

Green Tape Solutions

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Offset Management Plan - Conservation Area North and Conservation Area South Paradise Waters Residential Estate

Grampian Drive, Deebing Heights

Prepared for Stockland Development Pty Ltd



Prepared by:

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Report Number: PR16085_OMPInternal_VerF

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Signed declaration of accuracy is provided in page iii.

Document Records - Quality

TITLE	Offset Management Plan – Conservation Area North and Conservation Area South, Paradise Waters Residential Estate
FILED AS	PR16085_OMPInternal_VerD

Revision	Date	Prepared by (name/title)	Reviewed by (name/ title)	Approved by (name/title)
Draft version A	12/10/2016	Carla Perkins, Ecologist	Kelly Matthews, Director / Principal Ecologist	Kelly Matthews, Director / Principal Ecologist
Final version B	25/09/2017	Jasmine Vink, Graduate Ecologist	Kelly Matthews, Director / Principal Ecologist	Kell Cronin, Stockland Development Pty Ltd
Review following DOEE Comments Version C	02/11/2017	Jasmine Vink, Graduate Ecologist	Kelly Matthews, Director / Principal Ecologist	Kell Cronin, Stockland Development Pty Ltd
Review following DOEE Comments Version D	19/11/2017	Kelly Matthews, Director / Principal Ecologist	Kelly Matthews, Director / Principal Ecologist	Kell Cronin, Stockland Development Pty Ltd
Version E	20/12/2019	Kelly Matthews, Director / Principal Ecologist	Kelly Matthews, Director / Principal Ecologist	Kell Cronin, Stockland Development Pty Ltd
Version F – Change of dates	20/06/2019	Jasmine Vink, Graduate Ecologist	Kelly Matthews, Director / Principal Ecologist	Dave Franklin, Stockland Development Pty Ltd

Signed declaration of accuracy

I declare that:

1. To the best of my knowledge, all the information contained in, or accompanying this Offset Management Plan – Conservation Area North and Conservation Area South - Paradise Waters Residential Estate 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.
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 - c. The above offences are punishable on conviction by imprisonment, a fine or both.

Signed



Full name (please print)

DAVID LANER

Organisation (please print)

STOCKLAND

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I. Introduction

I.1 Background Information

Stockland Development Pty Ltd (Stockland) has EPBC Act approval to develop the 'Paradise Waters' residential estate at Grampian Drive, Deebing Heights near Ipswich, Queensland. The development is approximately 339 ha in area and is situated on land described as Lot 207 on CH31135, Lot 3 on RP179314, Lot 4 on RP179314 and Lot 210 on CH31207, hereinafter referred as the 'Site' (**Figure 1**). It is proposed that residential development be confined to Lot 207 on CH31135 (the northern lot) with the balance of the lots (the southern lots) to be dedicated to Ipswich City Council for conservation purposes.

On 13 May 2013, Stockland referred the project under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) for a determination as to whether the project constitutes a 'controlled action'. The Minister's Delegate determined that the project was a 'controlled action', with the controlling provisions of Listed Threatened Species & Communities (Sections 18 & 18A), more specifically defined in the request for further information on the koala (*Phascolarctos cinereus*).

An analysis of the vegetation to be removed as part of the development determined that 85ha of existing high and medium quality critical koala habitat is nominated for removal, with an additional seven (7) hectares becoming inaccessible to koala due to dog exclusion fencing (RPS, 2012, RPS, 2013b). The vegetation to be removed on site is described as 12.9-10.2/12.9-10.7 (*Corymbia citriodora*, *Eucalyptus crebra* open forest on sedimentary rocks / *Eucalyptus crebra* woodland on sedimentary rocks). As detailed in Condition 3 of the EPBC Approval (EPBC 2013/6864), Stockland is required to compensate for the loss of 92 ha of koala habitat and provide offsets, as follows:

- A minimum of 113.20 ha of koala habitat consisting of an internal offset referred to as 'Conservation area – North' and 'Conservation area – South' (as shown in Annexure 1 of EPBC 2013/6864) (**Figure 1**) is to be protected. Provision has been made for these internal offset areas to be rehabilitated, zoned as Conservation under the Ipswich Planning Scheme and transferred to Ipswich City Council for management as conservation areas in perpetuity.
- A minimum of 88 ha of koala habitat that is mapped as a Category X area within an external property ('Cannon Creek', Beaudesert). These areas will be legally protected through a Voluntary Declaration (VDec) under the *Vegetation Management Act 1999*. This declaration is legally binding on all current and future owners of the property.

I.2 Purpose of the Offset Management Plan

This Offset Management Plan (OMP) details the management objective, actions, interim performance and completion criteria for the provision of a koala habitat offset, as identified on **Figure 1** as 'Conservation area – North' and 'Conservation area – South'.

This offset will contribute to offsetting the impacts to koala habitat associated with the development of the Paradise Waters Residential Estate. The OMP is to protect and enhance koala habitat values in the offset site, to inform adaptive management, and demonstrate an increase in the quality of koala habitat required in accordance with the EPBC approval.

The total offset area and condition outcomes have been determined in accordance with the EPBC Act Environmental Offsets Policy (Offsets Policy) and associated guidance, and are detailed in EPBC

Preliminary Documentation - Paradise Waters Residential Development (RPS, 2014). The offset calculations are provided in **Appendix 1**.

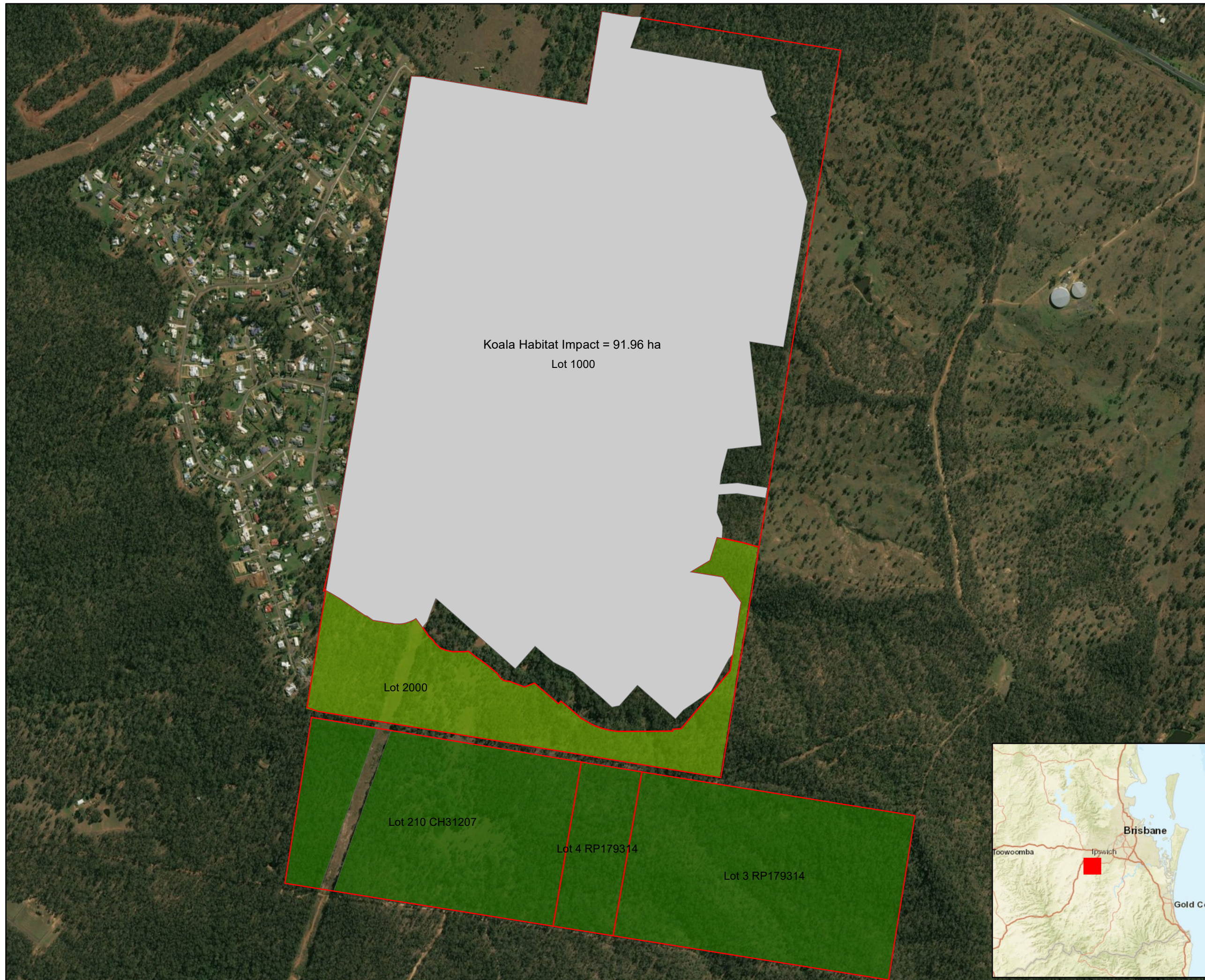
This OMP was prepared to meet the requirements of Condition 4 of the EPBC conditions of approval (EPBC 2013/6864). The approval condition requirements in respect of this OMP, and summary of how this plan complies with each requirement, is tabled in **Appendix 2**.

The plan does not detail management of the external offset. The offset management for the external site is detailed in a separate report (Crossroads Rural & Environment, 2016).

The approved plans, and any variations to the approved plans, will be made accessible to the public on the website of the approval holder for the duration of the EPBC approval.

**FIGURE 1:
IMPACT AND OFFSET
SITE AREA.**

**Project: Offset Management Plan
Paradise Waters**



- Development Footprint
- Site
- Internal offset areas**
 - Conservation area - North
 - Conservation area - South

Koala Habitat Impact = 91.96 ha
Lot 1000

Lot 2000

Lot 210 CH31207

Lot 4 RP179314

Lot 3 RP179314

Notes:
- Environmental data by Green Tape Solutions
- Site Infrastructure and Impact Areas from Client and RPS 2018
- Base map Copyright (c) Esri and its data suppliers.
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Ref: Paradise Waters 2018
Author: KM



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Document History:

Rev	Reason for Issue	Reviewer	Approver	Date
A	Draft	KM	KM	14/9/2018
B	Final	KM	KM	17/12/2018

2. Description of the Offset Management Areas

2.1 Property and Ownership Details

Table 1: Property and Ownership Details

Name of Registered Owner(s)	Stockland Development Pty Ltd
Postal Address	Grampian Drive, Deebing Heights
Phone / Mobile	07 3305 8620
Email address	geninfo@stockland.com.au
Real Property Description	Lot 207 on CH31135 Lot 3 on RP179314 Lot 4 on RP179314 Lot 210 on CH31207
Property Name	Paradise Waters
Area of Property (ha)	<u>Conservation Area North</u> : 26.9 ha Lot 207 on CH3113 (with offset site being future lot 2000 on CH31135) 26.9 ha <u>Conservation Area South</u> : 85.46 ha Lot 3 on RP179314 Lot 4 on RP179314 Lot 210 on CH31207
Local Government Area	Ipswich City Council (ICC)
Tenure Type	Freehold

A reconfiguration of lot application has been submitted to **ICC** for approval to cancel Lot 207 on CH31207 and create two new lots 1000 and 2000 on CH31207. Lot 1000 will be the development area and Lot 2000 will be zoned as Conservation Area and be dedicated to Ipswich City Council for conservation under this offset management.

2.2 Offset Location

The offset areas situated on the site consist of two conservation areas (Conservation Area – North and Conservation Area – South) within the southern extent of the development (**Figure 1**). These areas are defined by the coordinates given in **Table 2**.

Table 2: Bounding coordinates for offset area.

Offset Area	Coordinates	Location
Conservation Area - North	476343 m E, 6935782 m N	North-west corner
	477597 m E, 6935924 m N	North-east corner
	477482.4 m E, 693522 m N	South-east corner

Offset Area	Coordinates	Location
	476287 m E, 6935437 m N	South-west corner
Conservation Area - South	476275 m E, 6935412 m N	North-west corner
	478053 m E, 6935124 m N	North-east corner
	477978 m E, 6934647 m N	South-east corner
	476201 m E, 6934932 m N	South – west corner

2.3 Legally Secured Offset Details

The offset site will be zoned as Conservation Zone within Ipswich City Council (ICC) Planning Scheme to provide the site and the vegetation with a high level of protection. Under ICC Planning Scheme, there is a clear intent for the Conservation Zone to be used as a mechanism to preserve environmental values in the City. This intent is best expressed by the overall outcomes sought for the Conservation Zone, which are articulated in Section 4.18.2 (s) of the Planning Scheme. The overall outcomes are:

4.18.2 (a) The Conservation Zone provides for the protection and management of the Principal Nature Conservation Areas within or adjoining urban areas, including—

- i. areas or features of particular habitat significance;*
- ii. the diversity of habitats for flora and fauna;*
- iii. land which acts as wildlife corridors;*
- iv. important areas of remnant, endangered, vulnerable, rare and other significant vegetation;*
- v. significant wetlands; and*
- vi. natural areas of particular importance in terms of scenic amenity;*
- vii. to the general exclusion of the majority of land uses.*

ICC has agreed in principle to accept the donation of and transfer of the lots. These parcels will become part of Council's broader conservation estate, and shall be maintained and managed for long-term conservation values. These four parcels will be zoned as Conservation Area, and ongoing management of the site will be consistent with any conservation outcomes outline in this OMP. Whilst Stockland will be responsible for the management of the site for the duration of the OMP requirement (9 years), any associated works on the donated lands will be managed according to the long-term conservation outcomes, which will align with obligations under the EPBC offset requirements.

In the long-term, the land will form part of ICC's Conservation land holdings and will be managed through budget revenue created through the expanded Paradise Waters rates base. Council has resolved to accept in principle a transfer of ownership of the Southern Lots for long-term conservation.

2.4 Site Description

The site and surrounding area have been historically cleared for rural purposes. The property is currently used for grazing and also contains a high-voltage powerline and associated easement that crosses from north to south. These land uses have resulted in weed incursion within open grassland areas and into the edges, gullies and watercourses of forested areas.

The landform of the site can be described as undulating low hills, with valley flats having been extensively cleared whilst higher ridges in the eastern extent of the site consist of forested areas. The

dominant geology of the site consists of Jurassic lithic labile and feldspathic labile sandstone with some Quaternary clay, silt, sand, gravel and floodplain alluvium.

Minor watercourses consist of predominately ephemeral tributaries that feed Deebing Creek. The creek itself is barely discernible in the southern extent of the site, but has been extensively eroded in the northern extent.

The creek and surrounding valley flats are largely devoid of vegetation, apart from Queensland blue gum (*Eucalyptus tereticornis*) regrowth in the northern extent of the site. Forested areas classified as remnant vegetation occur along the eastern and southern boundary. These areas have been selectively logged for timber.

An analysis of the Regional Ecosystems (REs) within the broader landscape was undertaken and results show that REs on the site are consistent with those mapped by the Department of Natural Resources and Mines (DNRM). REs within the offset area consist of spotted gum (*Corymbia citriodora*) open forest and Moreton bay ash (*Corymbia tessellaris*) open forest/woodland (**Table 3** and **Figure 2: Vegetation communities and Ecological Features** (Excerpt from RPS, 2012).). Details of the vegetation communities within the offset area are provided in **Sections 2.2.1 – 2.2.2**.

Table 3: Regional Ecosystems (REs) present within offset area.

RE	Description	VM Class
RE 12.9-10.2	<i>Corymbia citriodora</i> , <i>Eucalyptus crebra</i> open forest on sedimentary rocks	Least Concern
RE 12.9-10.7	<i>Eucalyptus crebra</i> , <i>E. tereticornis</i> +/- <i>C. tessellaris</i> , <i>Angophora</i> spp., <i>E. melanophloia</i> woodland on sedimentary rocks	Of Concern

2.4.1 Vegetation Community 1 – *Corymbia tessellaris* Open Forest

Vegetation Community 1 occurs on the lower slopes around the edges of the site (**Figure 2**). The canopy in this area is dominated by Moreton Bay ash (*Corymbia tessellaris*), with narrow-leaved ironbark (*Eucalyptus crebra*) and Queensland blue gum (*Eucalyptus tereticornis*) commonly occurring (**Plate 1**).

The shrub layer is dominated by Maiden’s wattle (*Acacia maidenii*), hickory wattle (*Acacia disparrima*), and the introduced invasive plants, lantana (*Lantana camara*), creeping lantana (*L. montevidensis*) and velvety tree pear (*Opuntia tomentosa*). Green wattle (*Acacia irrorata*) and black wattle (*Acacia leiocalyx*) were also associated. The ground cover is dominated by black-tipped spear grass (*Heteropogon contortus*) and pitted bluegrass (*Bothriochloa decipiens*) with the introduced red Natal grass (*Melinis repens*) also occurring.

This vegetation community is consistent with RE 12.9-10.7, described as *Eucalyptus crebra*, *E. tereticornis* +/- *C. tessellaris*, *Angophora* spp., *E. melanophloia* woodland on sedimentary rocks. This RE is listed as Of Concern under the *Vegetation Management Act 1999* (VM Act).



Plate 1: Vegetation Community 1

2.4.2 Vegetation Community 2 – *Corymbia citriodora* Open Forest

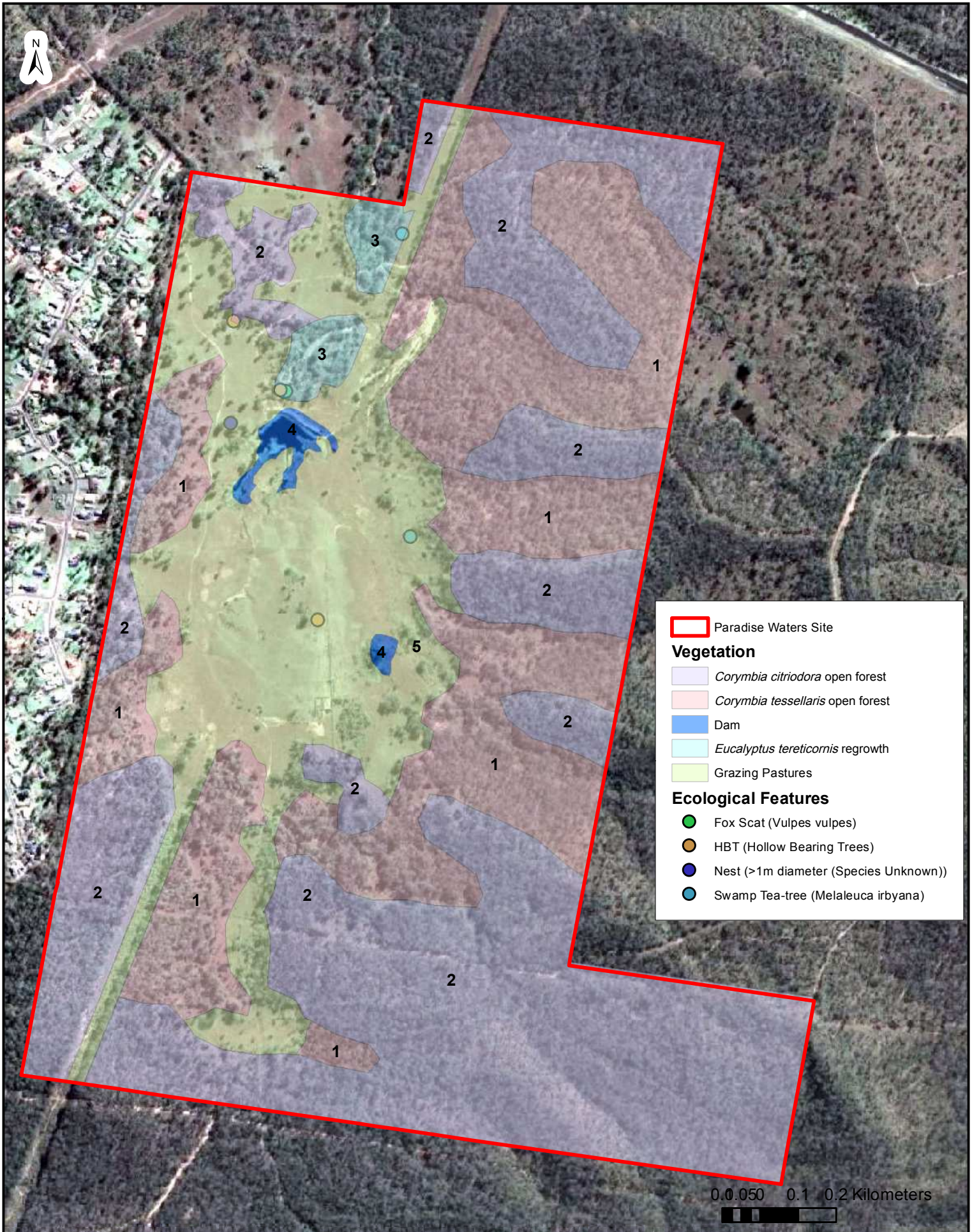
Vegetation Community 2 occurs along the ridges and upper slopes around the edges of the site (**Figure 2**). The canopy in this area is dominated by spotted gum (*Corymbia citriodora*), with narrow-leaved Ironbark (*Eucalyptus crebra*) and Queensland blue gum (*Eucalyptus tereticornis*) (**Plate 2**).

The understorey composition is concurrent with the Vegetation Community 1.

This area is consistent with RE 12.9-10.2, described as *Corymbia citriodora*, *Eucalyptus crebra* open forest on sedimentary rocks. This RE is listed as Least Concern under the VMA.



Plate 2: Vegetation Community 2



Paradise Waters Site

Vegetation

- Corymbia citriodora* open forest
- Corymbia tessellaris* open forest
- Dam
- Eucalyptus tereticornis* regrowth
- Grazing Pastures

Ecological Features

- Fox Scat (*Vulpes vulpes*)
- HBT (Hollow Bearing Trees)
- Nest (>1m diameter (Species Unknown))
- Swamp Tea-tree (*Melaleuca irbyana*)

0.0 0.050 0.1 0.2 Kilometers

DIGITAL CADASTRAL DATA BASE -
BOUNDARY INFORMATION
REGIONAL ECOSYSTEM VERSION 6 DATA
DERM AERIAL PHOTOGRAPHY.
Data provided by the
State of Queensland (Department of Environment
and Heritage Protection) 2012.
The State gives no warranty
in relation to the data (including accuracy,
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and accepts no liability (including without limitation,
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Project Manager	NS
Compiled by	KM
Map Projection	MGAz56
Map Datum	GDA94
File Reference	PR110937-4
Sheet Number	1 of 1

Client	Stockland Developments Pty Ltd
Title	Figure 2 - Vegetation Communities and Ecological Features

SCALE (A4) 1:12,745	DATE 07/08/2012	DRAWING NO. PR110937-4	ISSUE A
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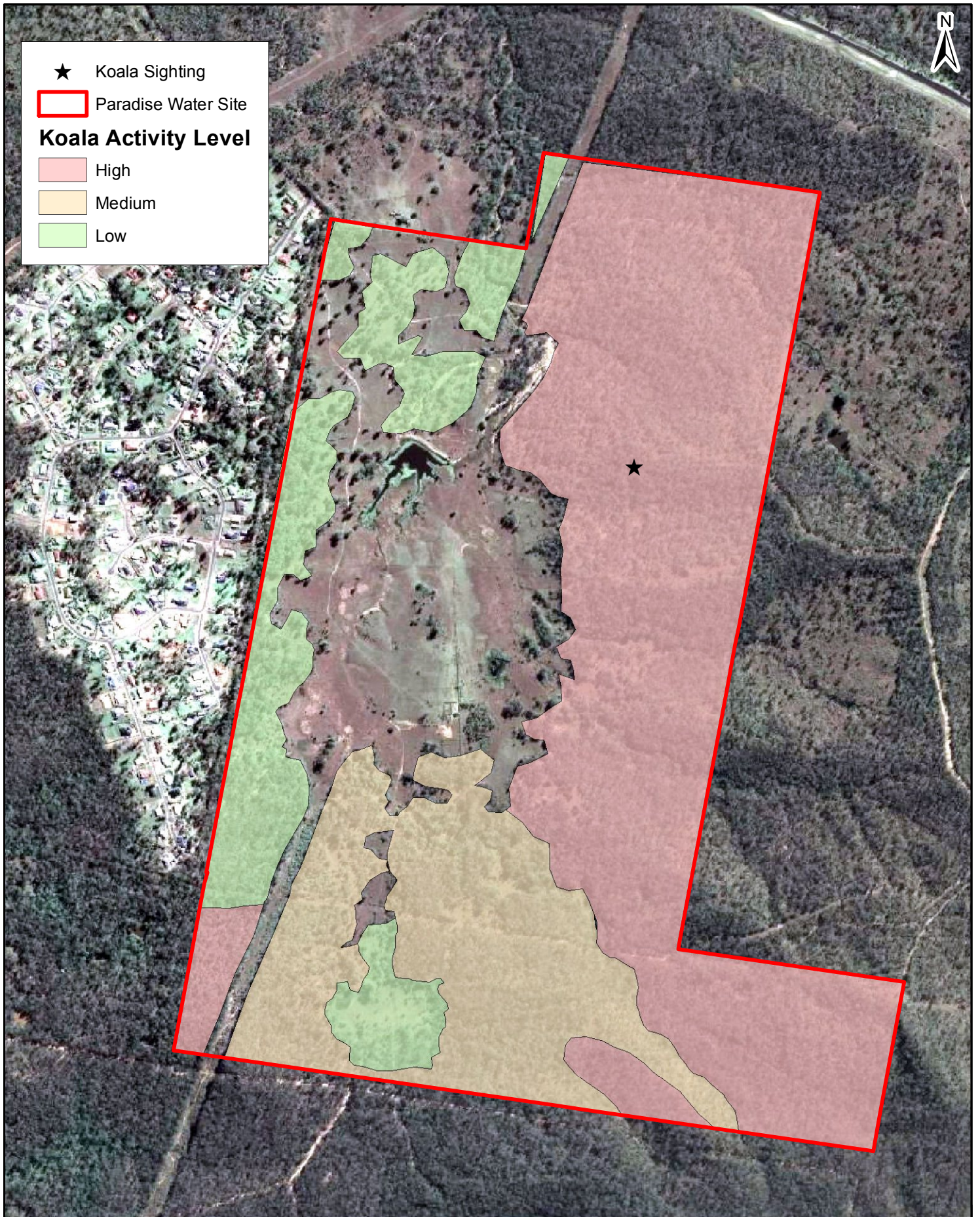
2.5 Koala Habitat and Ecological Corridor


The *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006 – 2016* (the 'Koala Plan') (EPA, 2006) identifies significant koala habitat area around the Ipswich area, based on species records and known vegetation communities within the area.

An ecological impact assessment undertaken by RPS (RPS, 2012) recorded direct observation of a single koala on the site, and evidence of koalas utilising the site as habitat and food source. Field surveys have confirmed the presence of koalas on the site, and vegetation on the eastern side of the site has been assessed as having High koala habitat value. Vegetation along the southern boundary has been identified as having Medium habitat value while the western extent of the site has Low habitat value (RPS, 2012) (**Figure 3**).

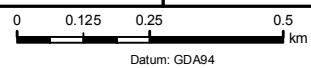
The Koala Population Analysis undertaken by RPS (2013a) revealed that, at a larger scale, the koala population on site is likely to be part of an important population: the Ipswich - Beaudesert koala population (RPS, 2013a). Lee *et al.* (2010) demonstrated that the Ipswich and Beaudesert koala populations are genetically related and connected through the Flinders - Goolman Conservation Estate and the Flinders - White Rock - Spring Mountain Conservation Estate. The vegetation connectivity within the surrounding area is relatively intact and the lack of infrastructures enables safe movement of koalas through the landscape. The offset site will support the long-term connection with this area.

The offset site is comprised of an ecological corridor and has been strategically designated within ICC's Planning Scheme to retain and enhance linkages between areas of remnant vegetation within the broader landscape. The offset site plays an important role in maintaining ecosystem services and providing connectivity to protected vegetation to the Flinders - Goolman Conservation Estate, which itself is connected to Flinders - White Rock - Spring Mountain Conservation Estate.



Client: Stocklands	
Compiled by: MR	Date: 13/03/13
Approved by: KM	Date: 13/03/13
	

Koala Habitat Map	
Figure 3	Project: Paradise Waters Koala Survey
Source: Aerial from Bing Maps	



3. Offset Baseline Condition Assessment

As stipulated by Condition 4 of the EPBC Approval (EPBC 2013/6864), a monitoring plan is required in order to assess the success of offset management activities against the baseline condition of the offset site. This is required to demonstrate whether or not the specified condition improvement over time to increase the ecological benefit, specifically relating to koalas, has been attained. This monitoring plan must include, but not be limited to, control sites and periodic ecological surveys undertaken by a suitably qualified person/s. The suitably qualified person will have at a minimum 10 years relevant experience relating to offsets and rehabilitation.

3.1 Offset Calculator Input

As part of the EPBC preliminary documentation, the habitat quality was determined using the Koala Habitat Assessment Tool (DotE, 2014). The habitat assessment tool is used instead of the three generic habitat quality categories found in the Offsets Assessment Guide and is applied once to the entire area of habitat being offset. Result of the Koala Habitat Assessment Tool is used to calculate the starting quality of the offset site and to estimate the future quality, with the proposed offset/management interventions.

Table 4 demonstrates how current and proposed future habitat quality are calculated. In its current form, the offset area is considered to contain a start quality value of 7. Approximately 80% of the offset area is covered in remnant vegetation, however portions of the area are open grass, weeds or non-remnant and non-regrowth native regeneration. The area has a high potential to support koala movement and usage in its current state; however, the lack of canopy vegetation and the infestation of weed species reduce its value. The current habitat quality score was calculated as 7.

BioCondition assessment tool (Eyre *et al.*, 2015) will be used to evaluate the vegetation composition and condition over the time. A baseline condition assessment was undertaken in October 2016. The results of this condition assessment will be compared to those of subsequent monitoring events in order to assess the overall success of current management practices and to track the overall progress of the offset in relation to the OMP objective and improve habitat condition from score of 7 to 8 within the required 9 years.

Table 4: Koala Habitat Assessment Tool

Highlighted section outlines the area that will be improved as a result of the rehabilitation work.

Attribute	Coastal*	Attributed Score	Score of internal offset areas - Prior to offset management	Score of internal offset areas - After 9 years of management
koala Occurrence	Evidence of one or more koala within the last 2 years	2	The koala Population Analysis revealed that the site contain koala habitat and koala were sighted directly north of the offset area during the site investigation. Score 2	This value remains unchanged. Evidence of one or more koala within the last 2 years still occur at proximity of the site. Score 2
	Evidence of one or more koala within 5km of the edge of the impact area within the last 5 years	1		
	None of the above	0		
Vegetation Composition	Has forest or woodland with 2 or more known koala food tree species in the canopy	2	Section of the offset site contains a number of koala food tree species including <i>Corymbia tessellaris</i> , <i>Eucalyptus crebra</i> and <i>Eucalyptus tereticornis</i> . However, there are large areas of medium, low and very low-quality habitat which contains no no-juvenile koala trees. As a result of the proposed rehabilitation work will focus on the large degraded area to improve the overall vegetation composition to sustain any koala population. Score 1	Large portions of the internal offset areas include open grass, weeds or non-remnant and non-regrowth native vegetation community. These areas include no or limited non-juvenile koala canopy trees. The proposed rehabilitation management actions will improve the habitat quality of the offset site by providing suitable planting and by improving the habitat quality through weed management. We will use the BioCondition assessment tool to evaluate the vegetation composition and condition over the time. The results of this first BioCondition assessment (undertaken in 2016) will be compared to those of subsequent monitoring events in order to assess the overall success of current management practices and to track the overall progress of the offset in relation to the OMP objectives and improve habitat condition from score of 7 to 8 within the required 9 years. Details are provided in the following Sections 3.2 and 3.3. Score 2
	Has forest or woodland with only 1 species of known koala food tree present in the canopy	1		
	None of the above	0		
Habitat Connectivity	Area if part of a contiguous landscape >500ha	2	The site is contiguous with Flinders-Goolman Conservation Estate which is >500ha. Score 2	This value remains unchanged. The site is contiguous with Flinders-Goolman Conservation Estate which is >500ha. Score 2
	Area if part of a contiguous landscape <500ha, but >300ha	1		
	None of the above	0		

Attribute	Coastal*	Attributed Score	Score of internal offset areas - Prior to offset management	Score of internal offset areas - After 9 years of management
Key Existing Threats	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence.	2	There is no evidence of koala mortality within the site. Score 2.	This value remains unchanged. The offset site is located south of any type of development and the installation of dog proof fencing will minimise any koala mortality within the offset site. Score 2
	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence.	1		
	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, or Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.	0		
Recovery Value	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1** of the koala Assessment Tool.	2	The koala Population Analysis revealed that the site contains koala population but is not critical to conserve koala within the broader landscape. Score 0	This value remains unchanged. The koala Population Analysis revealed that the site contains koala population but is not critical to conserve koala within the broader landscape. Score 0
	Uncertainty exists as to whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1** of the koala Assessment Tool.	1		
	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1** of the koala Assessment Tool.	0		
Total habitat quality score			7	8

*Source: DoE, 2013a

3.2 Baseline Condition Assessment Methodology

Assessment of vegetation condition is important for understanding habitat values, assessing the impacts of land management practices, and formulating management actions. It also forms the basis for determining offset suitability and for ongoing monitoring of offset condition.

The BioCondition assessment framework has been developed by the Queensland Herbarium as a vegetation condition assessment tool to provide a measure of how well a terrestrial ecosystem is functioning for the maintenance of biodiversity values at a local or property scale. In BioCondition, 'condition' refers to the degree to which the attributes of a patch of vegetation differs from the attributes of the same vegetation type in its reference (or unmodified) state (Eyre *et al.*, 2015). It is a rapid, site-based, quantitative and repeatable assessment methodology that provides a numeric score that can be summarised as a condition rating, or functional through to dysfunctional condition for biodiversity. It should be noted that the BioCondition score (BC score) does not provide an index of habitat suitability for fauna, as this depends on many other factors that are not directly surrogates of condition, for example predator risk and sheltering component of habitat, such as dead, hollow-bearing trees.

A total of four (4) BioCondition transects were undertaken within the offset site on 5th October 2016. Assessments at these sites was undertaken in accordance with the methodology outlined in *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland Assessment Manual (version 2.2)* (the 'BioCondition Manual') (Eyre *et al.*, 2015). The results from each site were then compared to the benchmark for RE 12.9-10.2. Benchmarks have been developed by the Queensland Herbarium based on quantitative values derived from reference sites for each condition attribute.

A 100 m measuring tape was used to establish a transect for each BioCondition plot, with each transect being set up with the 0 m mark on the southern end of the transect. Median vegetation height data was measured using an electronic clinometer (HaglofHEC) and the coordinates of each transect were recorded with a GPS receiver (Garmin Montana 650T with waypoint averaging). At each transect, photographs were taken at the start (0 m) and centre (50 m). At the start of the transect, a landscape photograph taken along the 100 m tape. At the centre, a series of five (5) plot centre landscape photos were taken in the direction of north, east, south, west and ground, with the aid of a compass.

Following data collection from each site, calculations were performed to provide a 'score' to compare attribute data from each transect site against the relevant benchmark value.

A control site will be established within the Paradise Waters project area, isolated from the proposed management actions and located outside the offset area. BioCondition assessments will be performed within the control site to verify the success of the management actions. The location of the control site has not yet been finalised as the development layout has been modified. BioCondition assessment will be undertaken within the control site prior to the commencement of the rehabilitation work, and concurrent with offset site condition monitoring.

3.3 Baseline Condition Assessment Results

Site locations were chosen so as to best represent the vegetation communities on site and to reflect areas where disturbance factors were most pronounced (e.g. weed infestations close to edges of

cleared areas). All four of the BioCondition Assessment sites have been situated within the same vegetation community, RE12.9.10-2, due to the shape and areal extent of the offset conservation areas along the eastern boundary limiting the ability to place a site within the RE12.9-10.7 community in this location, and the small patch size of the RE12.9-10.7 community within the western extent of the other offset area.

The location of each BioCondition Assessment site is given in **Table 5** and illustrate in **Figure 4**.

Table 5: Location of BioCondition (BC) sites within offset area.

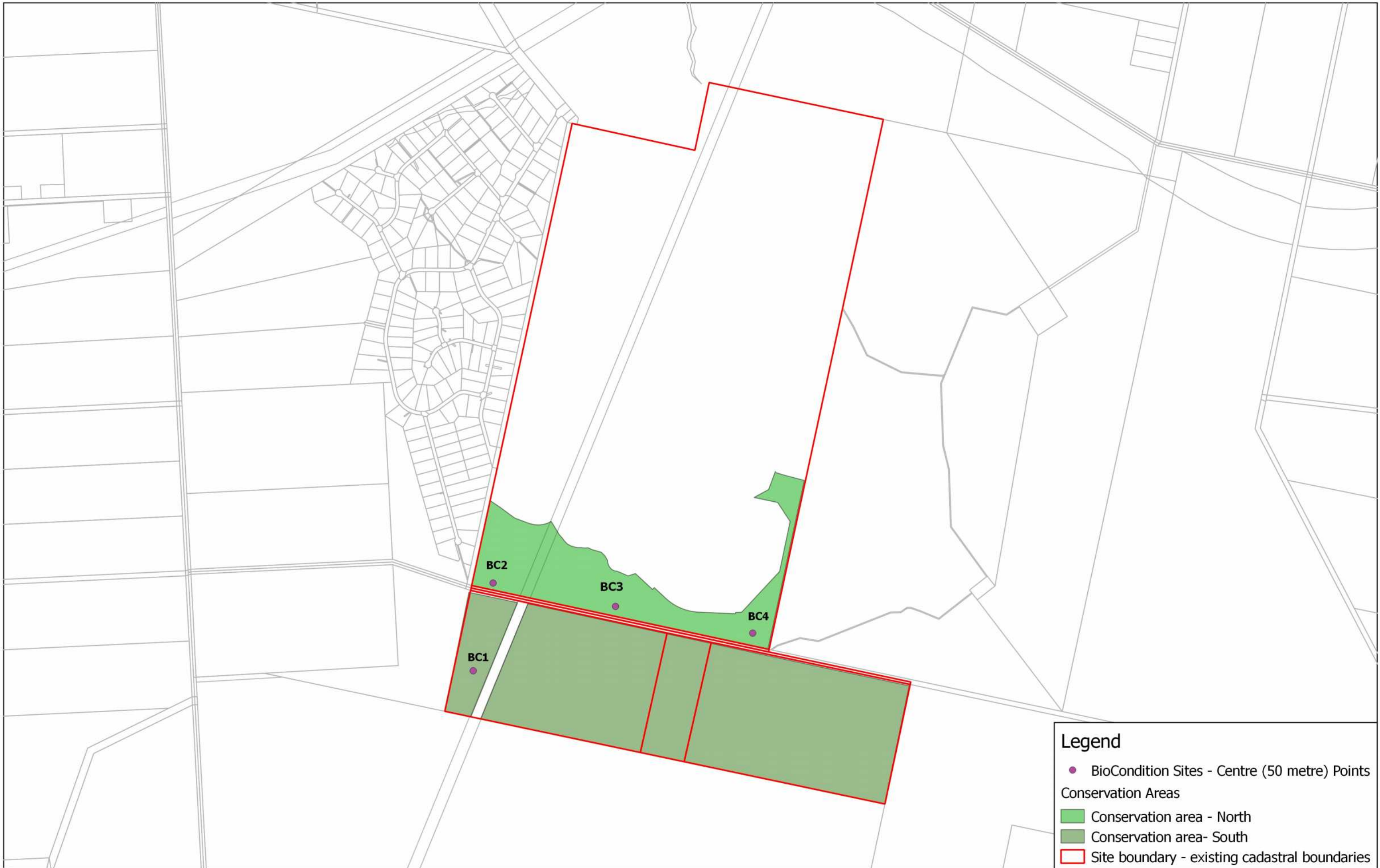
BioCondition Sites	Vegetation Community	Transect Coordinates	
		Start Latitude / longitude (Decimal Degree)	End Latitude / longitude (Decimal Degree)
BC1	RE12.9-10.2	-27.7066 / 152.771	-27.7061 / 152.771
BC2	RE12.9-10.2	-27.7059 / 152.765	-27.705 / 152.765
BC3	RE12.9-10.2	-27.7086 / 152.76	-27.7079 / 152.759
BC4	Grazing Pasture	-27.7052 / 152.76	-27.7046 / 152.76

The BC Score for the assessment site is determined by adding the scores for each site-based and landscape level attribute and dividing by the maximum possible score for the RE (i.e. 100 for wooded REs, 50 for grassland REs, 65 for shrub-land RE or 85 for mangrove REs).

Calculations were then performed to classify the BioCondition score for each site and to derive the final BC class and functionality rating. These classes and the final BC class for each BioCondition site is provided in **Table 6**.

Table 6: Classification of BioCondition Scores into Classes and Functionality Ratings

BC Class	BC Score	BC Score as (%)	Rating Description	Total habitat quality score (as per EPBC calculator)
1	> 0.90	> 90%	Highly functional	10
2	0.80 - 0.89	80% - 89%	Functional - Highly functional	9
3	0.70 - 0.79	70% - 79%	Functional	8
4	0.60 - 0.69	60% - 69%	Dysfunctional – Functional	7
5	0.50 - 0.59	50% - 59%	Dysfunctional	6
6	0.40 - 0.49	40% - 49%		5
7	0.30 - 0.39	30% - 39%		4
8	0.20 - 0.29	20% - 29%		3
9	0.10 - 0.19	10% - 19%		2
10	<0.09	<10%		1



Legend

- BioCondition Sites - Centre (50 metre) Points
- Conservation Areas
- Conservation area - North
- Conservation area- South
- Site boundary - existing cadastral boundaries

Offset Management Plan - Paradise Waters Residential Estate,
Grampian Drive, Deebing Heights

CLIENT:
Stockland Pty Ltd

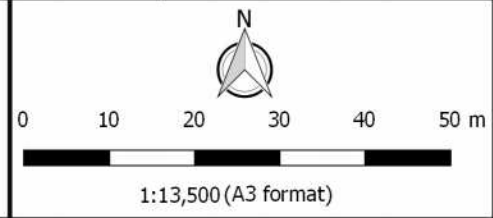
Figure 4: Location of BioCondition Assessment Sites

SHEET NUMBER:
Sheet 1 of 1

DATE
10/10/2016

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The key objectives of this BioCondition monitoring is to provide either an early warning that condition targets are unlikely to be achieved, and therefore trigger corrective action/s, or to provide an early control signal, being that management actions have or are likely to achieve the desired condition improvement by the required timeline (i.e. koala habitat quality score increased/ing from 7 to 8 in 9 years). To achieve this objective, we propose to undertake a series of management actions within the offset site which will increase the current habitat quality from 7 to 8 as required under the EPBC conditions.

Table 7 provides the results of the baseline BioCondition Assessments undertaken in October 2016. These results have been referenced against the benchmark values provided within the most current BioCondition benchmark for RE12.9-10.2 (Queensland Herbarium, 2016). RE 12.9-10.2 is described as *Corymbia citriodora subsp. variegata* +/- *Eucalyptus crebra* open forest on sedimentary rocks. However, not all the BioCondition criteria are considered relevant to the koala requirement and the benchmark has been adapted to address koala requirement on site. The following criteria will be measured and recorded to monitor change in the habitat quality for koala:

- **Koala food trees.** One of the most important factors influencing the distribution and numbers of koalas in any area is the presence and density of their food tree (Office of Environment and Heritage, 2016). Percentage cover of koala food trees canopy across the offset area will be recorded using the BioCondition Assessment. This will include the presence of large trees, tree canopy median height, recruitment of dominant canopy species richness and tree canopy cover.
- **Non-native plant cover.** Natural Resource Management Ministerial Council (2009) demonstrated that the destruction of mid-storey shelter trees and the introduction of weed species were some of the major treat to koalas. Reducing weed infestation will also support koala movement across the landscape and contribute to improving habitat for koala on site. The percentage of non-native plant cover will be estimated through the BioCondition Assessment.
- **Landscape context** attributes are scored using different attributes depending on whether the assessment is within a fragmented or intact landscape. Subregions considered to have fragmented landscapes include South East Queensland, therefore each site has been scored for the patch size, connectivity and context attributes. Landscape context attributes were assessed and scored using GIS data.

Table 7: Amended BioCondition Scores relative to the maximum score for site-based and landscape attributes relevant to koala habitat.

BioCondition Assessment Attributes	Benchmark Values (RE12.9-10.2)	Highest Possible Score for Attribute	BC1		BC2		BC3		BC4 (Grazing Pasture)		BC5 - Control Site	
			BC Value	BC Score	BC Value	BC Score	BC Score	BC Score	BC Value	BC Score	BC Value	BC Score
Site-based attributes												
Large koala food trees DBH (cm)	61	24	38	14.95	38	14.95	38	14.95	5	2.00	TBD	TBD
Koala tree canopy median height (m)	21	8	19	7.23	24.6	8.00	19	7.23	5	1.90	TBD	TBD
Recruitment of dominant koala canopy species (%)	100	8	100	8.00	100	8.00	75	6.00	10	0.80	TBD	TBD
Tree canopy cover (%)	64	8	60.3	7.54	73	8.00	44	5.50	5	0.63	TBD	TBD
Native shrub cover (%)	6	8	15.3	8.00	4.2	5.60	8.8	8.00	1	1.33	TBD	TBD
Native plant species richness – Trees	6	8	6	8.00	6	8.00	7	8.00	2	2.67	TBD	TBD
Non-native plant cover / Weed (%)	1	16	17	0.00	20	0.00	30	0.00	40	0.00	TBD	TBD
TOTAL FOR SITE-BASED ATTRIBUTES RELEVANT TO KOALA HABITAT	-	80	-	49.79	-	52.55	-	49.69	-	9.33	TBD	TBD
Landscape Attributes												
Patch size	-	10	-	10	-	10	-	10	-	10	TBD	TBD
Connectivity	-	5	-	5	-	5	-	5	-	5	TBD	TBD
Context	-	5	-	5	-	5	-	5	-	5	TBD	TBD
TOTAL FOR LANDSCAPE ATTRIBUTES	-	20	-	20	-	20	-	20	-	20	TBD	TBD
TOTAL FOR ALL ATTRIBUTES (%)	-	100	-	69.79	-	72.55	-	69.29	-	29.33	TBD	TBD

BioCondition Assessment Attributes	Benchmark Values (RE12.9-10.2)	Highest Possible Score for Attribute	BC1		BC2		BC3		BC4 (Grazing Pasture)		BC5 - Control Site	
			BC Value	BC Score	BC Value	BC Score	BC Score	BC Score	BC Value	BC Score	BC Value	BC Score
BC CLASS	-	1	-	4	-	3	-	4	-	0	TBD	TBD
HABITAT QUALITY SCORE (as per Table 6)	-	9	-	7	-	8	-	7	-	5	TBD	TBD
HABITAT QUALITY SCORES - FOLLOWING 9 YEARS MANAGEMENT - (BCSCORES)	-	9	-	8 (> 70%)	-	8 (> 70%)	-	8 (> 70%)	-	7 (>60%)	TBD	TBD

TBD – To be determined during the first BioCondition assessment monitoring

4. Offset Management Actions and Requirements

The provision of offset is to be relevant to the environmental value being impacted (e.g. koala) as well as to the associated attributes which may be lost or are at risk of loss (e.g. koala habitat). Offsets should be 'like-for-like' – that is, an offset should mitigate impacts to an environmental value by actions that benefit the same environmental value being impacted.

The objectives of this OMP are:

- To protect, manage, rehabilitate and improve koala habitat throughout the offset site; and,
- To comply with the requirements of condition 4 of EPBC Approval (EPBC 2013/6864).

The following sections detail management actions and performance criteria that will be used to achieve and demonstrate attainment and maintenance the OMP's completion criteria. As required under the approval condition, Stockland commits to:

- Monitor condition change and improvement within the offset area, through the four BioCondition monitoring sites;
- Exclude grazing from offset areas, except where necessary for bushfire prevention and control, for example by using crash grazing as outlined in **Section 4.1**;
- Install and maintain koala friendly fence to prevent domestic livestock from entering offset areas while allowing koala movement as outlined in **Sections 4.1 and 4.4**;
- Undertake regular koala predator control as outlined in **Section 4.2**.
- Manage the vegetation including increase abundance of koala food trees and controlling weeds. Where planting is required the use of local provenance plants will be provided as outlined in **Section 4.3**;
- Undertake periodic ecological surveys by a suitably qualified person as defined in **Section 6**.

4.1 Stock Exclusion

As the site is currently grazed by domestic stock, stock removal and exclusion will reduce the impact of grazing and support native vegetation regeneration within the site. This will allow for the colonisation of native grasses and forbs, assist in weed control and promote successful regeneration of canopy and understorey species utilised by koalas as habitat and foraging resources.

Stock exclusion will be achieved by:

1. **Installation of a fence along the offset site boundary** - Fencing of the offset area boundary with all fencing installed by a suitably experienced subcontractor in accordance with the following.
 - a. No barbed wire will be used in fencing installed.
 - b. For internal wire fence (i.e. not fauna-specific fencing), the bottom wire will be set a minimum of 500 mm from the ground (greater if possible) to allow for unrestricted movement of koalas and other wildlife. Strands above the bottom wire strands should be spaced at intervals of no less than 300 mm.
 - c. Fencing will be no higher than 1.2 metres. Line posts will be set 7-10 m apart with a box strainer assembly (or similar) at corners.

- d. Permanent fences will include a wire mesh gate. These must be installed at convenient locations to allow for easy movement of weed control subcontractors and fire control equipment.
- e. Electric fences are to be 2-strand with the bottom wire set at 500 mm above the ground. Electric fences will be solar powered and not require mechanical clearing of a fence-line.

2. Removal of stray stock within the offset site.

The performance criteria (PC) and targets used for this stock exclusion strategy will include:

- PC 1: Stock are excluded from the offset site, except where authorised by an ecologist for fuel/fire hazard management. Stock will be removed as soon as practicable following detection or installation of stock exclusion fencing, or within 5 days at a maximum.
- PC 2: One-way barrier fencing is established along the offset boundary and maintained to exclude stock.
- PC 3: Damaged boundary fencing is repaired within five days of detection.

In the event of unintended stock access, a contingency response will be implemented, which will be comprised of identifying where the stock accessed the offset area, repairing damage to fencing and removing the unauthorised stock. Stock will be removed as soon as reasonably possible, or within 5 days at a maximum.

4.2 Feral Predator Control

The current known feral predators occurring on site are wild dogs, foxes and feral cats. Dog attack has been identified as one of the main causes of death and injury to koalas. A strategy incorporating the control of feral species has been recommended in the comprehensive study carried out by Lunney *et al* (2007). This study identified that removing predatory feral species (e.g. dogs) as the leading way to increase koala population in an area.

Although dogs are the main threat to koalas, cats and foxes also prey on young koalas. Foxes have been observed climbing trees in search of arboreal prey (Mella *et al.*, 2017), and cats carry the parasite toxoplasmosis that is fatal if transferred to koalas (Hartley *et al.*, 1990).

Feral predator control will include installing one-way barrier fencing to prevent koalas entering the development area and to restrict predators from entering the offset area from the adjacent estate. As the offset area is in close proximity to suburban development, baiting feral species is not an appropriate control strategy outside of the offset. The popular leg hold traps are also not appropriate for the area given the by catch experienced with their deployment. Cage trapping will be implemented as the most suitable solution for predator control in the offset area.

Vertebrate pest control and monitoring will use best practice approaches, guided by the Ipswich City Council and Department of Agriculture and Fisheries (DAF). Pest control will be undertaken by appropriately trained and licensed personnel. At a minimum trapping will take place quarterly for the first two years of rehabilitation and twice yearly for the seven years following. The number and placement of traps will be decided by a feral species professional with appropriate experience and licenses. Camera trapping monitoring will take place in line with the trapping program to ensure the trapping undertaken is efficient. The camera data will dictate if further trapping programs are required throughout the year, an alternative placement of traps or if a larger number of traps are required in the programs.

No fences will be installed between the northern conservation area (future Lot 2000) and the southern three parcels to allow for uninterrupted movement of koalas over the landscape.

Steps will be taken to minimise the introduction of pest animals and control populations of current identified pest animals within the management area in accordance with the *Biodiversity Act 2014*. These steps include predator exclusion fencing, predator trapping programs and the exclusion of the public from the rehabilitation area. Current known pests occurring on site are wild dogs, foxes and feral cats.

The performance criteria and targets for feral predator control are:

- PC 4: Dog trapping programs are implemented quarterly for the first two years (2020 and 2021), and twice yearly for the following seven calendar years (2022-2029);
- PC 5: Trapping programs will increase in intensity whilst camera trapping data indicates the predator population is not declining; and
- PC 6: Predator control measures at the offset boundary, ie one-way barrier fencing, is demonstrably effective and maintained.

4.3 Habitat Rehabilitation

Rehabilitation of the offset site will include weed management and revegetation within existing cleared areas in order to increase the extent of suitable habitat for koalas. Medium quality habitat (11.86 ha) outlined in **Figure 5**, will be replanted with koala food species and intensively managed for weeds to improve to high quality habitat. High quality habitat (6.42 ha) will be managed for weeds to maintain and improve the current habitat value (**Figure 5**).

4.3.1 Weed Management

The objective of weed management is to avoid weed seed/propagule set and dispersal, and to continuously reduce and minimise the extent and occurrence of weeds within the offset site, including Weeds of National Significance (WoNS) and species listed as restricted invasive plants under the *Biosecurity Act 2014*. Weeds, such as the WoNS lantana (*Lantana camera*), infest habitat areas to the extent that koalas may have physical difficulty moving through the area on the ground. These weeds, and other terrestrial species, smother and compete with seedling koala food and habitat canopy trees, causing them to die or grow at a slower rate. Invasive grass species infestations have the potential to increase the fuel load of the habitat, causing more intense fires that would impact koalas negatively (Lunney et al 2007).

The *Biosecurity Act 2014* (Qld) imposes a ‘general biosecurity obligation’ (GBO), which imparts a responsibility on all individuals or organisations to manage biosecurity risks that are under their control and that they know about, or should reasonably be expected to know about. Under the GBO, individuals and organisations whose activities present a biosecurity risk must take all reasonable and practical steps to prevent or minimise their activities from causing a biosecurity event. This includes implementing appropriate land use practices to prevent or minimise the spread of invasive animals and plants.

Weed management will be an ongoing issue for the site, with several species listed as WoNS or as restricted invasive plants under the *Biosecurity Act 2014* (Qld). These species include Lantana (*Lantana camara*), Creeping Lantana (*L. montevidensis*), Velvety Tree Pear (*Opuntia tomentosa*), Mother-of-Millions (*Bryophyllum delagoense*), Groundsel Bush (*Baccharis halmifolia*) and Giant Rat’s Tail Grass (*Sporobolus pyramidalis*). Of the listed weed species present, dense and extensive infestations of

lantana (*Lantana camara*) present the greatest threat to vegetation structure, condition and habitat quality within the offset area.

Weed management shall be undertaken within the management zones depicted in **Annexure 2** of the EPBC Approval, represented in **Figure 5**, in accordance with a Weed Management Plan (WMP) that shall be prepared and implemented for the offset site as part of the Rehabilitation Management Plan. The WMP shall consist of targeted weed control and frequent and regular monitoring to evaluate the success of weed control actions. In order to achieve the stated targets, a comprehensive weed survey shall be undertaken prior to commencement of weed treatment to provide a baseline assessment of the location, extent and densities of WoNS and restricted invasive plant infestations. The weed survey results will be used to map significant weed infestations, directly informing weed control priorities and actions.

The risk of transporting weed material and propagules from the offset site to other areas, both inside and outside of the offset and development area, shall be mitigated by ensuring that all vehicles entering and exiting the site are washed down. Vehicle wash-downs shall be undertaken in accordance with clean-down procedures, guidelines and checklist detailed by Biosecurity Queensland, in particular the Vehicle and Machinery Checklists – Clean-down procedures (Biosecurity Queensland, 2014).

Annual monitoring of weed infestations will be undertaken to detect and map new infestations and measure any reduction in the presence of weeds. This information will inform the following year's treatments and control program.

Performance criteria and targets for weed control are:

- PC 7: Prevent weed seed/propagule set and dispersal for Weeds of National Significance (WoNS) and species listed as restricted invasive plants under the *Biosecurity Act 2014*;
- PC 8: Reduce the total extent of the area of lantana (*Lantana camara*) in the offset area by 75% in 2029 (year 9), and ongoing progressive reduction in extent after Year 9. This will open up the groundlayer to allow for koalas to have easier mobility while on the ground;
- PC 9: Reduce the total extent of the area of creeping Lantana (*L. montevidensis*) in the offset area by 75% by 2029, and ongoing progressive reduction in extent after Year 9. Creeping lantana control will focus on treating infestations within revegetation areas, along the offset site boundary and within the existing electricity easement, and other observed dense infestations;
- PC 10: Continuously reduce the extent of Velvety Tree-Pear (*Opuntia tomentosa*) and Harrisia Cactus (*Harrisia martinii*) infestations over the duration of the approval;
- PC 11: Reduce weed infestation extent by 90% by 2029 (year 9), and ongoing progressive reduction in extent after Year 9. This will facilitate the removal of high fuel loads and allow for the unaffected growth of koala food and habitat trees. This rate of reduction will apply to the following species:
 - Giant rat's tail grass (*Sporobolus pyramidalis*);
 - Mother-of-millions (*Bryophyllum delagoense*);
 - Groundsel bush (*Baccharis halimifolia*).
- PC 12: All vehicles entering the site are appropriately washed down in accordance with Vehicle and Machinery Checklists – Clean-down procedures (Biosecurity Queensland, 2014). All wash down certificates to be by the ecologist for the first 9 years of monitoring.

4.3.2 Revegetation

Revegetation shall be undertaken as part of overall rehabilitation of the offset site. This shall consist of infill planting in currently vegetated areas and intensive revegetation in cleared areas within the areas depicted in Annexure 2 of the EPBC Approval (**Figure 5**). These rehabilitation areas have been identified to maximise opportunities to expand existing patches of vegetation within the offset, revegetate cleared and disturbed areas and improve connectivity and habitat quality.

The aim of revegetation within the offset area is to restore cleared and degraded areas within the offset area to pre-disturbance condition, using the vegetation communities on site as a guide to selecting species and determining planting ratios. The rehabilitation/planting work will increase the number of koala trees on site. As a result, the rehabilitation work will increase the overall BioCondition value of the offset area and improve the habitat quality for koala, achieving the future condition class of 8.

Species used for infill planting will consist of a mix of native canopy and sub-canopy/understorey species that are represented within mature vegetation communities present on site. A species mix for use in revegetation and infill planting is given in **Table 8**. All plantings are to be made using local provenance tube-stock in either 50 or 75 mm square native or forestry, or round tubes.

Table 8: Species mix for revegetation and infill planting.

Scientific Names	Common names	Scientific Names	Common names
<i>Acacia disparrima</i> var. <i>disparrima</i>	Hickory Wattle	<i>Eucalyptus crebra</i> *	Narrow-leaf ironbark
<i>Acacia irrorate</i>	Green Wattle	<i>Eucalyptus fibrosa</i> *	Broad-leaved Iron Bark
<i>Acacia leiocalyx</i>	Black Wattle	<i>Eucalyptus microcorys</i> *	Tallowood
<i>Acacia maidenii</i>	Maiden's Wattle	<i>Eucalyptus moluccana</i> *	Gum-topped Box
<i>Allocasuarina torulosa</i>	Forest She-oak	<i>Eucalyptus propinqua</i> *	Small-fruited Grey Gum
<i>Alphitonia excels</i>	Red Ash	<i>Eucalyptus tereticornis</i> *	Queensland Blue Gum
<i>Angophora leiocarpa</i>	Smooth-barked Apple	<i>Eucalyptus siderophloia</i> *	Queensland Grey Iron Bark
<i>Breynia oblongifolia</i>	Coffee Bush	<i>Hardenbergia violacea</i>	Native Sarsaparilla
<i>Corymbia citriodora</i> subsp. <i>variegata</i> *	Lemon-scented gum	<i>Heteropogon contortus</i>	Black-tipped Spear Grass
<i>Corymbia intermedia</i> *	Pink Bloodwood	<i>Jacksonia scoparia</i>	Dogwood
<i>Corymbia tessellaris</i> *	Moreton Bay Ash	<i>Lomandra longifolia</i>	Lomandra
<i>Cymbopogon refractus</i>	Barbed Wire Grass	<i>Lophostemon confertus</i> *	Brush Box
<i>Dianella caerulea</i>	Blue Flax-lily		

* Signifies koala food or habitat tree

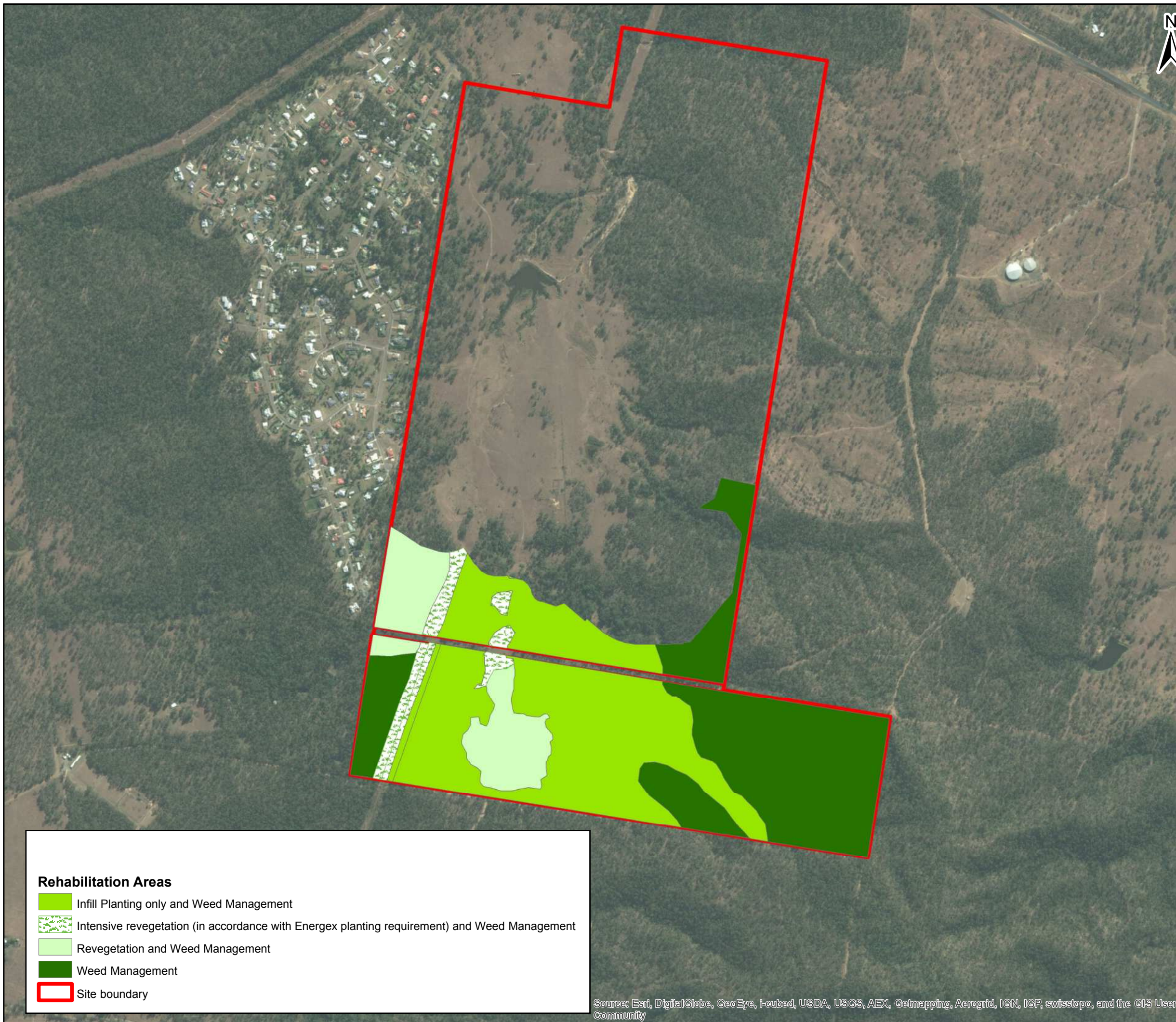
Specific rehabilitation notes for revegetation are listed in **Table 9**.

Table 9: Revegetation Requirement

Task	Specific requirement
Plant selection	<ul style="list-style-type: none"> • Plant species and sizes are supplied in accordance with this offset plan. • Plants are supplied in weed-free containers of the required size. Open rooted stock is not to be supplied. All plants are healthy and vigorous. Root-bound, damaged and diseased stock and stock with a poor growth form will not be planted. • Plant material must be sourced, if available, from local provenance stock. • Plants must not be planted if displaying nutritional or physiological disorders, leaf or stem damage, pests and diseases, root curling or showing signs of being pot bound or have weed species in the container. • A minimum of 20 cm tall for (75 mm) tube-stock (larger for potted stock) and must have a well-developed root system.
Planting	<ul style="list-style-type: none"> • Planting stock is randomly planted to reflect the natural composition of the original ecosystem. Seedlings must be moist at time of planting, preferably treated by soaking in a seaweed or fish emulsion solution for 15-20 minutes prior to planting to protect against transplant shock. • Crystals must be added to each hole and mixed with the back fill soil to ensure that roots are not in direct contact with concentrated fertilizer. The plant must be placed in the centre of the hole, filled in with loose crumbly soil, then firmed with the hands to create a shallow watering depression. The planting holes should be at least twice the width and half as deep as the pot size. • Mulch from chipped trees and other vegetation and/or other non-weed bearing mulch will be used around all planted trees. Each tree is to be mulched to a radius of 1m surrounding the plant at a depth of 100mm. Mulch should not touch the plant stems. Mulch can also be used in areas awaiting rehabilitation to suppress weed growth. • Each plant must be fertilized with a 10g slow release fertilizer pellet (Agriform or similar). The fertilizer pellet is to be placed adjacent to but not in contact with the root ball at 2-4cm below the soil surface and under the mulch. Species such as sedges and aquatic species are not to be fertilized. • All seedlings must be watered at planting (approximately 5-10L). On completion of the planting activities, the plants will require water at least once per week for the first month, then once a fortnight for another two months and then monitoring will be in place to measure the amount of water require due to climactic variance.
Replacement of dead/ diseased stock	<ul style="list-style-type: none"> • A survival rate of 80% is required three years after planting (based on planting rates reflecting local densities). Supplementary planting will be conducted if the survival rate is not achieved, and will continue until the survival rate is achieved.

Performance criteria and targets for revegetation include:

- PC 13: All planting is to be undertaken by the end of 2020;
- PC 14: A minimum of one canopy koala tree is to be located every 20m²(on average) within the offset area by the end of the first 9 years.
- PC 13: A survival rate of 80% is required three years after planting (based on planting rates reflecting local densities). Supplementary planting will be conducted if the survival rate is not achieved, and will continue until the survival rate is achieved.



Rehabilitation Areas

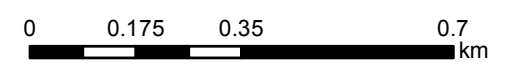
Figure 5

Project:		Paradise Waters	
Client:		Stocklands	
Compiled by:	CP	Date:	12/10/2016
Approved by:	KM	Date:	12/10/2016

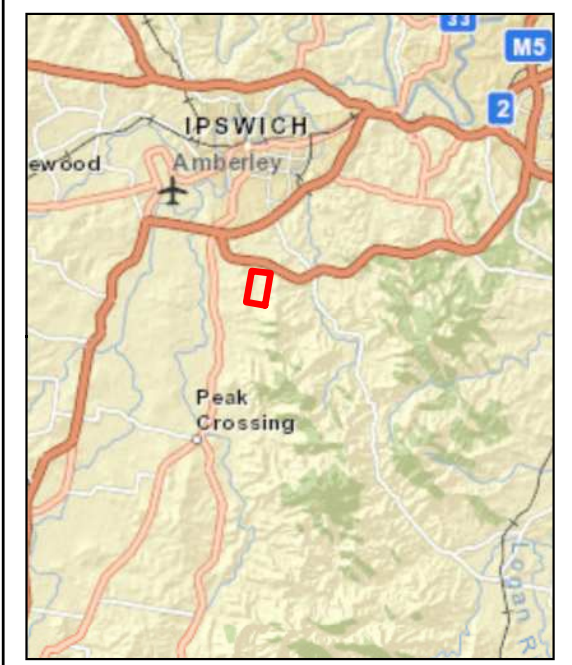
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Datum: GDA94



Rehabilitation Areas	
	Infill Planting only and Weed Management
	Intensive revegetation (in accordance with Energex planting requirement) and Weed Management
	Revegetation and Weed Management
	Weed Management
	Site boundary

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

4.4 Restricting Public Access

Given the proximity of the residential area around the offset site and the risk of degradation from activities such as rubbish dumping, firewood collection, etc., the plan will minimise adverse impacts from public access by installing fences, locked gates and signage. Fencing and locked gates will be in place around the offset site, so the focus of the actions will be on signage and boundary fence maintenance. An access proof fence will also surround the offset site in the Northern Lot, to exclude traffic and dogs from entering the offset site through the estate. While this increases the amount of existing koala habitat that is inaccessible to the koala population, the fencing will provide a higher level of protection for koalas using the offset site than currently exists.

The performance criteria and targets for access restriction include:

- PC 16: The offset site is accessed only for the purpose of implementing this plan during the duration of the approval;
- PC 17: An access proof fence surrounds the offset site and remain in place for the duration of the approval and beyond; and
- PC 18: Fence condition is monitored on a quarterly basis (this can include opportunistic fence inspections by contractors and staff accessing the site throughout the year). Any damage is reported to the project manager with repair taking place when reasonably possible, within 5 working days at a maximum.

At no time can persons access the management area without informing the landholder or relevant personnel (property manager) of the intent of entry. A minimum of 24 hours' notice is to be provided to the property manager. When entering and leaving the property, the property manager must be advised.

Persons entering the management area are required to hold a current weed hygiene certificate for all vehicles and equipment.

Persons operating equipment on the site must be licenced and proficient in its operation. Due to the rough terrain, all persons must have completed a certified 4x4 training program and be confident in traversing rough and steep terrain.

4.5 Summary of Management Objectives and Actions

Table 10 provides a summary of the management objectives and actions to implement within the offset site.

Table 10: Summary of Management Objectives, Actions and timeframe

Management Objective	Management Actions	Where	When	Relevant Performance Criteria	Monitoring Activities
<p>To attain and maintain koala habitat completion criteria:</p> <ul style="list-style-type: none"> ➤ that vegetation condition within the offset site is continuously maintained or improved, evidenced by an improvement in each site-based attribute, for each of the four (4) BioCondition monitoring sites, over the period of this plan (2020-2029); ➤ that vegetation condition within the grazing area is improved over the period of this plan (2020-2029), as measured at the one grazing pasture transects, so as to achieve a minimum score of 54/80 	<p>Weed control: manage all species listed as WoNS or as restricted invasive plants under the <i>Biosecurity Act 2014</i> (Qld)</p> <p>Creeping lantana control will focus on treating infestations within revegetation areas, along the offset site boundary and within the existing electricity easement, and other observed dense infestations.</p>	<p>Conservation area – within management zones depicted in Annexure 2 of the EPBC Approval, represented in Figure 5.</p>	<p>Initial treatment week 3-5 and then quarterly for the first two years and biannually there after until 2029.</p>	<p>PC7: Prevent weed seed/propagule set and dispersal for WoNS and listed restricted invasive plants under the <i>Biosecurity Act 2014</i>.</p>	<p>BioCondition assessment to be undertaken every year for 9 years (End of 2020-2029) and then condition is to be maintained for the duration of the approval.</p>
	<p>Weed control: all vehicles entering and exiting the site are washed down in accordance with Vehicle and Machinery Checklists – Clean-down procedures.</p>			<p>PC8: Reduce the total extent of the area of lantana (<i>Lantana camara</i>) in the offset area by 75% in 2029 (year 9), and ongoing progressive reduction in extent after Year 9.</p>	
				<p>PC9: Reduce the total extent of the area of creeping Lantana (<i>L. montevidensis</i>) in the offset area by 75% by 2029, and ongoing progressive reduction in extent after Year 9.</p>	
				<p>PC10: Continuously reduce the extent of Velvety Tree-Pear (<i>Opuntia tomentosa</i>) and Harrisia Cactus (<i>Harrisia martinii</i>) infestations over the duration of the approval.</p>	
				<p>PC11: Reduce overall weed infestation extent by 90% in 9 years, and ongoing progressive reduction in extent after Year 9.</p>	
				<p>PC 12: All vehicles entering the site are appropriately washed down in accordance with Vehicle and Machinery Checklists –</p>	<p>All wash down certificates to be collected by the</p>

Offset Management Plan – Conservation Area North and Conservation Area South
Paradise Waters Residential Estate (EPBC 2013/6864)

				Clean-down procedures (Biosecurity Queensland, 2014).	ecologists for the first 9 years of monitoring.
	<u>Stock exclusion:</u> Stock will be removed as soon as practicable following detection or installation of stock exclusion fencing.	Within the offset areas depicted in Annexure 2 of the EPBC Approval, represented in Figure 5 .	Monitoring to take place yearly.	PC1: Stock are excluded from the offset site, except where authorised by an ecologist for fuel/fire hazard management. Stock will be removed as soon as practicable following detection or installation of stock exclusion fencing, or within 5 days at a maximum.	Fence condition is monitored on a quarterly basis (this can include opportunistic fence inspections by contractors and staff accessing the site throughout the year).
	<u>Stock exclusion:</u> Installation of fences of the offset area boundary as per requirement section 4.1.			PC2: Boundary fencing is established and maintained to exclude stock.	
				PC3: Damaged boundary fencing is repaired within five days of detection.	
	<u>Revegetation:</u> Revegetation the offset site in particular the grazing area shall be undertaken as per Table 9.	Within the offset areas depicted in Annexure 2 of the EPBC Approval, represented in Figure 5 .	Initial treatment week 3-5 and then quarterly for the first two years and biannually there after	PC 13: All planting is to be undertaken by the end of 2020	BioCondition assessment to be undertaken every year for 9 years (2020-2029) and then condition is to be maintained for the duration of the approval.
				PC 14: A minimum of one canopy koala tree is to be located every 20m ² (on average) within the offset area by the end of the first 9 years.	
				PC 15: A survival rate of 80% is required three years after planting (based on planting rates reflecting local densities). Supplementary planting will be conducted if the survival rate is not achieved, and will continue until the survival rate is achieved.	
To avoid or minimise feral animal predation on koala	<u>Feral animal control:</u> installation of one-way barrier fencing to prevent koalas entering the development area and to restrict predators from entering the offset area from the adjacent estate.	One-way fence to be installed as outlined in Figure 5 , along the northern boundary of the offset site.	Quarterly for the first two years, twice yearly for the following rehabilitation timeframe (2020-2029)	PC4: Dog and cat trapping programs are implemented at least quarterly for the first two years (2020 and 2021), and twice yearly for the following nine calendar years (2022-2029).	Camera trapping and opportunistic sightings of feral species.
	<u>Feral animal control:</u> Cage	Cage and camera		PC5: Trapping programs will increase in	

	trapping will be implemented as the most suitable solution for predator control.	trapping are to be installed within the whole offset areas depicted in Annexure 2 of the EPBC Approval, represented in Figure 5 .		intensity whilst camera trapping data indicates the predator population is not declining.	
	<u>Feral animal control</u> : Camera trapping monitoring will take place in line with the trapping program to ensure the trapping undertaken is efficient.			PC6: Predator control measures at the offset boundary, ie one-way barrier fencing, is demonstrably effective and maintained.	
To prevent unauthorised access to the offset area	<u>Access control</u> : Installation of fence, locked gates and signage around the offset site.	Within the offset areas depicted in Annexure 2 of the EPBC Approval, represented in Figure 5 .	Monitoring to take place monthly and opportunistically	PC 16: The offset site is accessed only for the purpose of implementing this plan during the duration of the approval.	Fence and gate condition is monitored on a quarterly basis (this can include opportunistic fence inspections by contractors and staff accessing the site throughout the year).
	<u>Access control</u> : An access proof fence (one-way fence) will also surround the offset site in the Northern Lot, to exclude traffic and dogs from entering the offset site through the estate.			PC 17: An access proof fence surrounds the offset site and remain in place for the duration of the approval and beyond.	
	<u>Access control</u> : Persons operating equipment on the site must be licenced and proficient in its operation.			PC 18: Fence condition is monitored on a quarterly basis (this can include opportunistic fence inspections by contractors and staff accessing the site throughout the year). Any damage is reported to the project manager with repair taking place when reasonably possible, within 5 working days at a maximum	
	<u>Access control</u> : Persons entering the management area are required to hold a current weed hygiene certificate for all vehicles and equipment				

5. Roles and Responsibilities

All employees and contractors, who will work within the site, have a general duty of care under the *Environmental Protection Act 1994*. Notwithstanding any specifications in this OMP, the contractors must report environmental incidents to the property manager and participate in the investigation and corrective actions required to reduce environmental harm or the re-occurrence of the incident.

While general environmental compliance is the responsibility of all site personnel, specific roles and responsibilities for environmental performance and compliance will be allocated to specific positions. **Table 11** provides an overview of environmental management roles and responsibilities for the OMP.

Table 11: Roles and Responsibilities

Positions	Roles and Responsibilities
Development Manager/ Contract Administrator / Project Manager	<p>The Contract Administrator (or equivalent role) is responsible for directing and managing activities concerned with the construction contract and assisting with reporting, where appropriate. This person will liaise directly with the Project Ecologist to ensure successful offset management.</p> <p>The Contract Administrator (Council) also acts as liaison between landowner and contractors until 2029. Following this, the land will be dedicated to Council, and Council will be the sole manager of the land.</p>
Rehabilitation Contractor	<p>The Rehabilitation Contractor will be responsible for ensuring that works on site are undertaken in accordance with the OMP. Specific responsibilities include:</p> <ul style="list-style-type: none"> • Ensuring all personnel responsible for implementing the Project's environmental management requirements including the OMP are competent on the basis of training, education, and experience; • Allocating resources to ensure the OMP is implemented; • Ensuring the implementation of work practices that reduce the risk of environmental impact; • Advising the Contractor's Project Manager whenever works are programmed, identification of the type of works and report any compliance actions, as required. • Undertaking rehabilitation works in accordance with the approved OMP; and • Undertaking the maintenance of management zones in accordance with the approved OMP. <p><u>Qualification required:</u> The rehabilitation contractor must have a minimum of 5 years' experience in undertaking rehabilitation and restoration work including planting, watering, mulching, and undertaking weed management. The contractor must have appropriate licenses and permit to use weed herbicides.</p>

Positions	Roles and Responsibilities
Feral Species Contractor	<ul style="list-style-type: none"> • Responsible for predatory feral species control. • Undertaking camera trapping surveys to track the number of feral species in the offset site. • Reports to the Project Ecologist to discuss trapping success and contingency. <p><u>Minimum qualification required:</u> Must have at least 5 years' experience in the field of feral species control with appropriate permits to traps and dispose of feral species.</p>
Project Ecologist	<ul style="list-style-type: none"> • Meeting with the site supervisor/ Rehabilitation Contractor and audit site works to ensure compliance with the OMP as required; • Liaise with the Rehabilitation Contractor during the life of the OMP to provide advice on remedial action where required; and, • Undertake yearly BioCondition Assessment to monitor offset condition. • Prepare monitoring reports to be submitted to DotE. <p><u>Minimum qualification required:</u> the project ecologist must possess a Bachelor of Environmental Science (or equivalent), and a minimum of 10 years' experience in flora and fauna surveys, managing offset rehabilitation / restoration work, supervising on-ground work, negotiating with the relevant authority and undertaking ecological monitoring and reporting. The rehabilitation area is to undergo a review every year by a qualified independent ecologist and must be familiar with the offset requirement outlined in this offset management plan. The Project ecologist must be able to identify trends and opportunities for improvement to ensure continual improvement and best practice management.</p>

6. Monitoring and Reporting

Stockland will maintain accurate records substantiating all activities associated with implementing this plan, and will make them available upon request to the Department.

6.1 Monitoring objectives

The key objective of the offset and associated rehabilitation is to achieve the completion criteria for koala habitat values (from 7 to 8 by 2029). Therefore, the monitoring program must provide an:

- 'early-control' function, that is to have confidence management actions are effective for achieving the offset completion criteria; and
- 'early warning' function, so as inform timely decisions on corrective actions to ensure completion criteria are achieved.

This monitoring program will inform the effectiveness of rehabilitation works, with monitoring parameters to be 'SMART':

- Specific - Clear and concise to avoid any misinterpretation of the data.
- Measurable - Can be quantified and results can be compared to other data and able to show trends if measured over time. These measures should also give a consistent result, regardless of who is doing the calculation.
- Achievable - Practical, reasonable and credible given available resources and expected conditions.
- Relevant - Informative and useful to stakeholders, having regard to OMP objectives and completion criteria (i.e. need to measure what is important to the success of the plan).
- Timed - Specifies a timeframe for achievement and measurement.

6.2 Photo Point Monitoring

10 photo monitoring locations will be installed within the offset area (Two photo monitoring points will be placed within each of the four transects). These points will include a landscape photo along the transect from the "Start Point" and another five photographs at the 50 m meter point of the transect taken in a standardized N, S, E, W & Ground direction to exactly match the original photos. Photo monitoring will take place in October of each year for the duration of the management program.

6.3 Fixed Location BioCondition Assessment

The flora monitoring program includes sampling replicate sites at each of the established BioCondition sites, using the adapted BioCondition methodology as outlined in **Section 3.2**. Results from these subsequent BioCondition assessments shall be compared to the benchmark for the relevant and adapted Regional Ecosystem (RE12.9-10.2) (**Appendix 3**) and scored, with the final BC score compared to the corresponding score from previous monitoring events and the baseline score. The aim of this component of the OMP is to detect any increase in the BC score at each monitoring transect to achieve an increase of habitat condition score from 7 to 8. Based on the results for key attributes assessed by the BioCondition assessments, for example, an increase in non-native shrub/weed cover. Management actions shall be taken to target the identified issue.

BioCondition assessment will be undertaken at 12 monthly intervals, with the first monitoring event at the end of 2020.

6.4 Unbounded Flora Survey

The flora monitoring program shall also include an unbounded flora survey, which is to be conducted at each annual monitoring event, in conjunction with BioCondition assessment. The aim of this survey is to compile a comprehensive species list for the offset site, and to provide an indication of the relative abundance of each species, according to the ACFOR scale (Abundant, Common, Frequent, Occasional and Rare). The unbounded flora survey shall also include a census of all invasive plant species, with an assessment of overall weed abundance and cover.

The ACFOR scale is as follows:

A - The species observed is "Abundant" within the given area.

C - The species observed is "Common" within the given area.

F - The species observed is "Frequent" within the given area.

O - The species observed is "Occasional" within the given area

R - The species observed is "Rare" within the given area.

6.5 Statistical Analysis of Results

Field observations, vegetation assessment will be undertaken in accordance with the Guide to determining terrestrial habitat quality – a toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy (version 1.1 December 2014) (DEHP, April 2017).

Data for each of the BioCondition attributes monitored will be collected at each site and reported on and presented in a sequential manner (including previous data collected) to quantify change from the benchmark collected in 2015. This will record the change in each attribute measured and hence the condition of the ecological community and habitat, thus enabling a statistical comparison to previous years' data and the progression of the offset site condition and EPBC Offset Assessment Guide Calculator inputs.

The BioCondition assessment is considered to be an effective way to detect change in environmental condition due to management interventions (Queensland Herbarium, 2016). The BioCondition framework is a typical Australian multimetric condition approach and has been tested for attribute suitability, observer variability and appropriate reference site identification (Queensland Herbarium, 2016).

Tucker (2016) found that the strategic location of reference sites for benchmarking was fundamental to mitigating the effects of climate, environmental gradients and disturbance processes. His results suggest that multimetric design may be altered through the removal of vegetation species richness estimates, improving usability for non-specialists without compromising surrogacy potential. Site location should be representative of the vegetation community, and at least 50 m from any major disturbance, such as a road. Also, sites must be located at least 500m apart to ensure independence of the data between sites assessed (Eyre *et al.*, 2015).

Keith (2000) outlined the number of vegetation sampling is one of the critical factors in determining the proportion of the flora captured. It is important to ensure that the plot remains within the regional ecosystem to be sampled. Two to five randomly selected sampling provide sufficient spatial replication

to enable statistically valid conclusions as established under the monitoring program (Keith, 2000). Our BioCondition assessment program will provide 4 BioCondition transect and one control site which met the statistical requirement to effectively demonstrate attainment of performance targets and completion criteria as well as to detect change in environmental condition due to management interventions.

6.6 Monitoring Schedule

Management area monitoring will include visual assessment of the fences, access tracks, weed control and regrowth by an ecologist. Monitoring will include an assessment of all works conducted in the period since the previous monitoring report, with notes to be provided within the annual monitoring report. Notes will include an assessment of the efficacy of the field work, estimate of success rates, notes on the condition of access fence and the overall offset area condition.

Table 12 outlines the monitoring schedule for the offset site.

Table 12: Monitoring schedule

Management Activities	Monitoring activities	Parameter/s measured	Related guidelines	Where	When	Reliability
1. Rehabilitation Works (planting and weed management)	<ul style="list-style-type: none"> Undertake BioCondition assessment Check seedling/planting mortality Verify condition of rehabilitation works 	<ul style="list-style-type: none"> Habitat structure and quality specifically relating to koalas as per table 7 Percentage of successful seedlings. Percentage of weeds present on site 	<ul style="list-style-type: none"> South East Queensland Ecological Restoration Frameworks (Chenoweth EPLA et al., 2012) A Condition Assessment Framework for Terrestrial Biodiversity in Queensland (Eyre et al., 2015) 	Rehabilitation Areas as per outlined in Figure 5	BioCondition assessment to be performed on yearly basis for the first 9 years (until 2029).	High – planting will be maintained and dead plant will be replaced over the 9 years.
						High – weed management will be undertaken for the first 9 year and target WONS and declared weeds species.
						High – BioCondition assessment is a reliable method and the most practical method of objectively measuring the condition of the habitat for Koala.
2. Exclusion of stock	<ul style="list-style-type: none"> Inspection of fences and for presence of stock 	<ul style="list-style-type: none"> Damage to fences Presence of stock 	Not applicable	Whole offset site	Fence condition is monitored on a quarterly basis.	High – Direct monitoring (visual) will ensure that the fence is maintained and cattle are excluded from the offset site.
3. Feral species management	<ul style="list-style-type: none"> Camera trapping and opportunistic sightings of feral species (direct sighting or evidence of presence) 	<ul style="list-style-type: none"> Presence of feral species Any increases in population of feral predators 	<ul style="list-style-type: none"> Guidelines for the management of wild dogs (DAFF, 2011b) DF01: Wild dog barrier fence, and DF02: Wild dog check fence (DAFF, 2011a) 	Whole offset site	Initial monitoring to take place at the end of 2020 and biannual until 2029. Council to monitor as per Council's guidelines thereafter.	Medium – Effectiveness of feral pest management, in particular wild dog management, can be difficult to evaluate if the site is connected to large forest patches.
4. Fire Management	<ul style="list-style-type: none"> Check presence and condition of fire breaks Check fuel loads 	<ul style="list-style-type: none"> Quality and maintenance of fire breaks 	<ul style="list-style-type: none"> Council's fire management programs or as per the bushfire management plan for the site. 	Whole offset site	Opportunistic monitoring by project ecologist throughout the duration of the rehabilitation.	High – monitoring of fire breaks and fuel load is the most reliable way to management fire on site

5. Restrict Access	<ul style="list-style-type: none"> Fencing and locked gates will be in place around the offset site. 	<ul style="list-style-type: none"> Checking for damage to fences and presence of stock inside the conservation area 	<ul style="list-style-type: none"> Not applicable 	Northern boundary of the offset area as illustrated in Figure 5	As soon as after stock are being removed from the offset site and maintained thereafter.	High - Direct monitoring (visual) will ensure that the fence is maintained and cattle are excluded from the offset site

6.7 Contingency Response and Corrective Actions

If structured monitoring or opportunistic observations indicate that a risk has been realised, a basic action plan is to be prepared identifying appropriate corrective actions to rectify the event or circumstance.

An example of some common risks and the suggested contingency response are provided below in **Table 13**.

Table 13: An example of common risks and a contingency response

Risk	Initial Response	Corrective Actions
New Weed infestations	<ul style="list-style-type: none"> Identify how the new infestation arose Ensure all staff are retrained in the use of hygiene procedures (e.g weed and seed of vehicles) 	<ul style="list-style-type: none"> Correct hygiene protocols if this was considered an issue. Increase weed treatments with the advice of the rehabilitation contractor. Upon being notified or becoming aware of new weed infestation being present in greater than 10% of the offset area, the Rehabilitation Contractor (first 9 years of management) is to implement pest control measures within one month. These measures may include, and are not limited to foliar spraying, basal bark spraying, stem injection, cut stump, cut and swab, stem scraper; and wick applicators. The monitoring report will document the weed presence, weed control measures and extent of grass cover during the reporting period and the correlating responsive actions.
Largescale seedling death	<ul style="list-style-type: none"> Identify the reason for death (e.g. Incorrect planting technique, drought etc.) 	<ul style="list-style-type: none"> Replant dead or dying seedlings with healthy stock while remedying the initial reason for death. For example, retrain staff or increase watering frequency or duration. Continue monitoring for the following 3 months thereafter. The monitoring report will document the location and rate of mortality during the reporting period and the correlating responsive actions.
Increase of feral predatory species	<ul style="list-style-type: none"> Assess issues and review management program 	<ul style="list-style-type: none"> Increase trap numbers and/or frequency of trapping events.

		<ul style="list-style-type: none"> • Monitor with camera traps until the feral species contractor is satisfied the numbers are decreasing.
Damage in fence	<ul style="list-style-type: none"> • Identify where fence is broken and potential cause of damage. 	<ul style="list-style-type: none"> • Upon being notified or becoming aware of an unsecure offset area, the Rehabilitation Contractor or Landowner is to undertake fence maintenance and repairs to re-secure the offset area as soon as possible and within 30 days. • The monitoring report will document the installation, maintenance and repair of fences during the reporting period.
Uncontrolled bushfire	<ul style="list-style-type: none"> • Contact the fire authorities on 000 if a fire is seen in the offset site. <p>Inspect the site for injured koalas and transport to a wildlife vet if a competent staff member is present. Alternatively contact the Australia Zoo Wildlife Hospital on 07 5436 2097.</p>	<ul style="list-style-type: none"> • Upon being notified or becoming aware of prohibited fire in the offset area, the Rehabilitation Contractor is to reassess access protocols for any lessees etc., signage and general access within one fortnight. • After any occurrence of fire in the offset area, the landowner or rehabilitation contractor will: <ul style="list-style-type: none"> ○ inspect and repair, and widen if necessary, all firebreaks; and ○ reassess fuel load reduction practices (ie. Increase controlled stock access if appropriate to lower fuel loads or increase invasive grass control with the removal of large sections of dead grass off site); and ○ exclude grazing until the grass cover present at the end of the dry season is a minimum • The monitoring report will document any known incidences of fire that have occurred during the reporting period and the correlating responsive actions.

6.8 Reporting

Reports will be provided annually to the respective Government Agency, Ipswich City Council and the Proponent detailing the progress implementing this plan. Monitoring will be conducted in November of each calendar year with reports provided within 20 working days of the field monitoring being completed.

The following list describes the components of the monitoring report that are a requirement:

- Reporting will be provided following the completion of each monitoring program annually until the completion of the management program.

- The report will contain:
 - Name and contact details of landholder / relevant authority. If someone other than the landholder is undertaking management activities (i.e. a contractor) their details must also be provided, including skills and expertise of the responsible entity (ies).
 - DNRM/EPBC approval number;
 - Lot on Plan property description and postal address;
 - Photo monitoring;
 - BioCondition assessment and associated GPS locations of central transect;
 - An overview of the progress of the management area in achieving the management outcomes and how any risks or threats have impacted on the area
 - An indication of any risks or potential threats that have become apparent to the management area since the development of the vegetation management plan, and activities to be undertaken to manage these threats and/or risks
 - Evidence of progress towards the management outcomes and where all management outcomes have been achieved in full, evidence of completion.

A proposed table of contents for the annual monitoring report is provided below.

1. Introduction
2. General Management Area Condition
3. Annual Works Program Report
 - Fencing and ongoing maintenance
 - Fire break maintenance and maintenance of current access tracks (in accordance with bushfire management plan for the site)
 - Erosion control and / or soil disturbance (if required)
 - Weed control
 - Equipment, vehicles to be washed and blown down for weed spread measures between all management activities
 - Feral animal control and macropod reduction
 - Monitoring and evaluation
4. Statement of Attainment Against Management Targets
5. Statement of Risk Management Against Threatening Processes
6. Results – including BioCondition Assessment, Unbounded Floral Survey, Fire Fuel Monitoring and Weed Report

6.9 Annual Compliance Reporting

Within three months of every 12 month anniversary of the commencement of the action, the approval holder must publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of any plans as specified in the conditions. The compliance reports

must remain on the website for 12 months from the date of publishing. Documentary evidence providing proof of the date of publication must be provided to the Department at the same time as the compliance report is published. The approval holder may cease preparing and publishing the annual compliance reports required by this condition if they have written agreement from the Minister to do so.

7. Risks to Offset Management Objectives

Offsets for clearing permits require long-term security of the outcome (whether land acquisition or on-ground management). Rehabilitating the land and transferring the land into the conservation estate both reduces the risk to the offset site and increases the long-term protection of the site.

A risk assessment of potential impacts for the Project and associated offset delivery has been undertaken. A standard risk assessment matrix (**Table 14**) has been used for the purpose of assessing risks associated with management of the offset site. **Table 15** provides an assessment of the likelihood and consequence of each potential risk and associated impact.

Table 14: Risk Assessment Matrix

		Consequence				
		Minor	Moderate	High	Major	Critical
Likelihood	Highly Likely	Medium	High	High	Severe	Severe
	Likely	Low	Medium	High	High	Severe
	Possible	Low	Medium	Medium	High	Severe
	Unlikely	Low	Low	Medium	High	High
	Rare	Low	Low	Low	Medium	High

Likelihood and consequence

Qualitative measure of likelihood (how likely is it that this event/circumstances will occur after management actions have been put in place/are being implemented)	
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances
Qualitative measure of consequences (what will be the consequence/result if the issue does occur)	
Minor	Minor risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing low cost, well characterised corrective actions.
Moderate	Moderate risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing well characterised, high cost/effort corrective actions.
High	High risk of failure to achieve the plan's objectives. Results in medium-long term delays to achieving plan objectives, implementing uncertain, high cost/effort corrective actions.
Major	The plan's objectives are unable to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies.
Critical	The plan's objectives are unable to be achieved, may include widespread and severe environmental harm, with no evidenced mitigation strategies.

Table 15: Risk Assessment for Offset Management Activities

Management objective/desired outcome	Event or circumstance	Likelihood consequence and risk level			Management actions/measures	Residual risk			Detection/monitoring activity/ies	Feasible/effective corrective actions
		L	C	RL		L	C	RL		
To achieve the plan's completion criteria within 9 years of commencement of the action (2029).	Weed species establishment and invasion	2	1	LOW	<ul style="list-style-type: none"> Vehicle wash-down protocols will be implemented during construction; Implement Rehabilitation Management Plan for the project. 	2	1	LOW	<ul style="list-style-type: none"> Quarterly monitoring of weed species. Informal monthly monitoring. 	<ul style="list-style-type: none"> Increase weed control where necessary.
	Noise, dust and vibration disruption to fauna during offset management activities	3	2	MED	<ul style="list-style-type: none"> Development and implementation of Wildlife Management Plan to minimise direct impact on fauna during offset management activities. Development and implementation of Wildlife Management Plan to minimise human/fauna interaction. Undertake on-ground work activities as per Local or State Government regulations. 	2	2	LOW		

Management objective/desired outcome	Event or circumstance	Likelihood consequence and risk level			Management actions/asures	Residual risk			Detection/monitoring activity/ies	Feasible/effective corrective actions
		L	C	RL		L	C	RL		
	Grazing as a result of fences being damaged ...	3	3	MED	<ul style="list-style-type: none"> Maintenance of the offset areas should be provided on regular basis to ensure that fences are maintained and no grazing occur on site (unless permitted to reduce weed in section). 	2	1	LOW	<ul style="list-style-type: none"> Quarterly monitoring of all fences. 	<ul style="list-style-type: none"> Stock to be removed within 5 business days and fences to be repaired.
	Lack of serviceable tracks for easy vehicular access	3	2	MED	<ul style="list-style-type: none"> Maintain roads / tracks to level where they can be easily traversed by 4x4 vehicles with trailers, Rural Fire Service vehicles and monitoring. Ensure no roads are dead ends and that all roads connect with other roads on the property for multiple access points and escape routes in the event of an uncontrolled burn. 	2	2	LOW	<ul style="list-style-type: none"> Degraded or inaccessible tracks to be reported once found by on ground staff. 	<ul style="list-style-type: none"> Tracks are to be repaired as soon as reasonably possible.
	Revegetation / On ground management issues	3	2	MED	<ul style="list-style-type: none"> Receive approval for all operational work including the Rehabilitation Management Plan. Rehabilitation Management Plan and performance criteria 	2	2	LOW	<ul style="list-style-type: none"> Ongoing communication between staff and management. 	

Management objective/desired outcome	Event or circumstance	Likelihood consequence and risk level			Management actions/asures	Residual risk			Detection/monitoring activity/ies	Feasible/effective corrective actions
		L	C	RL		L	C	RL		
					are to prepared, in consultation with relevant stakeholders					
Manage uncertainties	Key data / information used to formulate the plan inadequate	2	2	LOW	<ul style="list-style-type: none"> BioCondition assessment is a recognized methodology that is approved in Qld and is used to assess the ecological function of an ecosystem. Data will be collected in a standard and repetitive manner to minimise any errors. 	1	1	LOW		
	Limitations and/or uncertainty, associated with the use of that data/information.	2	2	LOW	<ul style="list-style-type: none"> A minimum of four transects will be monitored during the 9 years of the rehabilitation work. Additional random ecological assessment will be provided to reduce any uncertainties in the use of data. Additional data will be collected if the assessment of the results is not considered sufficient to assess the success of the offset. 	1	1	LOW		
	Limitations and/or	2	2	LOW	<ul style="list-style-type: none"> Assessment of the offset success will be undertaken by 	2	1	LOW		

Management objective/desired outcome	Event or circumstance	Likelihood consequence and risk level			Management actions/measures	Residual risk			Detection/monitoring activity/ies	Feasible/effective corrective actions
		L	C	RL		L	C	RL		
	uncertainty, associated with the implementation of the offset plan				independent, qualified ecologists (Relevant qualifications are outlined in Section 6.2).					

8. Conclusion

This OMP provides offset management strategies to comply with Condition 4 of the EPBC approval, which requires that the unavoidable clearing of non-juvenile koala habitat trees within the proposed development area be offset. A total clearing area of 92 ha of koala habitat was required to be compensated through the provision of internal and external offset.

In accordance with the Environmental Offset Policy, offset strategies are proposed to provide approximately 40% of the offset requirement by rehabilitating 113.20ha of land south of the development within the area identified as offset site - north and offset site south.

By implementing the proposed offset and a number of key recommended actions designed to minimise impacts during the construction and operational phases, the proposed development will not significantly adversely impact upon ecological values within the local area. The proposed offset counterbalances the significant residual impact of the project and will deliver long term environmental benefits.

9. References

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Appendix 1

Offset Calculations - EPBC Preliminary Documentation Paradise Waters Residential Development

Appendix 2

Approval Condition and Assessment of Compliance

Condition Numbers	Condition of Approval	Section and/or Page Number which address the approval condition	Key Commitments for meeting each condition
3	<p>To compensate for the loss of 92 ha of koala habitat, the approval holder must secure and manage as koala habitat, the following offset areas:</p> <p>i. a minimum of 113.2 hectares of koala habitat referred to as “Conservation area - north” and “Conservation area - south” in Annexure 1: and</p> <p>ii. a minimum of 88 ha of koala habitat that is mapped as a category X area within the area described in RPS Report Number PR123497-1 provided to the Department via correspondence dated 18 August 2014 or an alternative offset site approved by the Minister in writing.</p> <p>The offset described in condition 3(ii) must be legally secured in accordance with Queensland legislation, within 2 years of commencement of the action.</p>	<p>The internal offset management plan illustrates the management actions that will be undertaken in the 113.2 hectares of koala habitat referred to as “Conservation area - north” and “Conservation area - south” in Annexure 1 of the approval. These areas will be dedicated to Ipswich City Council.</p> <p>An external offset management plan is provided as part of this EPBC post-approval application. This plan provides details of the management actions undertaken in the 88 ha of koala habitat provided on lot 1 RP12394. The external offset management plan outlined the site will be legally secured in accordance with Queensland legislation, within 2 years of commencement of the action.</p>	<p>The 113.2ha internal offset area will be dedicated for conservation to Council.</p> <p>The landholder has agreed for the 88ha external offset area to be legally secured by a Voluntary Declaration (Vdec) (Vegetation Management Act 1999) over the offset site for the duration of the management plan or until the offset site attains remnant status.</p>
4	<p>At least three months prior to commencement of the action, the approval holder must submit an Offset Management Plan (OMP) which has been reviewed by a suitably qualified person to the Minister for approval. The approval holder must not commence the action unless the Minister has approved the OMP in writing. The approved OMP must be implemented. The OMP must include, but not be limited to:</p>	<p>The internal of external offset management have been prepared and reviewed by independent qualified person.</p>	<p>Not applicable</p>
4.a	<p>a detailed description of the offset areas required by Condition 3, consistent with the EPBC Act Environmental Offsets Policy</p>	<p>Description of the offset area is provided in Section 2.0 of this plan.</p>	<p>Not applicable</p>

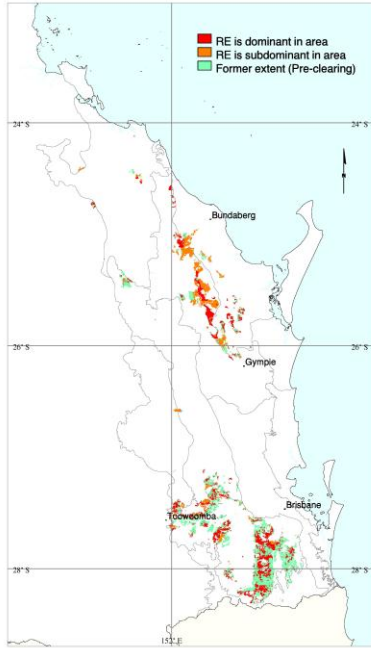
<p>4.b</p>	<p>measures to protect, manage and rehabilitate koala habitat in the offset areas, including, but not limited to:</p> <ol style="list-style-type: none"> i. a map/maps showing areas to be managed; ii. timing of management activity for each area; iii. performance criteria for each area; iv. a monitoring plan to assess the success of the management activities measured against the baseline condition. This must include, but not be limited to, control sites and periodic ecological surveys to be undertaken by a suitably qualified person; v. a risk assessment and a description of the measures that would be implemented to mitigate the identified risks; vi. the use of local provenance plants for rehabilitation, where planting is undertaken; vii. installing and maintaining fencing as necessary to prevent domestic livestock from entering offset areas while allowing koala movement; viii. excluding grazing from offset areas, except where necessary for bushfire prevention and control, for example by using crash grazing; ix. vegetation management including increasing abundance of koala food trees and controlling weeds, including as shown in Annexure 2; and x. undertaking regular koala predator control. 	<ol style="list-style-type: none"> i. The map of the area is provided in Figure 1. ii. Timing of management activity for each area and performance criteria are provided in Section 5. iii. Monitoring plan is provided in Section 7 iv. A risk assessment has been added in Section 8. v. All compensatory plant will be local provenance plant for rehabilitation. This requirement is also outlined in Section 5.3.2. vi. Details of the one way koala fence and maintenance of the fence are provided in Section 5.4 vii. Exclusion of grazing from offset areas and stock strategy is outlined in Section 5.1 viii. Vegetation / rehabilitation management strategy including weed management is provided in Section 5.3 ix. koala predator control is outlined ion Section 5.2 	<p>Keys commitment include:</p> <ul style="list-style-type: none"> • Rehabilitation of the offset area (including removal of weed) for a period of 9 years then the offset site will be dedicated to Council. • Undertake koala predator control for a minimum period of 9 years. • Installation of barrier-proof fencing will surrounding the designated northern conservation area, restricting koalas from entering the development area, and preventing dogs or traffic impacting on the proposed conservation area. • Exclusion of stock in the offset area.
<p>4.c</p>	<p>Details of the offset attributes (including maps in electronic Geographic Information System (GIS) format with accompanying shapefiles), site descriptions, environmental values, connectivity with other koala habitat and biodiversity corridors</p>	<p>Section 2 of this plan outlines the description of the site. GIS shapefiles are also attached with the post-approval application.</p>	<p>Not applicable</p>

4.d	<p>detailed surveys and descriptions of the offset areas to clearly identify baseline conditions and establish performance indicators. This must include:</p> <ul style="list-style-type: none"> i. a baseline description (prior to any management activities) of the current condition of the extant vegetation of each offset area, including the location of survey points (GPS reference); ii. the quantity of koala habitat provided by the offset area; iii. the quality of koala habitat found within the offset area (prior to any management activities); iv. vegetation condition mapping; and v. photo reference points. 	<p>Details of the surveys and description of the offset areas to clearly identify baseline conditions and establish performance indicators are provided in Section 3.</p>	<p>Baseline condition and performance criteria include BioCondition assessment of relevant transects, provision of mapping and photos reference points.</p>
4.e	<p>Details of the parties responsible for managing, monitoring and implementing the OMP for the duration of this approval, including the minimum relevant experience and qualifications required for the relevant responsibilities</p>	<p>Details of the parties responsible for managing, monitoring and implementing the OMP for the duration of this approval are provided in Section 5.5.</p>	<p>Details of the parties responsible for managing, monitoring and implementing the OMP for the duration of this approval are provided in Section 5.5.</p>

Appendix 3

BioCondition Benchmarks for RE12.9-10.2

Corymbia citriodora subsp. variegata +/- Eucalyptus crebra open-forest on sedimentary rocks



Pre-clearing area (ha), remnant area (ha) and per cent remaining: 227,046 88,197 39%

Species recorded: Total: 175; woody: 59; ground: 125; Avg. spp./site: 28.2; std dev.: 7.7, 15 site(s)

Basal area: Avg./site: 16.0 m²/ha, range: 8.0 - 30 m²/ha, std. deviation: 5 m²/ha, 15 site(s)

Structural formation: Open-forest: 73%; woodland: 27%, 15 site(s)

Representative sites: 14276, 14283, 15472, 15476, 15477, 15480, 15481, 15482, 15483, 15518, 15525, 15528, 15786, 15795, 40825.

Stratum: T1

Height avg. = 21.2m, range 18-25m, 15 sites

Crown cover avg. = 53.5%, range 25.0-71.0%, 15 sites

Dominant species (relative cover, frequency): Corymbia citriodora subsp. variegata (65, 100%), Angophora leiocarpa (28, 27%), Eucalyptus crebra (25, 80%)

Frequent species (cover, frequency): Corymbia citriodora subsp. variegata (34, 100%), Eucalyptus crebra (14, 80%), Angophora leiocarpa (16, 27%), Eucalyptus tereticornis (3, 20%), Corymbia tessellaris (13%), Eucalyptus moluccana (16, 13%), Eucalyptus siderophloia (9, 13%), Allocasuarina torulosa (7%), Alphitonia excelsa (7%), Alstonia constricta (7%), Brachychiton populneus (7%), Eucalyptus melanophloia (3, 7%)

Stratum: T2

Height avg. = 12.9m, range 9-17m, 14 sites

Crown cover avg. = 19.9%, range 2.0-40.0%, 14 sites

Dominant species (relative cover, frequency): Corymbia citriodora subsp. variegata (42, 73%), Eucalyptus crebra (36, 67%), Angophora leiocarpa (18, 27%)

Frequent species (cover, frequency): Corymbia citriodora subsp. variegata (10, 73%), Eucalyptus crebra (6, 67%), Angophora leiocarpa (3, 27%), Alphitonia excelsa (1, 20%), Acacia disparrima subsp. disparrima (14, 13%), Corymbia intermedia (4, 13%), Corymbia tessellaris (4, 13%), Eucalyptus major (7, 13%), Lophostemon confertus (14, 13%), Acacia maidenii (7%), Allocasuarina torulosa (7%), Eucalyptus melanophloia (4, 7%), Eucalyptus moluccana (4, 7%), Eucalyptus siderophloia (2, 7%), Eucalyptus tereticornis (3, 7%), Notelaea longifolia (7%)

Dominant species: Relative cover (mean of cover of species / total cover of all species in that stratum for all values > zero) and frequency (percent of total sites) ordered by decreasing relative abundance. Up to five most dominant species with frequency > 20% listed for each stratum.

Frequent species: Cover (mean of all values > zero) and frequency (percent of total sites) of all species occurring in more than 5% of sites ordered by decreasing frequency. Ground layer species are listed as either graminoid or forb.

Naturalised species have an asterisk (*) after the name. indet. after listed name = indeterminate species or genus

Stratum: T3

Height avg. = 7.2m, range 5-10m, 6 sites

Crown cover avg. = 13.0%, range 8.0-20.0%, 6 sites

Dominant species (relative cover, frequency): Eucalyptus crebra (57, 27%), Corymbia citriodora subsp. variegata (34, 33%)

Frequent species (cover, frequency): Corymbia citriodora subsp. variegata (6, 33%), Eucalyptus crebra (5, 27%), Angophora leiocarpa (3, 13%), Acacia glaucocarpa (8, 7%), Allocasuarina luehmannii (13, 7%), Alphitonia excelsa (7%), Celastrus subspicata (7%), Corymbia tessellaris (1, 7%), Eucalyptus major (7, 7%)

Stratum: S1

Height avg. = 2.5m, range 1.5-5m, 15 sites

Crown cover avg. = 21.6%, range 2.0-50.0%, 15 sites

Dominant species (relative cover, frequency): Acacia disparrima subsp. disparrima (48, 40%), Alphitonia excelsa (24, 53%), Acacia leiocalyx (20, 40%), Eucalyptus crebra (16, 27%), Lantana camara (12, 40%)*

Frequent species (cover, frequency): Alphitonia excelsa (4, 53%), Corymbia citriodora subsp. variegata (1, 47%), Acacia disparrima subsp. disparrima (7, 40%), Acacia leiocalyx (4, 40%), Lantana camara (4, 40%), Eucalyptus crebra (2, 27%), Jacksonia scoparia (1, 27%), Alstonia constricta (4, 20%), Angophora leiocarpa (1, 20%), Acacia falcata (9, 13%), Acacia fimbriata (15, 13%), Acacia glaucocarpa (4, 13%), Acacia maidenii (2, 13%), Choretrum candollei (13%), Corymbia tessellaris (13%), Eremophila debilis (13%), Maytenus cunninghamii (13%), Myoporum montanum (1, 13%), Pittosporum angustifolium (1, 13%), Acacia amblygona (8, 7%), Acacia concurrens (7%), Acacia decora (7%), Acacia implexa (7%), Acacia irrorata (8, 7%), Acacia loroloba (1, 7%), Acacia neriifolia (7%), Alectryon diversifolius (5, 7%), Allocasuarina littoralis (18, 7%), Allocasuarina torulosa (2, 7%), Astrotricha latifolia (5, 7%), Brachychiton populneus (1, 7%), Brachychiton rupestris (7, 7%), Breynia oblongifolia (2, 7%), Citrus australis (5, 7%), Corymbia intermedia (7%), Cupaniopsis parvifolia (7%), Daviesia ulicifolia (7%), Eucalyptus major (2, 7%), Eucalyptus moluccana (4, 7%), Eucalyptus tereticornis (7%), Flindersia australis (7%), Gomphocarpus physocarpus* (7%), Hovea lorata (2, 7%), Indigofera australis (8, 7%), Lophostemon confertus (20, 7%), Persoonia sericea (7%), Psydrax odorata (4, 7%), Psydrax odorata forma buxifolia (7%), Pultenaea euchila (2, 7%), Solanum ellipticum (7%), Solanum seaforthianum* (7%), Swainsona galegifolia (7%), Wikstroemia indica (7%), Xanthorrhoea johnsonii (8, 7%)*

Dominant species: Relative cover (mean of cover of species / total cover of all species in that stratum for all values > zero) and frequency (percent of total sites) ordered by decreasing relative abundance. Up to five most dominant species with frequency > 20% listed for each stratum.

Frequent species: Cover (mean of all values > zero) and frequency (percent of total sites) of all species occurring in more than 5% of sites ordered by decreasing frequency. Ground layer species are listed as either graminoid or forb.

Naturalised species have an asterisk (*) after the name. indet. after listed name = indeterminate species or genus

Stratum: G

Height avg. = 0.6m, range 0.15-1m, 15 sites

PFC avg. = 47.2%, range 10-90%, 15 sites

Dominant species (relative cover, frequency): *Entolasia stricta* (33, 27%), *Cymbopogon refractus* (28, 67%), *Themeda triandra* (24, 67%), *Eremochloa bimaculata* (20, 33%), *Imperata cylindrica* (17, 27%)

Frequent species (cover, frequency): **GRAMINOIDS:** *Cymbopogon refractus* (14, 67%), *Themeda triandra* (14, 67%), *Panicum effusum* (1, 60%), *Heteropogon contortus* (8, 47%), *Aristida vagans* (1, 40%), *Eragrostis brownii* (33%), *Eremochloa bimaculata* (5, 33%), *Entolasia stricta* (9, 27%), *Imperata cylindrica* (6, 27%), *Cyperus gracilis* (20%), *Eragrostis spartinoideus* (2, 20%), *Bothriochloa decipiens* (1, 13%), *Capillipedium spicigerum* (13%), *Chloris divaricata* (20, 13%), *Digitaria breviglumis* (2, 13%), *Gahnia aspera* (1, 13%), *Melinis repens** (5, 13%), *Scleria mackaviensis* (13%), *Aristida calycina* (36, 7%), *Aristida gracilipes* (16, 7%), *Aristida indet.* (7%), *Aristida personata* (4, 7%), *Aristida queenslandica* var. *queenslandica* (7%), *Bothriochloa bladhii* (7%), *Cleistochloa rigida* (7%), *Cyperus aggregatus** (7%), *Dichanthium sericeum* (7%), *Digitaria didactyla** (7%), *Digitaria parviflora* (7%), *Eriachne glabrata* (7%), *Fimbristylis dichotoma* (7%), *Lepidosperma laterale* (2, 7%), *Megathyrsus maximus* var. *pubiglumis** (1, 7%), *Oplismenus aemulus* (7%), *Panicum decompositum* (5, 7%), *Paspalidium caespitosum* (7%), *Paspalidium distans* (7%), *Sarga leiocladum* (7%), *Scleria sphacelata* (7%), *Sporobolus elongatus* (1, 7%), *Urochloa foliosa* (1, 7%)

FORBS: *Cyanthillium cinereum* (47%), *Dianella revoluta* (1, 47%), *Eustrephus latifolius* (47%), *Lantana camara** (5, 40%), *Glycine tabacina* (33%), *Peripleura hispidula* var. *hispidula* (33%), *Desmodium rhytidophyllum* (27%), *Eremophila debilis* (27%), *Lantana montevidensis** (3, 27%), *Brunoniella australis* (20%), *Chrysocephalum apiculatum* (20%), *Galactia tenuiflora* (20%), *Hardenbergia violacea* (20%), *Opuntia stricta** (20%), *Sida hackettiana* (3, 20%), *Achyranthes aspera* (2, 13%), *Bidens pilosa** (13%), *Desmodium gunnii* (13%), *Dianella caerulea* (13%), *Dianella indet.* (13%), *Gomphocarpus physocarpus** (13%), *Laxmannia gracilis* (13%), *Lobelia purpurascens* (13%), *Lomandra longifolia* (1, 13%), *Lomandra multiflora* (1, 13%), *Mentha diemenica* (1, 13%), *Opuntia tomentosa** (13%), *Passiflora subpeltata** (15, 13%), *Abutilon oxycarpum* forma *oxycarpum* (7%), *Acacia leiocalyx* (1, 7%), *Alphitonia excelsa* (7%), *Alstonia constricta* (1, 7%), *Asparagus africanus** (7%), *Breynia oblongifolia* (2, 7%), *Brunonia australis* (7%), *Cassytha pubescens* (7%), *Cheilanthes sieberi* (7%), *Cheilanthes tenuifolia* (7%), *Clematicissus opaca* (7%), *Conyza bonariensis** (7%), *Crotalaria montana* (7%), *Cynanchum bowmanii* (1, 7%), *Desmodium brachypodum* (7%), *Desmodium uncinatum** (7%), *Desmodium varians* (7%), *Dianella brevipedunculata* (1, 7%), *Dianella caerulea* var. *vannata* (7%), *Einadia hastata* (7%), *Glycine indet.* (7%), *Goodenia hederacea* (1, 7%), *Goodenia rotundifolia* (7%), *Grewia latifolia* (1, 7%), *Gymnostachys anceps* (7%), *Hibiscus sturtii* (1, 7%), *Hovea acutifolia* (7%), *Jasminum didymum* (7%), *Jasminum didymum* subsp. *lineare* (7%), *Jasminum suavissimum* (1, 7%), *Leucopogon juniperinus* (7%), *Lissanthe strigosa* (2, 7%), *Lomandra confertifolia* subsp. *pallida* (25, 7%), *Lomandra filiformis* (7%), *Monotoca scoparia* (7%), *Myoporum montanum* (7%), *Opuntia indet.* (7%), *Ozothamnus diosmifolius* (7%), *Passiflora suberosa** (7%), *Picris angustifolia* subsp. *carolorum-henricorum* (7%), *Plectranthus parviflorus* (7%), *Podolepis neglecta* (7%), *Pomax umbellata* (7%), *Pterocaulon redolens* (7%), *Pycnosorus chrysanthes* (7%), *Rhodanthe anthemoides* (7%), *Secamone elliptica* (1, 7%), *Sida cordifolia** (7%), *Sida rhombifolia** (7%), *Solanum nemophilum* (1, 7%), *Solanum stelligerum* (7%), *Stephania japonica* (7%), *Velleia paradoxa* (7%), *Velleia spathulata* (7%), *Wahlenbergia gracilis* (7%), *Wedelia spilanthis* (7%)

Dominant species: Relative cover (mean of cover of species / total cover of all species in that stratum for all values > zero) and frequency (percent of total sites) ordered by decreasing relative abundance. Up to five most dominant species with frequency > 20% listed for each stratum.

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