cunninghamiana		24 - 30			6		12
Melaleuca leucadendra	32 - 45			13			33
Melaleuca trichostachya			32 - 37			6	6
Melaleuca trichostachya			55 - 59			4	7
Casuarina cunninghamiana		41 - 45			4		15
Melaleuca leucadendra		52 - 65			13		23
Lophostemon grandiflorus			56 - 61			5	6
Melaleuca leucadendra	65 - 71			6			25
Eucalyptus tereticornis	71 - 78			7			27
Cryptocarya triplinervis		68 - 71			3		9
Melaleuca leucadendra		75 - 83			8		21
Lophostemon grandiflorus			79 - 83			4	8
Melaleuca leucadendra		86 - 91			5		12
Melaleuca leucadendra		93 - 100			7		22
Totals				**32**	**46**	**24**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	25	40	30	32.5	25	
Leaf	10	30	40	40	20	28
Panicum maximum var. tricho	25			2.5		
Lomandra longifolia	25	30			40	
Cyperus polystachyus	15			10		
Chrysopogon fallax			20	15		
Commelina ensifolia	.		5			
Lepidium bonariense*			2.5			
Melaleuca leucadendra			2.5			
Trophis scandens					10	

Lomandra longifolia					5
Total	**100**	**100**	**100**	**100**	**100**

Large Trees	**Threshold Size: 49cm DBH for Eucs; 29cm for non-Eucs**			
Casuarina cunninghamiana	.	1		
Melaleuca leucadendra	11			
Lophostemon grandiflorus		8		
Eucalyptus tereticornis	2			
Total	**13**			

Additional Species:

Trees: Corymbia tessellaris, Lophostemon suaveolens

Shrubs: Ficus opposita

Grass and Graminoids: Chionachne ramiflorus

Forbs: Eustrephis latifolius, Cyanthilium cinereum

Exotic species: Cynodon dactylon*, Cryptostegia grandiflora*, Lantana camara*, Cardiospermum grandiflorum*, Ageratum conyzoides, Urena lobata*, Xanthium occidentale*, Macroptilium atropurpureum*

Summary		
Canopy Cover T1 / T2 %	32	
Shrub cover (S1/S2) %	24	
Canopy Height - Median (m)	27	
No of Canopy Species Recruiting (%)	100	3 out of 3 canopy trees recruiting
Large Tree Count Eucs	13	
Large Tree Count - Non-eucs	9	
Tree Species Richness	5	
Shrub Species Richness	5	
Grass Species Richness	2	
Forb Species Richness	2	
Native Grass Cover (%)	7	
Leaf Litter Cover (%)	28	
Non-native plant cover (%)		30% cover of lantana on the lower river terraces
Coarse Woody Debris (m)	23	

Biocondition Site 21 (offset)
Regional Ecosystem: 11.4.2
Mapped Regional Ecosystem (DNRM): 11.11.15a
Location Start:-22.753500° / 149.666664°
Location End: -22.754190°/ 149.667220°

Landform / Soil: Upper terrace of Deep Creek above current flood level. Flat terrace formed on silty clay loam. Break of slope with gentle rise on footslopes 300m to the west.

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 19 /51
T2 Median Height / Cover (m/%): 13 /15
S1 Median Height / Cover (m/%): 6 / 11

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Eucalyptus populnea	0 - 11			11			19
Eucalyptus crebra	11 - 17.			6			18
Eucalyptus crebra	25 - 34			9			19
Eucalyptus crebra			36 - 38			2	4
Eucalyptus populnea		34 - 39			5		13
Atalaya hemiglauca			38 - 41			3	6
Eucalyptus crebra		42 - 46			4		14
Alphitonia excelsa			46 - 49			3	6
Eucalyptus crebra	50 - 57			7			17
Eucalyptus populnea	57 - 63			6			17
Eucalyptus crebra	63 - 68			5			22
Eucalyptus crebra		74 - 80			6		15
Eucalyptus crebra	87 - 94			7			21
Atalaya hemiglauca			96 - 98			2	6
Alphitonia excelsa			99 - 100			1	6
Totals				**51**	**15**	**11**	

Ground Cover

	Q1		**Q2**	**Q3**	**Q4**		**Q5**	
Bare		42.5	15	10	10	10		
Leaf		40	52.5	46.5	65	61.5		53.1
Eragrostis elongata		15		2.5	5			
Heteropogon contortus		2.5	15	20				
Eriachne glabrata			10					
Aristida sp.								
Themeda triandra				15	10	20		
Chloris divaricata								
Themeda triandra								
Panicum sp.						2.5		23.5
Atalaya hemiglauca								
Grevillea parallela					5			

Capparis lasiantha				5	
Glycine sp.			1		
Cyperus gracilis		2.5			5
Atalaya hemiglauca			5		
Eucalyptus crebra		5			
Euphorbia hirta*					1
Total	**100**	**100**	**100**	**100**	**100**

Large Trees	**Threshold Size: 39cm DBH Eucalyptus / 24cm DBH non-Eucalyptus**
Eucalyptus populnea	0
Eucalyptus Crebra	2
Total	**2**

Additional Species:

Trees:

Shrubs: Pogonolobus reticulatus, Alectryon diversifolius, Acacia salicinia, Grevillea parallela, Maytenus cunninghamii, Carrisa ovata, Myoporum acuminatum, Psydrax odorata

Grass and graminoids: Aristida sp.

Forbs: Pterocaulon sphacelatum

Exotic species: Opuntia tomentosa*, Lepidium bonariense*, Sida spinosa*

Summary		
Canopy Cover T1 / T2 %	51	
Shrub cover (S1/S2) %	<10	
Canopy Height - Median (m)	19	
No of Canopy Species Recruiting (%)	100	2 out of 2 canopy trees recruiting
Large Tree Count	2	
Tree Species Richness	2	
Shrub Species Richness	10	
Grass Species Richness	9	
Forb Species Richness	2	
Native Grass Cover (%)	23.5	
Leaf Litter Cover (%)	53.1	
Non-native plant cover (%)	<1	
Coarse Woody Debris (m)	83	

Additional Notes: Heavily logged with removal of ironbark

Biocondition Site 22 (offset)
Regional Ecosystem: 11.4.2
Mapped Regional Ecosystem (DNRM): 11.11.15a
Location Start:-22.756893° / 149.664280°
Location End: -22.756497°/ 149.663435°

Landform / Soil: Upper terrace of Deep Creek above current flood level. Flat terrace formed on silty silty clay loam. Break of slope with gentle rise on footslopes 150m to the west.

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 18 /51
T2 Median Height / Cover (m/%): NA
S1 Median Height / Cover (m/%): 6 / 4

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Eucalyptus populnea	0 - 4			4			18
Eucalyptus crebra x populnea	4 - 7.			3			18
Eucalyptus populnea	17 - 24			7			19
Eucalyptus crebra	29 - 39			10			17
Acacia salicinia			42 - 44			2	5
Eucalyptus crebra	59 - 79			20			19
Eucalyptus populnea	79 - 86			7			23
Acacia salicinia			82 - 84			2	6
Totals				**51**	**0**	**4**	

Ground Cover

	Q1		**Q2**	**Q3**	**Q4**		**Q5**	
Bare	15	10	20	15				
Leaf	50	50	31.5	63	60			50.9
Themeda triandra	10	25	25	20				
Cymbopogon refractus	25	5	15					
Eremophila debilis		10						
Eriachne glabrata			5					
Panicum sp.					40			36
Glycine sp.			2.5	1				
Stylosanthes humilis			1					
Eucalyptus crebra				1				
Total	**100**	**100**	**100**	**100**	**100**			

Large Trees	**Threshold Size: 39cm DBH Eucalyptus / 24cm DBH non-Eucalyptus**
Eucalyptus populnea	2
Eucalyptus Crebra	3
Total	**5**

Additional Species:

Trees: Corymbia dallachiana

Shrubs: Acacia salicina, Capparis canescens, Myoporum acuminatum, Petalostigma pubescens, Atalaya hemiglauca, Breynia oblongifolia, Grevillea parallela, Alphitonia excelsa.

Grass and graminoids: Eragrostis elongatus, Bothriochloa decipiens (?), Aristida calycina, Heteropogon contortus, Chloris divaricata

Forbs: Pterocaulon sphacelatum

Exotic species:

Summary		
Canopy Cover T1 / T2 %	51	
Shrub cover (S1/S2) %	<5	
Canopy Height - Median (m)	18	
No of Canopy Species Recruiting (%)	100	2 out of 2 canopy trees recruiting
Large Tree Count	5	
Tree Species Richness	3	
Shrub Species Richness	9	
Grass Species Richness	9	
Forb Species Richness	2	
Native Grass Cover (%)	36	
Leaf Litter Cover (%)	51	
Non-native plant cover (%)	<1	
Coarse Woody Debris (m)	49	

Additional Notes: Heavily logged with removal of ironbark. Site has been subject to heavy grazing activity

Biocondition Site 23 (offset)
Regional Ecosystem: 11.4.2
Mapped Regional Ecosystem (DNRM): 11.11.15a
Location Start:-22.756893° / 149.664280°
Location End: -22.756497°/ 149.663435°

Landform / Soil: Upper terrace of Deep Creek above current flood level. Flat terrace formed on silty clay loam. Break of slope with gentle rise on footslopes 150m to the west.

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 20 /57
T2 Median Height / Cover (m/%): 12 /9
S1 Median Height / Cover (m/%): 6 / 24

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Eucalyptus crebra	0 - 8			8			23
Eucalyptus crebra		13 - 17			4		12
Eucalyptus crebra	20 - 30			10			21
Eucalyptus populnea		28 - 33			5		8
Acacia salicinia			31 - 35			4	5
Eucalyptus crebra	38 - 45			7			10
Eucalyptus crebra	47 - 56			9			23
Eucalyptus crebra	57 - 65			8			22
Atalaya hemiglauca			67 - 70			3	6
Corymbia dallachiana			73 - 76			3	6
Eucalyptus populnea	75 - 85			10 .			18
Atalaya hemiglauca			82 - 89			7	6
Eucalyptus crebra	84 - 89			5			18
Acacia salicinia			88 - 94			6	7
Acacia salicinia			97 - 98			1	6
Totals				**57**	**9**	**24**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	10	10	40	15	10	
Leaf	61.5	60	42.5	45	40	49.8
Heteropogon contortus	10					
Aristida calycina	10		15		10	
Eragrostis elongatus	5	10				
Cymbopogon refractus	2.5	5		10		
Chloris divaricata				5	40	24.5
Glycine sp.	1					
Pterocaulon sphacelatum			2.5			
Myoporum acuminatum				25		
Cyperus gracilis		15				
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	Threshold Size: 39cm DBH Eucalyptus / 24cm DBH non-Eucalyptus
Eucalyptus populnea	
Eucalyptus Crebra	2
Total	**2**

Additional Species:

Trees: Corymbia dallachiana

Shrubs: Alphitonia excelsa, Grewia retusifolia, Capparis mitchellii, Capparis canescens, Myoporum acuminatum, Pogonolobus reticulatus, Maytenus cunninghamii

Grass and graminoids: Aristida latifolia

Forbs: Brunoniella australis

Exotic species:

Summary		
Canopy Cover T1 / T2 %	57	
Shrub cover (S1/S2) %	24	
Canopy Height - Median (m)	20	
No of Canopy Species Recruiting (%)	100	2 out of 2 canopy trees recruiting
Large Tree Count	2	
Tree Species Richness	3	
Shrub Species Richness	9	
Grass Species Richness	6	
Forb Species Richness	3	
Native Grass Cover (%)	25	
Leaf Litter Cover (%)	50	
Non-native plant cover (%)	<1	
Coarse Woody Debris (m)	92	

Additional Notes: Heavily logged with removal of ironbark. Site has been subject to heavy grazing activity

Biocondition Site 24 (offset)
Regional Ecosystem: 11.3.25
Mapped Regional Ecosystem (DNRM): 11.3.25
Location Start:-22.767269° / 149.657604°
Location End: -22.766490° / 149.657269°

Landform / Soil: Incised drainage line. Fluvial sands and silts in channel. No bedrock exposed in stream channel.

Structural Formation: Open Forest

T1 Median Height / Cover (m/%): 33 /34
T2 Median Height / Cover (m/%): 10 /43
S1 Median Height / Cover (m/%): 7 / 49

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Pouteria chartacea		0 - 7			7		19
Mallotus philippensis			5 - 7.			2	6
Casuarina cunninghamiana		7 - 12.			5		16
Mallotus philippensis			12 - 22.			10	8
Eucalyptus tereticornis	12 - 24.			12			32
Eucalyptus tereticornis		24 - 28			4		19
Alphitonia excelsa			21 - 28.			7	7
Mallotus philippensis			29 - 34			5	6
Casuarina cunninghamiana		34 - 42			9		18
Mallotus philippensis			50 - 56			6	6
Mallotus philippensis			58 - 64			6	6
Melaleuca fluviatilis	67 - 89			22			34
Casuarina cunninghamiana		67 - 75			8		13
Lophostemon grandiflorus		89 - 97				9	14
Acacia disparrima			96 - 100			4	7
Totals				**34**	**33**	**49**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	40	30	30	20	25	
Leaf	40	30	30	20	20	28
Cyperus polystachyus	10	10	10			
Jasminum didymum	10					
Psydrax odorata		5				
Trophis scandens		10				
Entolosia stricta		10				
Panicum maximum var. trichoglume		5		50	40	
Chrysopogon fallax			25			
Eragrostis elongata					10	
Sida cordifolia*			5			
Eustrephis latifolius				5		

Lantana camara*				2.5	
Alternanthera pungens*				2.5	
Passiflora suberosa*					2.5
Paspalideum distans					2.5
Total	**100**	**100**	**100**	**100**	**100**

Large Trees	**Threshold Size: 49cm DBH for Eucs; 29cm for non-Eucs**	
Casuarina cunninghamiana	.	9
Melaleuca fluviatilis	5	
Lophostemon grandiflorus		3
Eucalyptus tereticornis	3	
Pouteria chartacea		1
Total	**8**	**13**

Additional Species:

Trees: Corymbia tessellaris

Shrubs: Ficus opposita, Planchonia careya, Flueggia virosa, Breynia oblongifolia

Grass and Graminoids: Aristida sp., Lomandra longifolia, lomandra filiformis

Forbs: Cyanthilium cinereum

Exotic species: Lantana camara*

Summary		
Canopy Cover T1 / T2 %	34	
Shrub cover (S1/S2) %	50	
Canopy Height - Median (m)	33	
No of Canopy Species Recruiting (%)	100	3 out of 3 canopy trees recruiting
Large Tree Count Eucs	8	
Large Tree Count - Non-eucs	13	
Tree Species Richness	4	
Shrub Species Richness	8	
Grass Species Richness	4	
Forb Species Richness	4	
Native Grass Cover (%)	8	
Leaf Litter Cover (%)	28	
Non-native plant cover (%)		30% cover of lantana on the lower river terraces
Coarse Woody Debris (m)	7	

Additional Notes: Dense shrub cover of lantana camara on flood plain levee adjacent to channel

Biocondition Site 25 (offset)
Regional Ecosystem: 11.3.25
Mapped Regional Ecosystem (DNRM): 11.3.25
Location Start:-22.769507° / 149.657046°
Location End: -22.769376° / 149.656139°

Landform / Soil: Incised drainage line. Fluvial sands and silts in channel. No bedrock exposed in stream channel.

Structural Formation: Open Forest

T1 Median Height / Cover (m/%): 25 / 20
T2 Median Height / Cover (m/%): 14 /94
S1 Median Height / Cover (m/%): 7 / 19

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Lophostemon grandiflorus		0 - 5			5		12
Casuarina cunninghamiana		7 - 18.			11		18
Corymbia tessellaris	11 - 20.			9			30
Lophostemon suaveolens		18 - 26			8		22
Lophostemon grandiflorus			22 - 26			4	4
Casuarina cunninghamiana		27 - 32			5		18
Corymbia tessellaris	32 - 43			11			27
Lophostemon grandiflorus			37 - 40			3	6
Casuarina cunninghamiana		39 - 47			8		14
Lophostemon suaveolens		44 - 62			18		21
Mallotus philippensis			57 - 62			5	7
Casuarina cunninghamiana		61 - 67			6		14
Lophostemon suaveolens		68 - 72			5		15
Melaleuca fluviatilis		70 - 80			10		18
Mallotus philippensis			75 - 78			7	7
Lophostemon grandiflorus		80 - 85			5		9
Melaleuca fluviatilis		83 - 89			6		19
Lophostemon suaveolens		90 - 97			7		18
Totals				**20**	**94**	**19**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare			10		50	
Leaf	92.5	60	70	20	30	54.5
Chrysopogon fallax		30				6
Cyperus sp.	2.5	10	15			
Eustrephis latifolius	5					
Passiflora suberosa			2.5			
Megathyrsus maximus subsp. trichoglume			2.5			
Lomandra longifolia				80	15	
Glycine tabacina					5	

Total	**100**	**100**	**100**	**100**	**100**

Large Trees	**Threshold Size: 49cm DBH for Eucs; 29cm for non-Eucs**				
Casuarina cunninghamiana	.		13		
Melaleuca fluviatilis					
Lophostemon grandiflorus			18		
Eucalyptus tereticornis		1			
Corymbia tessellaris		4			
Lophostemon suaveolens		4			
Eucalyptus platyphylla		1			
Total		**10**	**31**		

Additional Species:

Trees:

Shrubs:Diospyros humilis, Cupaniopsis anacardioides, Acacia polystachya, Flueggea virosa

Grass and Graminoids:

Forbs: Cyanthilium cinereum

Exotic species: Lantana camara*, Cryptostegia grandiflora*, Stachytarpheta jamaicensis*, Praxelis clematidea*

Summary		
Canopy Cover T1 / T2 %	>80	
Shrub cover (S1/S2) %	19	
Canopy Height - Median (m)	29	
No of Canopy Species		
Recruiting (%)	70	5 out of 7 canopy trees recruiting
Large Tree Count Eucs	10	
Large Tree Count - Non-eucs	31	
Tree Species Richness	7	
Shrub Species Richness	5	
Grass Species Richness	1	
Forb Species Richness	3	
Native Grass Cover (%)	8	
Leaf Litter Cover (%)	6	
Non-native plant cover (%)	40% cover of lantana on the margins	
Coarse Woody Debris (m)	11	

Additional Notes: Dense shrub cover of lantana camara on flood plain levee adjacent to channel

Biocondition Site 26 (offset)
Regional Ecosystem: 11.4.2
Mapped Regional Ecosystem (DNRM): 11.11.15a
Location Start:-22.757823° / 149.665827°
Location End: -22.758158°/149.664906°

Landform / Soil: Upper terrace of Deep Creek above current flood level. Flat terrace formed on silty clay loam

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 19 /47
T2 Median Height / Cover (m/%): 12 /18
S1 Median Height / Cover (m/%): 6 / 2

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Eucalyptus crebra	0 - 15			15			17
Eucalyptus crebra	15 - 25			10			21
Eucalyptus populnea	28 - 33			5			17
Eucalyptus populnea		35 - 39			4		12
Eucalyptus crebra	47 - 59			12			19
Eucalyptus crebra x populnea		66 - 71			6		12
Eucalyptus crebra		74 - 79			5		8
Corymbia dallachiana		82 - 85			3		8
Eucalyptus crebra			93 - 95			2	4
Corymbia dallachiana	95 - 100			5			21
Eucalyptus populnea							
Atalaya hemiglauca							
Eucalyptus crebra							
Acacia salicinia							
Acacia salicinia							
Totals				**47**	**18**	**2**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare		15	20	20	15	
Leaf	61.5	52.5	55	47.5	39	51.1
Aristida latifolia	30					
Heteropogon contortus	5	30	20			
Eriachne glabrata	2.5		5			
Cymbopogon refractus				30	40	32.5
Spermacoce sp.	1					
Stylosanthes humilis*		2.5		2.5		
Cyperus sp.					5	
Phyllanthus maderaspatensis					1	
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	Threshold Size: 39cm DBH Eucalyptus / 24cm DBH non-Eucalyptus
Eucalyptus populnea	
Eucalyptus Crebra	2
Total	**2**

Additional Species:

Trees: Corymbia dallachiana

Shrubs: Vachellia bidwillii, Grevillea parallela Alphitonia excelsa, Grewia retusifolia, Capparis mitchellii, Capparis canescens, Myoporum acuminatum, Pogonolobus reticulatus, Maytenus cunninghamii

Grass and graminoids: Aristida latifolia

Forbs: Brunoniella australis

Exotic species:

Summary		
Canopy Cover T1 / T2 %	57	
Shrub cover (S1/S2) %	24	
Canopy Height - Median (m)	20	
No of Canopy Species Recruiting (%)	100	2 out of 2 canopy trees recruiting
Large Tree Count	2	
Tree Species Richness	3	
Shrub Species Richness	9	
Grass Species Richness	6	
Forb Species Richness	3	
Native Grass Cover (%)	25	
Leaf Litter Cover (%)	50	
Non-native plant cover (%)	<1	
Coarse Woody Debris (m)	92	

Additional Notes: Heavily logged with removal of ironbark. Site has been subject to heavy grazing activity

Biocondition Site 27 (offset)
Regional Ecosystem: 11.4.2
Mapped Regional Ecosystem (DNRM): Non-remnant
Location Start:-22.768177° / 149.608783°
Location End: -22.767478°/149.608260°

Landform / Soil: Upper terrace of Tooloombah Creek above current flood level. Flat terrace formed on silty clay loam. Minor overflow flood path to the east.

Structural Formation: Woodland

T1 Median Height / Cover (m/%): 19 /65
T2 Median Height / Cover (m/%): 10 /14
S1 Median Height / Cover (m/%): 6 / 7

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Eucalyptus populnea	0 - 10			10			16
Eucalyptus populnea	11 - 15.			10			21
Eucalyptus populnea	16 - 31			15			17
Eucalyptus populnea	35 - 37			2			15
Eucalyptus crebra	37 - 46			9			16
Eucalyptus crebra	53 - 65			12			17
Eucalyptus crebra	66 - 73			7			18
Acacia salicinia			77 - 81			4	5
Acacia salicinia			83 - 86			3	7
Eucalyptus crebra		86 - 94			8		12
Eucalyptus populnea		94 - 100			6		11
Totals				**65**	**14**	**7**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	40	30	5	10	15	
Leaf	40	40	40	22.5	40	-36.5
Bothriochloa decipiens (?)	10	15		10		
Sporobolus virginicus	5		10	5		
Cymbopogon refractus				30		
Chloris divaricata					20	
Eragrostis elongata		5	30	10	10	
Aristida latifolia (?)						32
Eremophila debilis			2.5			
Sida cordifolia*			2.5			
Pterocaulon sphacelatum				2.5	5	
Cyperus gracilis	5	10	10	10	10	
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 39cm DBH Eucalyptus / 24cm DBH non-Eucalyptus**
Eucalyptus populnea	2

Eucalyptus Crebra	
Total	**2**

Additional Species:

Trees:

Shrubs: Geijera parviflora, Breynia oblongifolia, Atalaya hemiglauca

Grass and graminoids: Aristida latifolia, Heteropogon contortus

Forbs:

Exotic species: Lantana camara*, Cryptostegia grandiflora*

Summary		
Canopy Cover T1 / T2 %	65	
Shrub cover (S1/S2) %	7	
Canopy Height - Median (m)	16	
No of Canopy Species Recruiting (%)	100	2 out of 2 canopy trees recruiting
Large Tree Count	2	
Tree Species Richness	2	
Shrub Species Richness	4	
Grass Species Richness	8	
Forb Species Richness	0	
Native Grass Cover (%)	32	
Leaf Litter Cover (%)	36.5	
Non-native plant cover (%)		<5
Coarse Woody Debris (m)	97	

Additional Notes: Heavily logged with removal of ironbark. Site has been subject to heavy grazing activity

Biocondition Site 28 (offset)
Regional Ecosystem: 11.3.25
Mapped Regional Ecosystem (DNRM): 11.3.25
Location Start:-22.769398° / 149.607805°
Location End: -22.768659° / 149.607335°

Landform / Soil: Incised drainage line. Fluvial sands and silts in channel. No bedrock exposed in stream channel.

Structural Formation: Open Forest

T1 Median Height / Cover (m/%): 29 /21
T2 Median Height / Cover (m/%): 12 /22
S1 Median Height / Cover (m/%): 7 / 16

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Eucalyptus tereticornis	3 - 18.			15			28
Melaleuca trichostachya			52 - 57			5	8
Melaleuca fluviatilis		57 - 66			9		12
Casuarina cunninghamiana			59 - 63			7	7
Corymbia tessellaris	63 - 69			6			30
Melaleuca fluviatilis		76 - 87			11		12
Lophostemon grandiflorus			84 - 88			4	6
Melaleuca fluviatilis		98 - 100			2		13
Totals				**21**	**22**	**16**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	72.5	50	32.5	49	55	
Leaf	10	20	25	10	10	15
Chrysopogon fallax					15	3
Cyperus polystachys	10					
Casuarina cunninghamiana	5					
Unidentified forb	2.5					
Eustraphis latifolius		5				
Sida cordifolia*			2.5			
Cynodon dactylon					15	
Megathyrsus maximus subsp. Trichoglume"		20	30	40		
Lomandra longifolia						
Parthenium hysterophorus*				1		
Cyperus gracilis		5	10			
Bothriochloa pertusa*					5	
Total	**100**	**100**	**100**	**100**	**95**	

Large Trees	**Threshold Size: 49cm DBH for Eucs; 29cm for non-Eucs**
Casuarina cunninghamiana	2
Melaleuca fluviatilis	3

Lophostemon grandiflorus	1
Eucalyptus tereticornis	4
Corymbia tessellaris	3
Total	

Additional Species:

Trees:

Shrubs:Diospyros humilis, Cupaniopsis anacardioides, Mallotus philippensis

Grass and Graminoids:

Forbs:

Exotic species: Lantana camara*, Cryptostegia grandiflora*, Stachytarpheta jamaicensis*, Praxelis clematidea*

Summary		
Canopy Cover T1 / T2 %	21	
Shrub cover (S1/S2) %	22	
Canopy Height - Median (m)	29	
No of Canopy Species Recruiting (%)	100	3 out of 3 canopy trees recruiting
Large Tree Count Eucs	7	
Large Tree Count - Non-eucs	6	
Tree Species Richness	7	
Shrub Species Richness	4	
Grass Species Richness	1	
Forb Species Richness	1	
Native Grass Cover (%)	3	
Leaf Litter Cover (%)	15	
Non-native plant cover (%)	40% cover of lantana on the margins	
Coarse Woody Debris (m)	12	

Additional Notes: Dense shrub cover of lantana camara on flood plain levee adjacent to channel

Biocondition Site 29 (offset)
Regional Ecosystem: 11.3.25
Mapped Regional Ecosystem (DNRM): 11.3.25
Location Start:-22.754647° / 149.599144°
Location End: -22.754095° / 149.599731°

Landform / Soil: Incised drainage line. Fluvial sands and silts in channel. No bedrock exposed in stream channel.

Structural Formation: Open Forest

E Median Height / Cover (m/%): 33 /11
T1 Median Height / Cover (m/%): 17 /64
S1 Median Height / Cover (m/%): 6 / 24

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Casuarina cunninghamiana		3 - 8.			12		12
Casuarina cunninghamiana			8 - 16.			8	3
Eucalyptus tereticornis	8 - 19.			11			33
Casuarina cunninghamiana		22 - 29			7		12
Casuarina cunninghamiana			21 - 28			7	6
Melaleuca fluviatilis		28 - 36			8		8
Casuarina cunninghamiana		36 - 47			11		11
Casuarina cunninghamiana		53 - 68			5		10
Melaleuca trichostachya			63 - 68			5	6
Ficus obliqua		71 - 84			13		16
Casuarina cunninghamiana		84 - 92			8		17
Melaleuca trichostachya			88 - 92			4	6
Lophostemon grandiflorus			96 - 100			4	6
Totals				**11**	**64**	**24**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	40	10	10	50	30	
Leaf	35	75	45	20	30	41
Chrysopogon fallax	15					11
Sporobolus virginicus			40			
Casuarina cunninghamiana	5					
Bothriochloa pertusa*	5					
Cynodon dactylon		15			20	
Cyperus polystachys			5		20	
Panicum maximum var. trichoglume*				20		
Melaleuca trichostachya				10		
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 49cm DBH for Eucs; 29cm for non-Eucs**
Casuarina cunninghamiana	19
Melaleuca fluviatilis	7

Melia azaderach		4
Ficus obliqua		1
Eucalyptus tereticornis	2	
Corymbia tessellaris	1	
Total	**10**	**24**

Additional Species:

Trees:

Shrubs:Unid scrambling shrub, Mallotus philippensis, Cupaniopsis anacardioides, Ficus coronata

Grass and Graminoids:

Forbs: Ludwigia pepaloides

Exotic species: Cryptostegia grandiflora*, Lantana camara*, Parthenium hysterophorus*, Xanthium occidentale

Summary		
Canopy Cover T1 / T2 %	64	
Shrub cover (S1/S2) %	24	
Canopy Height - Median (m)	17	
No of Canopy Species Recruiting (%)	100	6 out of 6 canopy trees recruiting
Large Tree Count Eucs	10	
Large Tree Count - Non-eucs	24	
Tree Species Richness	6	
Shrub Species Richness	5	
Grass Species Richness	2	
Forb Species Richness	1	
Native Grass Cover (%)	11	
Leaf Litter Cover (%)	41	
Non-native plant cover (%)	30% cover of lantana on the margins	
Coarse Woody Debris (m)	35	

Additional Notes: Dense shrub cover of lantana camara on flood plain levee adjacent to channel

Biocondition Site 30 (offset)
Regional Ecosystem: 11.4.2
Mapped Regional Ecosystem (DNRM): Non-remnant
Location Start:-22.755425° / 149.600224°
Location End: -22.754620°/149.600651°

Landform / Soil: Upper terrace of Tooloombah Creek above current flood level. Flat terrace formed on silty clay loam.

Structural Formation: Open Forest

T1 Median Height / Cover (m/%): 19/50
T2 Median Height / Cover (m/%): 12 /11
S1 Median Height / Cover (m/%): 6 / 22

Tree Cover	T1 Interval (m)	T2	S1	T1 intercept (m)	T2	S1	height (m)
Corymbia tessellaris		0 - 2			2		12
Eucalyptus crebra			4 - 8.			4	8
Eucalyptus crebra	4 - 10.			6			23
Corymbia clarksoniana		11 - 15.			4		8
Eucalyptus crebra			15 - 18			3	8
Alphitonia excelsa			21 - 23			2	8
Eucalyptus crebra	25 - 40			15			14
Eucalyptus crebra			41 - 44			3	7
Eucalyptus crebra	44 - 60			16			19
Eucalyptus crebra			62 - 65			6	6
Eucalyptus populnea	73 - 82			9			18
Eucalyptus crebra	82 - 86			4			19
Eucalyptus crebra		84 - 89			5		11
Corymbia dallachiana		98 - 100				2	9
Atalaya hemiglauca			73 - 75			2	5
Totals				**50**	**11**	**22**	

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	10	30	30	10	10	
Leaf	35	30	48	55	48	43.1
Aristida calycina		40				
Themeda triandra	5					9
Atalaya hemiglauca			10			
Borthiochloa pertusa*			10	10	5	
Solanum esuriale			2			
Cyperus gracilis	50			20	15	
Glycine tabacina						
Sida cordifolia*				5		
Glycine sp.	1					
Aristida personata					10	

Sida spinosa*				2.5	
Panicum maximum var. trichoglume				10	
Total	**100**	**100**	**100**	**100**	**100**

Large Trees	**Threshold Size: 39cm DBH Eucalyptus / 24cm DBH non-Eucalyptus**
Eucalyptus populnea	2
Eucalyptus Crebra	5
Total	**7**

Additional Species:

Trees:

Shrubs: Grevillea parallela, Alphitonia excelsa, Grewia retusifolia, Petalostigma pubescens, Capparis canescens, Senna artemisioides

Grass and graminoids: Eragrostis longifolia, Heteropogon contortus

Forbs: .

Exotic species: Stylosanthes humilis

Summary		
Canopy Cover T1 / T2 %	50	
Shrub cover (S1/S2) %	22	
Canopy Height - Median (m)	19	
No of Canopy Species Recruiting (%)	100	3 out of 3 canopy trees recruiting
Large Tree Count	7	
Tree Species Richness	3	
Shrub Species Richness	6	
Grass Species Richness	4	
Forb Species Richness	3	
Native Grass Cover (%)	9	
Leaf Litter Cover (%)	43	
Non-native plant cover (%)	<5	
Coarse Woody Debris (m)	88	

Additional Notes: Heavily logged with removal of ironbark. Site has been subject to heavy grazing activity

Biocondition Site 31 (offset)
Regional Ecosystem: non-remnant (11.4.9)
Mapped Regional Ecosystem (DNRM): Non-remnant
Location Start:-22.66015° / 149.668131°
Location End: -22.660827°/149.667589°

Landform / Soil: Vertosol with gilgai on plain above flood level

Structural Formation: regrowth patchy open forest

T1 Median Height / Cover (m/%): 5.7/15
S1 Median Height / Cover (m/%): 1.5 / 17.5

Tree Cover	T1 Interval (m)	T2 interval (	S1 Interval (m)	height (m)
Acacia harpophylla	0 - 1.5			5.4
Alectryon diversifolius			27.1 - 30	1.3
Acacia harpophylla	34.1 - 36.3			5.7
Alectryon diversifolius	48.7 - 51.2			5.2
Acacia harpophylla			68.3 - 70.7	2.4
Carissa ovata			71.9 - 84.1	0.8
Acacia harpophylla	75.4 - 77			6.2
Acacia harpophylla	80.5 - 85.4			6.1
Acacia harpophylla	87.8 - 90.4			6
Totals				

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare		85	60	30	93	
Leaf	30	10	35	60	5	28
Enteropogon ascicularis	70	5	5	10	2	18.4
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 28cm DBH non-Eucalyptus**
none	0
Total	**0**

Additional Species:

Trees: Acacia harpophylla

Shrubs: Alectryon diversifolius, Capparis lasiantha

Grass and graminoids:

Forbs: Enchylaena tomentosa

Exotic species: Opuntia tomentosa

Summary		
Canopy Cover T1 / T2 %	15	
Shrub cover (S1/S2) %	17.5	
Canopy Height - Median (r	5.7	
No of Canopy Species Rec	100	1 out of 1 canopy trees recruiting
Large Tree Count	0	
Tree Species Richness	1	
Shrub Species Richness	3	
Grass Species Richness	1	
Forb Species Richness	1	
Native Grass Cover (%)	18	
Leaf Litter Cover (%)	28	
Non-native plant cover (%	<1	
Coarse Woody Debris (m)	0	

Additional Notes: Substantial gilgais, patchy regrowing Brigalow, ground layer very dry impacting grass species identification

Biocondition Site 32 (offset)
Regional Ecosystem: non-remnant (11.4.9)
Mapped Regional Ecosystem (DNRM): Non-remnant
Location Start:-22.659763° / 149.663182°
Location End: -22.660602°/149.663189°

Landform / Soil: Vertosol with gilgai on plain above flood level

Structural Formation: regrowth patchy open forest

T1 Median Height / Cover (m/%): 3.9/11
T2 Median Height / Cover (m/%): 1.8 /1.4
S1 Median Height / Cover (m/%): 0.4 / 3

Tree Cover	T1 Interval (m)	T2 interval (r	S1 Interval (m)	height (m)
Acacia harpophylla	0 - 1.2			1.6
Acacia harpophylla			12.6 - 14.4	0.4
Acacia harpophylla			15.9 - 16.6	0.3
Alectryon diversifolius			20.6 - 21.2	0.6
Alectryon diversifolius		52.5 - 53.9		1.8
Acacia harpophylla	57.5 - 60.2			3.6
Acacia harpophylla	67.3 - 69			3.4
Acacia harpophylla	85 - 88.4			5.5
Acacia harpophylla	96 - 98.8			5.5
Totals				

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	40	10	20	40	50	
Leaf	40	80	80	60	50	62
Pennisetum ciliare	20					4
Portulacca sp.		10				
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 28cm DBH non-Eucalyptus**
none	0
Total	**0**

Additional Species:

Trees: Acacia harpophylla

Shrubs: Alectryon diversifolius, Capparis lasiantha, Carissa ovata

Grass and graminoids:

Forbs: Enchylaena tomentosa, Cyperus polystacheous, Maireana villosa

Exotic species: Opuntia stricta, Sida rhombifolia, Lantana camara, Cryptostegia grandiflora, Cirsium vulgare

Summary		
Canopy Cover T1 / T2 %	11	
Shrub cover (S1/S2) %	3	
Canopy Height - Median (r	3.9	
No of Canopy Species Rec	100	1 out of 1 canopy trees recruiting
Large Tree Count	0	
Tree Species Richness	1	
Shrub Species Richness	3	
Grass Species Richness	0	
Forb Species Richness	4	
Native Grass Cover (%)	0	
Leaf Litter Cover (%)	62	
Non-native plant cover (%	<5	
Coarse Woody Debris (m)	0	

Additional Notes: Substantial gilgais, patchy regrowing Brigalow, ground layer very dry impacting grass species identification

Biocondition Site 33 (offset)
Regional Ecosystem: non-remnant (11.4.9)
Mapped Regional Ecosystem (DNRM): Non-remnant
Location Start:-22.664458° / 149.667971°
Location End: -22.66451°/149.667028°

Landform / Soil: Vertosol with gilgai on plain above flood level

Structural Formation: regrowth in substantially cleared area

T1 Median Height / Cover (m/%): 3.4/10.6
S1 Median Height / Cover (m/%): 1.3 / 3

Tree Cover	T1 Interval (m)	T2 interval (I	S1 Interval (m)	height (m)
Alectryon diversifolius	0 - 0.8			3.5
Elaeodendron australe			34.8 - 35.6	1.5
Acacia harpophylla	37.0 - 38.9			3.4
Acacia harpophylla	39.8 - 41.2			2.4
Alectryon diversifolius	69.1 - 71.8			2.5
Alectryon diversifolius			92.3 - 95	1.2
Acacia harpophylla	96.2 - 100			5.5
Totals				

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	45	30	60	20	90	
Leaf	40	60	30	80	10	44
Hyptis suaveolens	10					
Sida hackettiana	5					
Grass (indeterminate)		10				
Portulacca sp.			10			
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 28cm DBH non-Eucalyptus**
none	0
Total	**0**

Additional Species:

Trees: Acacia harpophylla

Shrubs: Alectryon diversifolius, Capparis lasiantha, Maireana villosa, Alstonia constricta, Melia azaderach, Eremophila mitchellii

Grass and graminoids:

Forbs: Sida sp.

Exotic species: Bidens pilosa, Sida hackettiana, Lantana camara, Cryptostegia grandiflora, Stachytarpheta sp., Hyptis suaveolens

Summary		
Canopy Cover T1 / T2 %	10.6	
Shrub cover (S1/S2) %	3	
Canopy Height - Median (n	3.4	
No of Canopy Species Recr	100	1 out of 1 canopy trees recruiting
Large Tree Count	0	
Tree Species Richness	1	
Shrub Species Richness	7	
Grass Species Richness	0	
Forb Species Richness	2	
Native Grass Cover (%)	0	
Leaf Litter Cover (%)	44	
Non-native plant cover (%)	<20	
Coarse Woody Debris (m)	0	

Additional Notes: Gilgais only present in very low relief, substantially impacted by clearing, adjacent to lower flood level community, ground layer very dry impacting grass species identification

Biocondition Site 34 (offset)
Regional Ecosystem: non-remnant (11.4.9)
Mapped Regional Ecosystem (DNRM): Non-remnant
Location Start:-22.664749° / 149.662996°
Location End: -22.664736°/149.663765°

Landform / Soil: Vertosol with gilgai on plain above flood level

Structural Formation: regrowth patchy open forest

T1 Median Height / Cover (m/%): 8/25
T2 Median Height / Cover (m/%): 3.2/3.6
S1 Median Height / Cover (m/%): 2.1 / 9.2

Tree Cover	T1 Interval (m)	T2 interval (m	S1 Interval (m)	height (m)
Casuarina cristata	0 - 2.2			7.2
Alectryon diversifolius			3.6 - 5.7	2.3
Acacia harpophylla	24 - 31			7.5
Acacia harpophylla		32 - 35.6		3.2
Acacia harpophylla	34.3 - 37.9			8.4
Acacia harpophylla	45.2 - 50			8
Carissa ovata			60.2 - 62.4	0.6
Casuarina cristata	72 - 76.9			11.5
Acacia harpophylla	80.7 - 85.2			4.5
Acacia harpophylla			88.5 - 93.4	3.5
Totals				

Ground Cover

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	
Bare	6		80	35	25	
Leaf	94	100	20	65	75	70.8
Total	**100**	**100**	**100**	**100**	**100**	

Large Trees	**Threshold Size: 28cm DBH non-Eucalyptus**
Casuarina cristata	1
Total	**1**

Additional Species:

Trees: Acacia harpophylla

Shrubs: Alectryon diversifolius, Capparis lasiantha, Carissa ovata, Denhamia celastroides

Grass and graminoids:

Forbs: Maireana villosa

Exotic species: Cryptostegia grandiflora

Summary		
Canopy Cover T1 / T2 %	25	
Shrub cover (S1/S2) %	3.6	
Canopy Height - Median (r	8	
No of Canopy Species Recr	100	2 out of 2 canopy trees recruiting
Large Tree Count	1	
Tree Species Richness	2	
Shrub Species Richness	4	
Grass Species Richness	0	
Forb Species Richness	1	
Native Grass Cover (%)	0	
Leaf Litter Cover (%)	70	
Non-native plant cover (%)	<1	
Coarse Woody Debris (m)	23	

Additional Notes: Substantial gilgais, patchy regrowing Brigalow, ground layer very dry impacting grass species identification

Appendix B Habitat quality assessment score summary and tables

Habitat Quality Assessment Calculation - Method

The quality of the vegetation associated with the draft Project OMP (both impacted sites and proposed offset sites) has been assessed using the 'Guide to determining terrestrial habitat quality V1.2' (EHP, April 2017) (hereon referred to as the Guide). The assessment methods are based on the BioCondition Assessment Manual (developed by the Queensland Herbarium), and align with the habitat quality measures required for input into the EPBC Act 'Offsets Assessment Guide' thereby determining land-based offset ratios. This allows for a consistent framework for environmental offsets between the State and Commonwealth approval process.

Under the EPBC Offset Assessment Guide there are three components to be considered when calculating habitat quality: site condition, site context, and species stocking rate. These differ slightly from the DES' Guide which describes site condition, site context and fauna species habitat (i.e. the ability of an area to support the threatened species in focus). The following habitat quality values (for both impact and offset sites) are provisional and based on precedents set under recent projects. As such, the habitat attributes as measured onsite have been apportioned differently to the method in the DES Guide so as to inform the three habitat components described in the EPBC Offset Assessment Guide.

Site condition is described using 15 habitat attributes derived from onsite and desktop assessment measures as follows:

- Recruitment of woody perennial species;
- Native plant species richness – trees;
- Native plant species richness – shrubs;
- Native plant species richness – grasses;
- Native plant species richness – forbs;
- Tree canopy height;
- Shrub canopy cover;
- Native perennial grass cover;
- Organic litter cover;
- Large trees – number;
- Coarse woody debris;
- Weed cover;
- Quality and availability of food and foraging habitat; and
- Quality and availability of shelter.

Site context is described using 7 habitat attributes derived from desktop assessment measures as follows:

- Patch size (fragmented);
- Connectedness (fragmented);
- Context (fragmented);
- Ecological corridors;
- Threats to species;
- Species mobility capacity; and
- Role of site location to overall population.

Species stocking rate is considered as a measure of the species presence on the site. For this assessment species stocking rate has been assessed on a scale of 0 – 4 as follows:

- 0 – There is no evidence the species is present onsite;
- 1 – The species has been detected onsite during habitat assessment surveys or other ecological surveys;
- 2 – Species density onsite is equivalent to or more than species density measured at a reference site that known from a reference site (not associated with an important population);
- 3 – Species density onsite is equivalent to that known from a reference site associated with an important population; and
- 4 – Species density onsite is equivalent to the maximum species density known from a reference site/s associated with an important population.

The overall scores (out of 10) for site condition and site context have then been weighted at a 30% contribution each to the overall habitat quality score used in the EPBC Offset Assessment Guide (based on level of importance). The species stocking rate number contributes the remaining 40% of the final habitat quality score.

Table 6. Project habitat quality attributes – site condition scores

		Assessment unit	Assessment site number	Recruitment of woody perennial species	Tree species richness	Shrub species richness	Grass species richness	Forb species richness	Tree canopy height	Tree canopy cover	Shrub canopy cover	Native perennial grass cover	Organic litter cover	Large trees	Coarse woody debris	Weed cover	Quality of food/foraging habitat	Quality and availability ofshelter	Site condition subtotal	Site condition maximum possible score
Project impact sites																				
Vegetation clearing – Koala habitat		1	1	5	3	3	3	5	5	5	3	3	5	10	2	10	5	5	**72**	**100**
		1	2	3	5	5	3	3	5	5	5	5	5	15	2	5	10	10	**86**	**100**
		1	4	3	3	5	3	3	5	5	5	3	3	15	2	10	10	5	**80**	**100**
		1	5	3	5	5	3	3	5	5	5	3	3	15	2	10	10	5	**82**	**100**
		1	10	5	3	5	5	2.5	5	5	5	1	5	5	2	10	10	5	**73.5**	**100**
		1	11	5	5	5	5	2.5	5	5	-	0	5	5	0	5	10	10	**67.5**	**100**
		1,2[1]	6	5	3	5	2.5	2.5	5	5	3	1	5	10	2	5	5	10	**69**	**95**
Potential groundwater drawdown	Koala habitat	3	3	5	5	5	3	3	5	3	3	1	5	10	2	5	5	5	**65**	**100**
		3	8	5	5	3	2.5	2.5	5	5	3	0	1	15	2	5	5	5	**64**	**100**
		3	9	5	5	5	3	3	5	5	3	3	5	10	2	10	10	10	**79**	**100**
		3	13	5	5	5	2.5	2.5	5	3	3	0	3	15	2	10	10	10	**76**	**100**
	Other	-	14													-	-	-		
		-	12	5	2.5	5	3	3	5	5	3	1	5	10	2	-	-	-	**59.5**	**80**
		-	7	-	5	3	5	2.5	5	5	5	1	5	5	0	-	-	-	**46.5**	**75**
Project offset sites																				
Koala habitat	OMA 1	1	15	5	2.5	5	3	2.5	5	5	5	1	3	5	0	3	5	5	**55**	**100**
		1	16	3	5	5	3	3	5	5	3	3	5	5	2	10	5	5	**67**	**100**
		1	17	3	5	5	3	3	5	5	3	5	5	5	2	10	5	5	**69**	**100**
		1	18	5	3	3	3	3	5	3	3	5	5	5	2	10	5	5	**65**	**100**
		1	19	5	3	5	3	3	5	5	3	5	5	5	2	10	5	5	**69**	**100**
		1	20	5	5	5	2.5	2.5	5	5	3	3	5	15	0	3	5	5	**74**	**100**
		1	21	5	3	5	5	3	5	3	5	5	5	5	5	10	5	5	**69**	**100**

		1	22	5	3	5	5	3	5	3	3	5	5	5	2	10	5	5	**72**	**100**
		1	23	5	3	5	3	3	5	3	5	5	5	5	5	10	5	5	**68**	**100**
		1	26	5	3	5	3	3	5	3	3	5	3	5	5	10	5	5	**69**	**100**
	OMA 2	1	27	5	3	3	5	2.5	5	3	5	5	5	5	5	10	10	5	**76.5**	**100**
		1	28	5	5	5	2.5	2.5	5	5	3	1	5	10	0	3	5	10	**67**	**100**
		1	29	5	5	5	3	2.5	5	3	3	5	3	15	0	3	5	10	**72.5**	**100**
		1	30	5	3	5	3	3	5	3	5	3	5	5	5	10	10	5	**75**	**100**
Ornamental Snake habitat – [1]	OMA 3	2	31	5	2.5	3	2.5	2.5	3	5	5	3	5	0	0	10	**5**	1	**52.5**	**100**
		2	32	5	2.5	3	2.5	3	3	3	3	0	5	0	0	10	**5**	1	**46**	**100**
		2	33	5	2.5	3	2.5	2.5	3	3	3	0	5	0	0	5	**5**	1	**40.5**	**100**
		2	34	5	3	3	2.5	2.5	3	3	3	0	5	5	2	10	**5**	1	**55**	**100**

1. Site 6 also constitutes likely habitat for Ornamental Snake

Table 7. Project habitat quality attributes – site context and species habitat scores, and overall habitat quality scores

					Site context attributes													
		Assessment unit	Assessment site number	Patch size (ha)	Patch size (fragmented)	Connectedness (fragmented)	Context (fragmented)	Ecological corridors	Threats to species	Species mobility capacity	Role of site location to overall population	Site context subtotal	Site context maximum possible score	Individual site condition score	Individual site context score	Species stocking rate	Overall assessment unit habitat quality score[2]
Project impact sites																	
Vegetation clearing – Koala habitat		1	1	19.4	2	0	0	0	1	5	1	9	56	7.2	1.6	1	5
		1	2	0.4	10	5	2	0	7	10	1	35	56	8.6	6.25	1	
		1	4	51.6	10	0	2	0	7	7	1	27	56	8.0	4.82	1	
		1	5	13	10	4	4	0	7	7	1	33	56	8.2	5.89	1	
		1	10	1.12	10	2	4	0	15	10	1	42	56	7.35	7.5	1	
		1	11	1.54	10	4	4	0	15	10	1	44	56	7.11	7.86	1	
		1,2[1]	6	24.4	10	0	2	0	7	7	1	27	56	6.9	4.82	1	
Potential groundwater drawdown	Koala habitat	3	3	16.4	10	0	2	0	1	7	1	21	56	6.5	3.75	1	5
		3	8	27	10	2	0	0	7	7	1	27	56	6.4	4.82	1	
		3	9	21.8	10	2	4	0	15	10	1	42	56	7.9	7.5	1	
		3	13	11.2	10	0	2	0	15	10	1	38	56	7.6	6.79	1	
	Other	-	14	4	10	5	4	0	-	-	-	19	26	-	7.31	1	-
		-	12	0.6	0	0	4	0	-	-	-	4	26	7.44	1.54	1	6
		-	7	2.94	10	2	0	0	-	-	-	12	26	6.2	4.62	1	6
Project offset sites																	
Koala habitat	OMA 1	1	15	89.2	10	5	5	0	7	10	1	38	56	5.5	6.79	1	5
		1	16	11.9	10	4	4	0	7	10	1	36	56	6.7	6.43	1	
		1	17	24.7	10	5	4	0	7	10	1	37	56	6.9	6.61	1	
		1	18		10	5	4	0	7	10	1	37	56	6.5	6.61	1	
		1	19	36.8	10	4	4	0	7	7	1	36	56	6.9	6.43	1	
		1	21		10	4	4	0	7	10	1	37	56	7.4	6.43	1	
		1	22	45.5	10	5	4	0	7	10	1	37	56	6.9	6.61	1	
		1	23		10	5	4	0	7	10	1	37	56	7.2	6.61	1	
		1	26		10	5	4	0	7	10	1	41	56	6.8	6.61	1	

	OMA 2	1	27	17.6	10	4	2	0	7	10	1	**34**	**56**	**7.65**	**6.07**	**1**	**5**
		1	28	15.5	10	2	2	0	15	7	1	**37**	**56**	**6.7**	**6.61**	**1**	
		1	29		10	2	2	0	15	7	1	**37**	**56**	**7.25**	**6.61**	**1**	
		1	30	8.43	10	5	2	0	7	10	1	**35**	**56**	**7.5**	**6.25**	**1**	
Ornamental Snake habitat –	OMA 3	2	31	128	10	2	2	0	7	10	1	**32**	**56**	**5.25**	**5.71**	**0**	**3**
		2	32		10	2	2	0	7	10	1	**32**	**56**	**4.6**	**5.71**	**0**	
		2	33		10	2	2	0	7	10	1	**32**	**56**	**4.1**	**5.71**	**0**	
		2	34		10	2	2	0	7	10	1	**32**	**56**	**5.5**	**5.71**	**0**	

1. Site 6 also constitutes likely habitat for Ornamental Snake
2. Overall score (100%) = Individual site condition score x 0.3 (30%) + Individual site context score x 0.3 (30%) + Species stocking rate x 0.4 (40%)

Appendix C EPBC Act Offsets Assessment Guide Output Results

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Koala
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Vegetation clearing	**Area**	108.2	Hectares	Based on site habitat quality assessments (July 2018)
			Quality	**5**	Scale 0-10	
			Total quantum of impact	54.10	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	54.10	Adjusted hectares	Mamelon Property - OMA 1 and OMA 2	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	303	**Risk of loss (%) without offset**	5%	**Risk of loss (%) with offset**	0%	15.15	90%	13.64	13.10	59.45	109.90%	Yes	
									Future area without offset (adjusted hectares)	287.9	**Future area with offset (adjusted hectares)**	303.0								
					Time until ecological benefit	15	**Start quality (scale of 0-10)**	**5**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**7**	2.00	90%	1.80	1.75				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	54.1	59.45	109.90%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Ornamental Snake
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Vegetation clearing	**Area**	20.9	Hectares	Based on site habitat quality assessments
			Quality	**3**	Scale 0-10	
			Total quantum of impact	6.27	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	6.27	Adjusted hectares	Mamelon Property - OMA 3	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	128	**Risk of loss (%) without offset**	20%	**Risk of loss (%) with offset**	0%	25.60	90%	23.04	22.14	29.14	464.69%	Yes	
									Future area without offset (adjusted hectares)	102.4	**Future area with offset (adjusted hectares)**	128.0								
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**3**	**Future quality without offset (scale of 0-10)**	**3**	**Future quality with offset (scale of 0-10)**	**5**	2.00	90%	1.80	1.76				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	6.27	29.14	464.69%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Appendix D Financial Settlement Offset Calculator Output

Taylor, Brett

From: no-reply@des.qld.gov.au
Sent: Monday, 12 November 2018 10:54 AM
To: Taylor, Brett
Subject: Environmental offsets calculator results - Financial settlement offset calculator
Attachments: data.csv

Environmental offsets calculator results - Financial settlement offset calculator

Payment details

Non-protected area cost

On ground cost	$70,000.00
Landholder incentive payment	$0.00
Administrative cost	$50,000.00
Total non-protected area cost	$120,000.00

Protected area cost

Total protected area cost	$0.00

Total cost

Grand total	$120,000.00

Total offset area: 3.5 ha

Section 1

Bioregion
    Rivers and inland waterways
Subregion
    Inland Waterways
Impact area
    3.5 ha
Notional offset area
    3.5 ha
Distinct matter area 1.1

    Impact area: 3.5 ha
    Notional offset area: 3.5 ha

    Matter groups:

- 1.1.1: Fish passage

Sections, areas and matter groups used in calculations

Section	Bioregion / Marine (and waterways) zone	Subregion / Marine bioregion	Local government area (LGA)	Distinct matter area (DMA)	DMA impact area (ha)	DMA notional offset area (ha)	Matter group
1	Rivers and inland waterways	Inland Waterways		1.1	3.5	3.5	1.1.1 Fish passage