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PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2015/727

Date: 14 October 2016

Queensland Government

ECOLOGICAL ASSESSMENT

Lot 2 on RP868726
820 Greenbank Road, North Maclean

A Report Prepared for
Anna Properties Pty Ltd

August 2016

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DOCUMENT CONTROL

Document

Title	Ecological Assessment – 820 Greenbank Road, North Maclean
Job Number	Q15004
File Reference	\\SERVER\data\QLD CLIENT FILES\Q15004_820 Greenbank Road, North Maclean\Report\EA
Version and Date	RW2 08/08/16
Client	Anna Properties Pty Ltd

Revision History (office use only)

Issue	Version	Draft/Final	Date	Distributed To	No. Copies	Media	Delivery Method
1	RW1	DRAFT	08/08/16	JWA	1	Word	Email
2	RW2	DRAFT	09/08/16	Client	1	PDF	Email
3	RW3	FINAL	18/08/16	Client	1	PDF	Email

Client Issue

Version	Date Sent	Author		Approved by	
		Name	Initials	Name	Initials
RW2	09/08/16	Adam McArthur / Phoebe Chapman	AM / PC	Adam McArthur	AM
RW3	18/08/16	Adam McArthur / Phoebe Chapman	AM / PC	Adam McArthur	AM

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1 INTRODUCTION

1.1 Background

JWA Pty Ltd has been engaged by Anna Properties Pty Ltd to complete an Ecological Assessment on land at 820 Greenbank Road, North Maclean. The land is hereafter referred to as the subject site.

The assessment has involved the following:

- determining the suite of Commonwealth and State listed threatened and regionally or locally significant flora and fauna species that occur in the locality from literature and database records;
- ground truthing vegetation communities and determining their conservation status in accordance with the Queensland Department of Natural Resources and Mines (DNRM) Regional Ecosystem Framework (*Vegetation Management Act* [*VMA*, *1999]*);
- assessing the likelihood of occurrence of threatened flora and fauna species on the subject site;
- searching for and recording threatened and regionally or locally significant flora and fauna species;
- assessing habitat provided by the site in the context of the surrounding area;
- assessing the corridor values of the site at a local and regional scale;
- assessing the potential impacts of the proposed development and determining appropriate mitigation measures;
- addressing statutory requirements regarding impacts to flora and fauna; and
- addressing relevant development assessment codes and policies.

1.2 The Subject Site

The site is located at 820 Greenbank Road, North Maclean and is formally described as Lot 2 on RP868726 (**FIGURE 1**). It covers an area of approximately 20.25 ha. The land is gently undulating and is currently partially vegetated with a mixed eucalypt dry sclerophyll forest. A dam is positioned in the central portion of the site, while a cleared easement runs diagonally southwest – northeast across the southern portion. An aerial photograph of the site is shown in **FIGURE 2**.

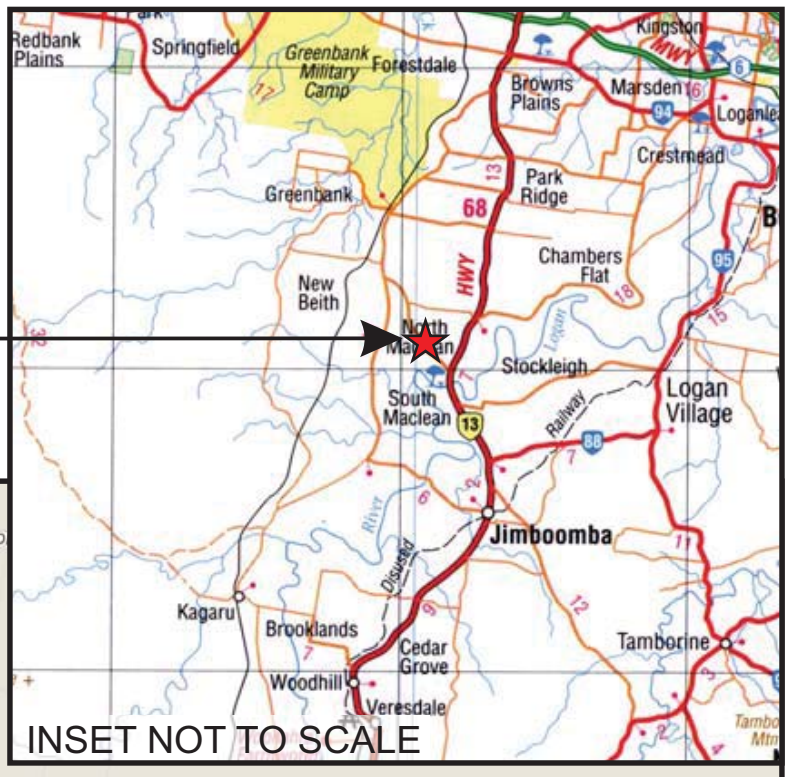
1.3 Planning Context

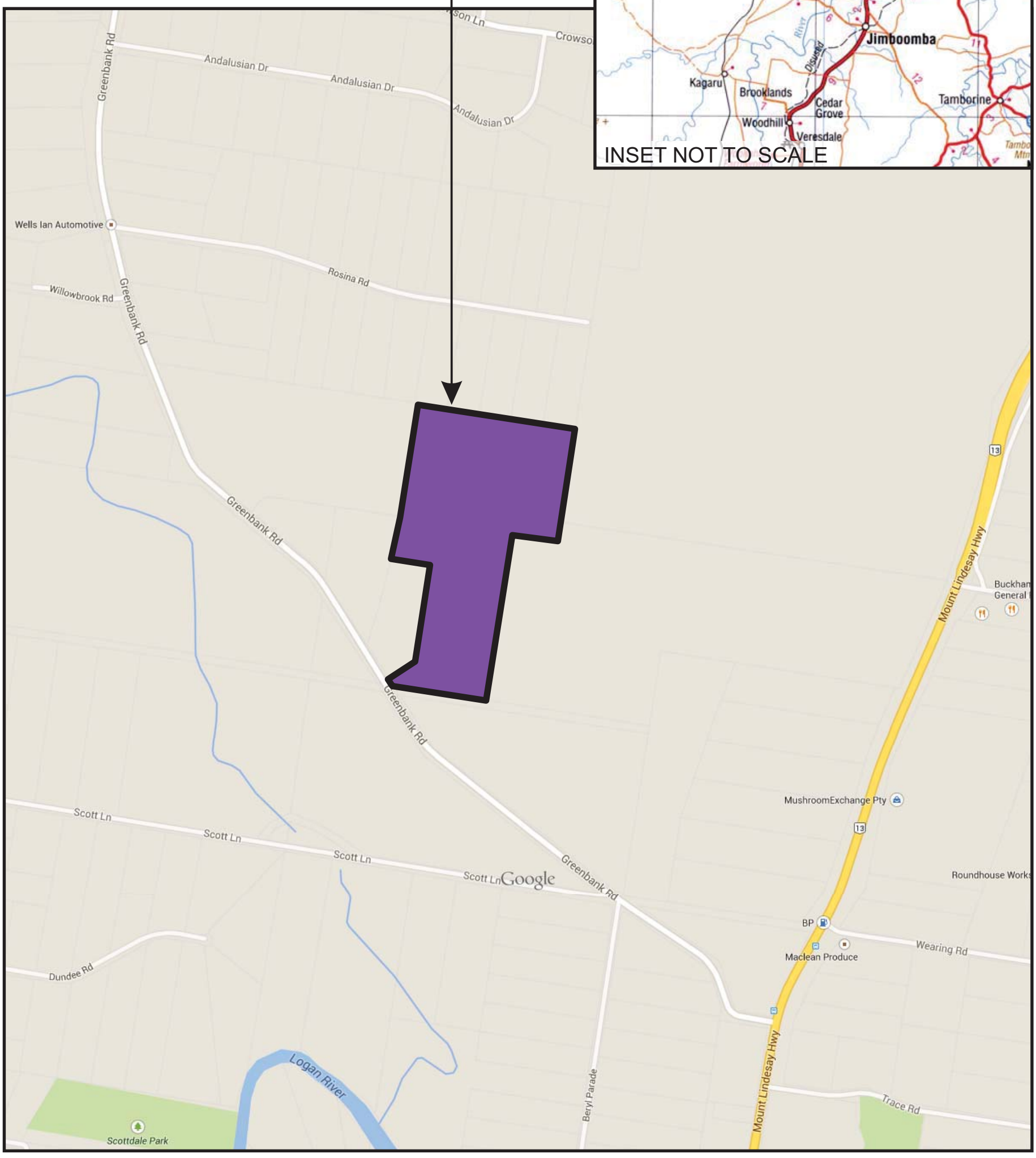
The site is located within the Greater Flagstone Priority Development Area (PDA), and is therefore within a region that has been identified for accelerated development with the goal of economic growth. The development will therefore be assessed under the PDA Guidelines prepared by the QLD Department of Infrastructure, Local Government and Planning in addition to standard state and Commonwealth legislation.

PDA Guidelines 14 (Environmental Values and Resource Use) and 17 (Remnant Vegetation and Koala Habitat Obligations in Greater Flagstone and Yarrabilba PDAs) set the

N

SUBJECT SITE





0 500m

SOURCE: Google Maps SCALE: 1 : 15 000 @ A4 JWA PTY LTD Ecological Consultants	CLIENT Anna Properties PROJECT Ecological Assessment Lot 2 on RP868726 820 Greenbank Road, North Maclean QLD Logan City Council LGA	**FIGURE 1** PREPARED: BW DATE: 07 August 2016 FILE: Q15004_Locality.cdr	TITLE **LOCALITY PLAN**

Legend
Subject Site

N

0 100m

1 : 2500

SOURCE: QLD Globe Sept 2013 Aerial Photo

SCALE: 1 : 2500 @ A3

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FIGURE 2

PREPARED: BW
DATE: 07 August 2016
FILE: Q15004_Aerial.cdr

TITLE

AERIAL PHOTOGRAPH

requirements for ecological site surveys and offsets for proposed developments within the Greater Flagstone PDA. These guidelines must be addressed as part of the ecological assessment.

A development application (DEV2015/727) for the site has been lodged with DILGP in 2015. Subsequently, Information Requests (19th and 28th January 2016) were issued via email outlining requirements for further assessment of the site's ecological values. Correspondence with DILGP has determined that targeted surveys for the following threatened species (known from the area) will be required:

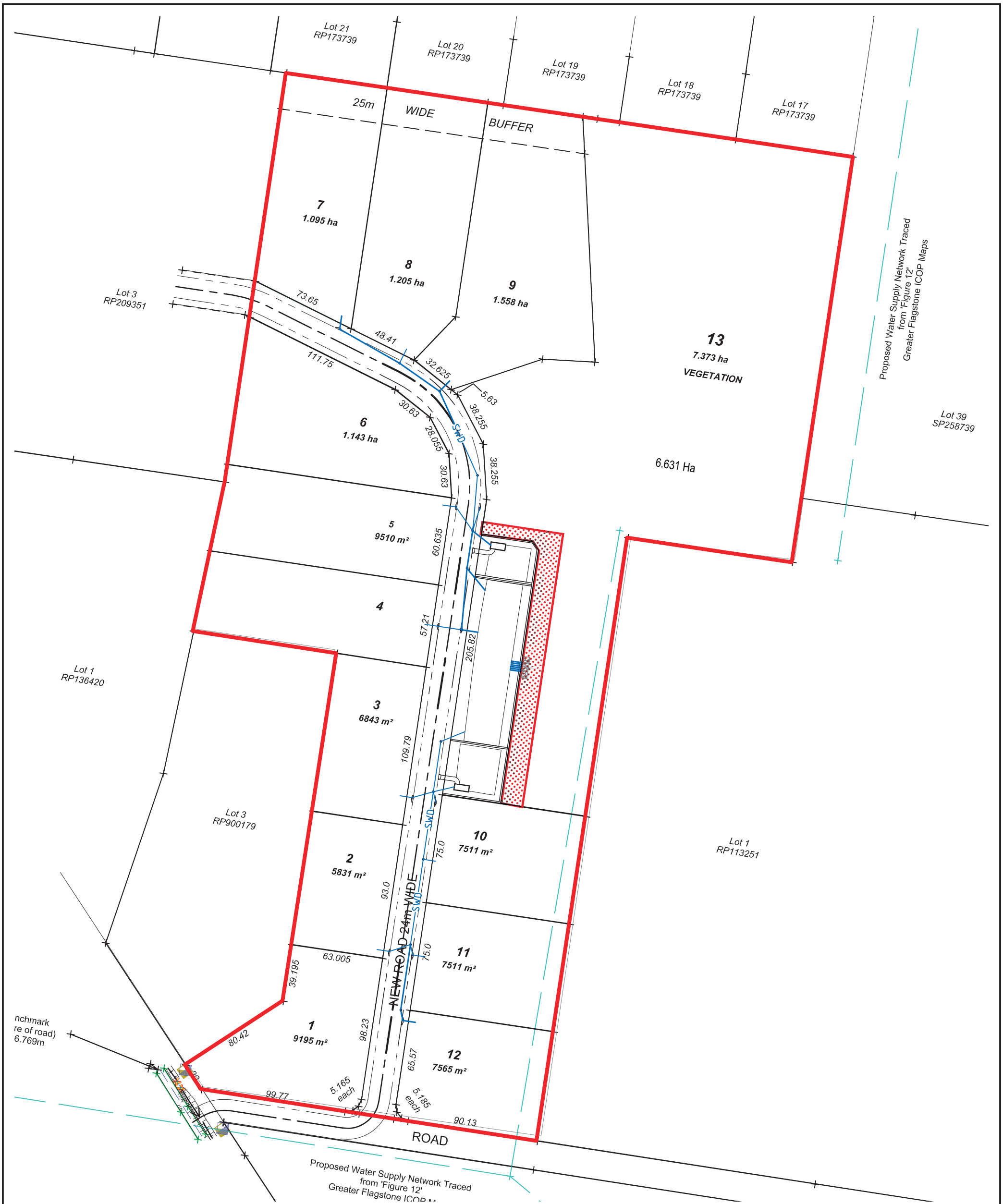
- Koala (*Phascolarctos cinereus*);
- Spotted-tailed quoll (*Dasyurus maculatus maculatus*);
- Tusked frog (*Adelotus brevis*);
- Glossy black cockatoo (*Calyptorhynchus lathami*); and
- Swamp tea-tree (*Melaleuca irbyana*).

An Offset Strategy has been prepared for the site (JWA 2016) in order to meet obligations under PDA Guideline 17 and should be read in conjunction with this report.

1.4 The Proposed Works

The proposed development includes the subdivision of the land into twelve (12) industrial Lots (**FIGURE 3**). An industrial connector road will traverse the site from the western boundary, south through the centre of the site to Greenbank Road. It is expected that services will be co-located within this road reserve. A stormwater detention basin will be located in the vicinity of the existing dam on site and will be approximately 7,350m^2 in size. The remainder of the site will be retained as a reserve and offset area.

It is noted that the current layout has been produced to give an indication on the footprint necessary (including for stormwater treatment devices) to assist in the development application noting that the final lot layout and servicing arrangements is likely to change pending buyer demand and servicing constraints, and also in response to any ecological constraints identified in this report. In this regard, a number of recommendations are made at in **Section 7** of this report in relation to layout changes to reduce/ameliorate potential impacts on ecological values of the site.



Legend

- Potential buffer zone required for basin refinement in future DCBDMP
- Proposed lots
- Proposed stormwater drainage
- Subject Site

N

0 100m

1 : 2500

SOURCE: Civil Dimensions (CD14-053 Greenbank Rd North Maclean CSBSMP Addendum Letter to DILGP 16-0...pdf); ONF Surveyors (5443_P1D_170516.dwg)

SCALE: 1 : 2500 @ A3

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FIGURE 3

PREPARED: BW
DATE: 08 August 2016
FILE: Q15004_Layout.cdr

TITLE

PROPOSED DEVELOPMENT LAYOUT

2 DESKTOP ASSESSMENT

2.1 Introduction

A desktop assessment was completed to highlight any potential conservation significant vegetation communities, any potential habitat for threatened flora and fauna, and any ecologically sensitive areas on the subject site. The desktop assessment included a review of:

- State and Commonwealth databases;
- State environmental mapping; and
- literature review of scientific journal articles and botanical literature to assist with habitat suitability assessments.

2.2 Methods

2.2.1 Database Searches

2.2.1.1 Background

The following databases were reviewed as part of the desktop assessment:

- the Commonwealth Environment Protection Biodiversity and Conservation (EPBC) Act (1999) Protected Matters Search Tool (PMST); and
- the Queensland Department of Environment and Heritage Protection (DEHP) Wildlife Online database.

2.2.1.2 EPBC Act PMST

The Commonwealth PMST generates a list of protected matters under the Commonwealth *EPBC Act* that may occur in or near the subject area including:

- world heritage and national heritage areas;
- wetlands of international significance (Ramsar Wetlands);
- Commonwealth marine areas;
- threatened ecological communities;
- threatened species; and
- migratory species.

The database incorporates information from a range of sources including government, research and community organisations. It should be noted that there are limitations on the accuracy of some matters reported by the PMST. In particular, database records of threatened and migratory species are based on their current known distribution and do not necessarily correlate to an actual observation. Database records are an indicator of potential presence only and do not take into account if suitable vegetation, geology, soil, climate or habitat types are actually present to support the occurrence of a significant species or community.

The Commonwealth PMST was used to determine the suite of threatened flora and fauna, migratory species and threatened ecological communities that were likely to be present within a 5 km radius of the subject site.

2.2.1.3 DEHP Wildlife Online

The DEHP Wildlife Online database contains recorded wildlife sightings and listings of plants, fungi, protists, mammals, birds, reptiles, amphibians, freshwater fish, marine cartilaginous fish and butterflies in Queensland. The database is based on collated species lists and wildlife records acquired by the Queensland government through a range of sources including specimen collections, research and monitoring programs and community wildlife recording programs.

The DEHP Wildlife Online database was consulted to determine the variety of threatened flora and fauna species known to occur within a 5 km radius of the subject site.

2.2.2 Environmental Mapping

2.2.2.1 Background

The following relevant DEHP environmental mapping was reviewed as part of the desktop assessment:

- Regional Ecosystem (RE) and Remnant Mapping (version 8);
- Essential Habitat Mapping (version 4);
- State Planning Regulatory Provisions (SPRP) and State Planning Provisions (SPP) Koala Habitat Mapping; and
- Protected plants flora survey trigger map.

DEHP environmental mapping was obtained from the DEHP website using the Lot and Plan numbers of the subject site.

2.2.2.2 Regulated Vegetation Management Mapping

Regulated vegetation management maps are used to determine the requirements that apply under the State Development Assessment Provisions (VMA 1999). The vegetation categories on the map are:

- category A (red) - areas subject to compliance notices, offsets and voluntary declarations;
- category B (dark blue) - remnant vegetation;
- category C (light blue) - high-value regrowth vegetation;
- category R (yellow) - regrowth vegetation within 50 m of watercourses in priority reef catchment areas; and
- category X (white) - areas not regulated under the *Vegetation Management Act 1999*.

2.2.2.3 Regional Ecosystems

Regional ecosystems (REs) are vegetation communities that are consistently associated with a particular combination of geology, land form and soil in a bioregion. Each RE has been assigned a conservation status which is based on its current extent in a bioregion as a proportion of its pre-clearing extent. Regional ecosystem maps show the extent and conservation status of regional ecosystems at a property level. On a regional ecosystem map, remnant vegetation is shown as either a remnant endangered regional ecosystem, a remnant of concern regional ecosystem, or a remnant least concern regional ecosystem.

The Queensland Herbarium has mapped the extent of RE's and Essential Habitat across Queensland, however it should be noted that mapping was completed at a scale of 1:100,000 and as such there are inaccuracies at a property scale. As a result, RE maps should be considered to indicative only and should not be relied upon as an inherently correct source of vegetation mapping. Site ground truthing is required to confirm the presence of RE types and their extent, verify floristics and structure and confirm conservation status.

2.2.2.4 Essential Habitat Mapping

Essential Habitat are areas identified by DEHP as essential habitat for a species of wildlife listed as endangered, vulnerable, near threatened or rare under the *Nature Conservation Act 1992*. These areas are shown on RE maps and Essential Habitat maps.

2.2.2.5 SPRP and SPP Koala Habitat Mapping

SPRP and SPP Koala habitat mapping shows areas within South East Queensland that must incorporate Koala conservation and habitat protection outcomes into planning decisions. The Koala habitat values mapping identifies areas of bushland habitat, areas suitable for rehabilitation and other areas of value.

2.2.2.6 Protected Plants Flora Survey Trigger Map

This mapping produced by the Department of Environment and Heritage Protection (DEHP) shows areas were particular provisions of the NCA apply to the clearing of protected plants.

2.3 Results

2.3.1 Database Searches

2.3.1.1 Threatened Flora Species and Ecological Communities

Database searches using the Commonwealth PMST identified seven (7) threatened flora species listed within schedules of the EPBC Act (1999) that may occur within 5 km of the subject site based on the availability of suitable habitat in the locality. The DEHP Wildlife Online database indicated that no threatened flora species listed within schedules of the Nature Conservation (Wildlife) Regulation (NCWR) 2006 have been recorded from within 5 km of the subject site.

Threatened flora species detected in the database searches are listed in **TABLE 1.** The conservation status of each species listed in **TABLE 1** is shown in accordance with the Commonwealth *EPBC Act* (*1999*) and Queensland *Nature Conservation (Wildlife) Regulation* (*NCWR, 2006*).

TABLE 1
DATABASE RECORDS OF THREATENED FLORA SPECIES WITHIN 5 KM OF THE SITE

Scientific Name	Common Name	EPBC#	NCWR*
Bosistoa transversa	Three-leaved bosistoa	CV	-
Cycas ophiolitica	Marlborough blue	CE	QE
Notelaea ipsviciensis	Cooneana olive	CCE	QE
Notelaea lloydii	Lloyd's olive	CV	QV
Phaius australis	Lesser swamp-orchid	CE	QE
Phebalium distans	My Berryman phebalium	CCE	QE
Thesium australe	Austral toadflax	CV	QV

CCE – Critically Endangered, CE – Endangered and CV – Vulnerable as listed within schedules of the Commonwealth *EPBC Act (1999)*;
* QE – Endangered, QV – Vulnerable and QNT – Near Threatened as listed within schedules of the Queensland *NCWR (2006)*;

Database searches using the Commonwealth PMST also revealed that three (3) threatened Ecological Communities may occur within 5 km of the subject site:

- Lowland Rainforest of Subtropical Australia – Critically Endangered;
- Swamp Tea-tree (*Melaleuca irbyana*) Forest of South-east Queensland – Critically Endangered; and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered.

2.3.1.2 Threatened Fauna Species

Database searches using the Commonwealth PMST identified twenty-one (21) threatened fauna species that may occur within 5 km of the subject site based on the availability of suitable habitats. The DEHP Wildlife Online database indicated that six (6) threatened fauna species have been recorded from within 5 km of the subject site.

Threatened fauna species detected in the database searches are listed in **TABLE 2.** The conservation status of each species listed in **TABLE 2** is shown in accordance with the Commonwealth *EPBC Act (1999)* and the Queensland *NCWR (2006)*.

TABLE 2
DATABASE RECORDS OF THREATENED FAUNA SPECIES WITHIN 5 KM OF THE SITE

Scientific Name	Common Name	EPBC#	NCWR*
Adelotus brevis	Tusked frog	-	QV
Anthochaera phrygia	Regent honeyeater	CCE	QE
Botaurus poiciloptilus	Australian bittern	CE	-

Scientific Name	Common Name	EPBC#	NCWR*
Calyptorhynchus lathami lathami	Glossy black-cockatoo	-	QV
Chalinolobus dwyeri	Large-eared pied bat	CV	QV
Dasyornis brachypterus	Eastern bristlebird	CE	QE
Dasyurus maculatus maculatus (SE mainland population)	Spotted-tail quoll	CE	QV
Delma torquata	Collared delma	CV	CV
Erythrotriorchis radiatus	Red goshawk	CV	QE
Furina dunmalli	Dunmall's snake	CV	QV
Geophaps scripta scripta	Squatter pigeon	CV	QV
Grantiella picta	Painted honeyeater	CV	QV
Lathamus discolor	Swift parrot	CCE	QE
Maccullochella mariensis	Mary River cod	CE	-
Petauroides volans	Greater glider	CV	-
Petrogale penicillata	Brush-tailed rock-wallaby	CV	QV
Phascolarctos cinereus	Koala	CV	QV
Poephila cincta cincta	Black-throated finch (southern)	CE	QE
Potorous tridactylus tridactylus	Long-nosed potoroo	CV	QV
Pteropus poliocephalus	Grey-headed flying-fox	CV	-
Rostratula australis	Australian painted snipe	CE	QV
Saiphos reticulatus	Three-toed snake-tooth skink	CV	-
Turnix melanogaster	Black-breasted button-quail	CV	QV

CCE - Critically Endangered, CE – Endangered and CV - Vulnerable as listed within schedules of the Commonwealth *EPBC Act (1999)*;
* QE - Endangered, QV - Vulnerable and QNT – Near Threatened as listed within schedules of the Queensland *NCWR (2006)*;

2.3.1.3 Migratory Species

Database searches using the Commonwealth PMST also revealed that eighteen (18) migratory wetlands and migratory terrestrial species may occur within 5 km of the site based on the availability of suitable habitat. Migratory species identified in database searches are listed in **TABLE 3.**

TABLE 3
DATABASE RECORDS OF MIGRATORY SPECIES WITHIN 5 KM OF THE SITE

Scientific Name	Common Name	Status#
Anseranas semipalmata	Magpie goose	M
Apus pacificus	Fork-tailed swift	M
Ardea alba	Great egret	M
Ardea ibis	Cattle egret	M
Cuculus optatus	Oriental cuckoo	M
Gallinago hardwickii	Latham's snipe	M
Haliaeetus leucogaster	White-bellied sea-eagle	M
Hirundapus caudacutus	White-throated needletail	M

Scientific Name	Common Name	Status#
Lathamus discolor	Swift parrot	CCE, M
Merops ornatus	Rainbow bee-eater	M
Monarcha melanopsis	Black-faced monarch	M
Monarcha trivirgatus	Spectacled monarch	M
Motacilla flava	Yellow wagtail	M
Myiagra cyanoleuca	Satin flycatcher	M
Pandion haliaetus	Osprey	M
Rhipidura rufifrons	Rufous fantail	M
Rostratula benghalensis (sensu lato)	Painted snipe	M
Tringa nebularia	Common greenshank	M

CCE - Critically Endangered, CE - Endangered, CV - Vulnerable and M – Migratory as listed within schedules of the Commonwealth *EPBCA (1999).*

2.3.2 DEHP Environmental Mapping

2.3.2.1 Regulated Vegetation Management and RE Mapping

The current regulated vegetation management map of the subject site includes Category X (vegetation not regulated under the VMA) areas over a large portion of the site. Category B (Remnant) vegetation in the eastern portion of the subject site is mapped as follows:

The DNRM mapping identifies the regulated vegetation as the following REs (**FIGURE 4**):

- Endangered RE 12.9-10.11 *Melaleuca irbyana* low open forest on sedimentary rocks; and
- Endangered RE 12.9-10.2/12.9-10.12/12.9-10.7 *Corymbia citriodora* subsp. *variegata*, with-or-without *Eucalyptus crebra*, open forest on sedimentary rocks / *Eucalyptus seeana*, *Corymbia intermedia*, *Angophora leiocarpa*, with-or-without *E. siderophloia*, *E. tereticornis*, *E. racemosa* subsp. *racemosa*, *C. citriodora* subsp. *variegata*, woodland to open forest with *Lophostemon suaveolens* sub canopy / *Eucalyptus crebra* with-or-without *E. tereticornis*, *Corymbia tessellaris*, *Angophora leiocarpa*, *E. melanophloia* woodland.

2.3.2.2 Essential Habitat Mapping

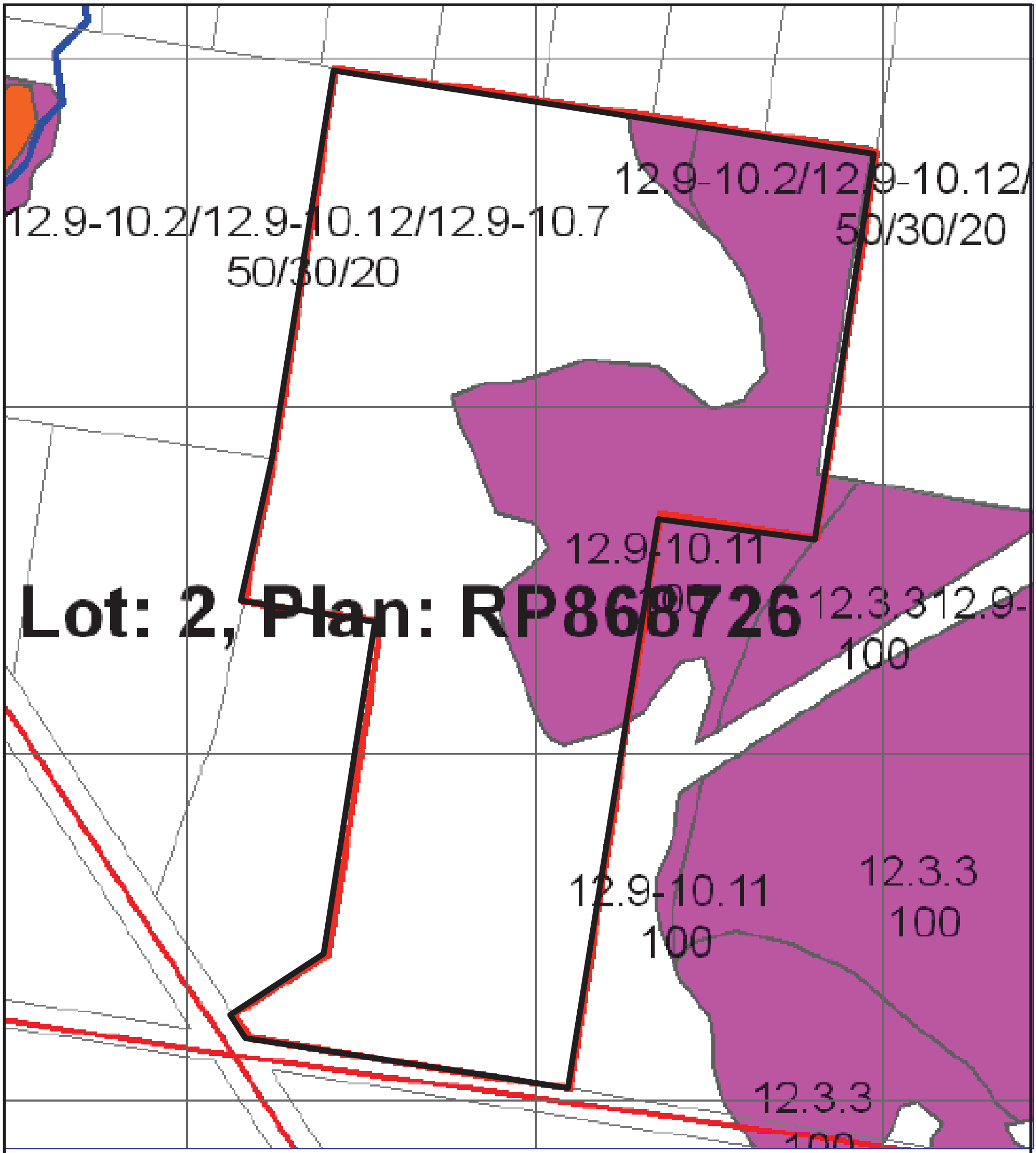
No Essential Habitat is mapped on the site.

2.3.2.3 SPRP and SPP Koala Habitat Mapping

The site is outside SPRP Koala Assessable Development Area. The SPP mapping shows the subject site as a combination of medium value rehabilitation and medium value bushland habitat (**FIGURE 5**).

2.3.2.4 Protected Plants Flora Survey Trigger Map

The Protected Plants Flora Survey Trigger Map identifies that the site is not located within a 'High Risk Area' prescribed under the NCWR (2006).



SOURCE: QLD DEHP Vegetation Management Supporting Map

SCALE: 1 : 4000 @ A4

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FIGURE 4

PREPARED: BW
DATE: 07 August 2016
FILE: Q15004_RE Map.cdr

TITLE

REGIONAL ECOSYSTEMS

Legend
Medium Value Bushland Habitat
Medium Value Rehabilitation
Subject Site

N

0 50m 100m

SOURCE: QLD DEHP Koala Habitat in South East Queensland

SCALE: 1 : 4000 @ A4

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FIGURE 5

PREPARED: BW
DATE: 07 August 2016
FILE: Q15004_Koala SPP Map.cdr

TITLE

KOALA HABITAT MAPPING

3 FLORA AND FAUNA ASSESSMENT

3.1 Introduction

PDA Guidelines 14 and 17 require that targeted surveys for threatened species known from the area be completed on the subject site. This section discusses the methods used in the flora and fauna assessment and presents the results of the assessment.

3.2 Methods

3.2.1 Site Vegetation Surveys

3.2.1.1 Background

An initial inspection of the subject site was undertaken by one (1) JWA scientist on the 3rd of March 2015 to ground truth and map vegetation on the site. A total of approximately seven (7) hours were spent on this component of the survey.

Further vegetation surveys, including random meander searches for threatened species, were undertaken on the 10th and 24th of June 2016. A total of approximately eleven (11) hours were spent on these surveys.

The flora surveys employed an assessment of floral taxa and vegetation communities in keeping with the methodology employed by the Queensland Herbarium for the survey of Regional Ecosystems and vegetation communities (Neldner *et al.* 2005). Preliminary identification of the vegetation communities was conducted prior to the commencement of fieldwork via interpretation of current RE mapping (Version 8) and aerial photographs.

2015 field surveys involved a botanical assessment at a number of representative sites and utilised a number of standard methods including tertiary and quaternary survey sites.

2016 surveys included the methodology described in the Nature Conservation Act's (1992) Flora Survey Guidelines - Protected Plants (DEHP 2014) as timed random meander searches.

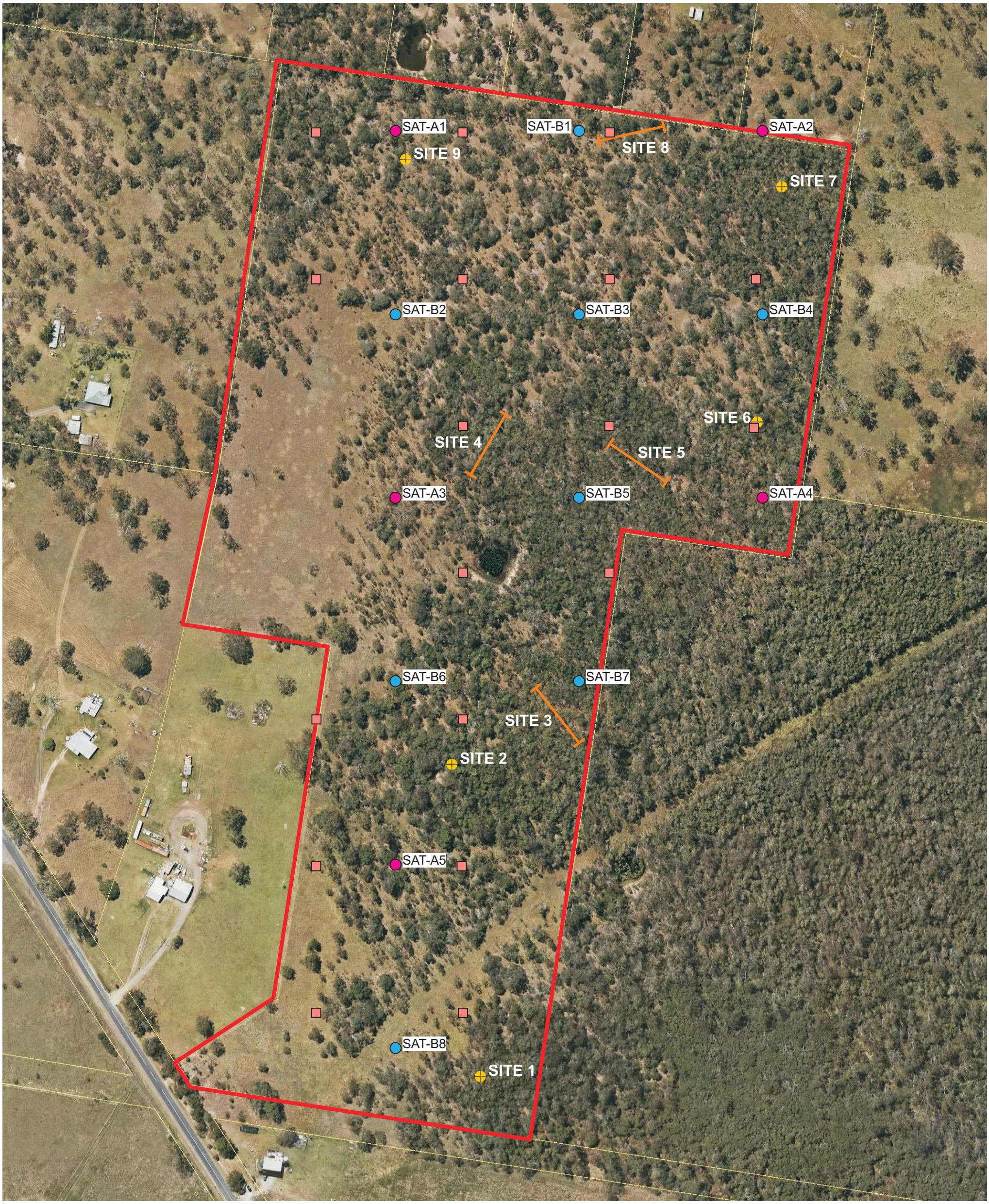
3.2.1.2 Tertiary Survey Sites

The 2015 field survey utilised four (4) tertiary transects within the site. Each of which comprised a 10 x 50 m (500m2) area. Locations of transects were recorded using a handheld GPS unit. The location of each tertiary survey site is shown in **FIGURE 6**.

Descriptive site information recorded at tertiary transects included location, orientation, aspect, slope, soil type, landform, disturbance, fire history and general notes on ecological integrity. Several digital photographs were taken at each plot as a visual reference.

Floristic analysis included plant identification and species diversity characterisation of all flora present. Relative abundance was assigned for all species recorded.

The structural analysis included recording the height class and life form of the dominant species within each strata present. The height of each stratum was recorded using ocular



Legend

- Quaternary Survey Site
- Tertiary Survey Site
- Hair Tubes
- SAT A Sites
- SAT B Sites
- Subject Site

N

0 100m

1 : 2500

SOURCE: JWA Site Investigations; QLD Globe Sept 2013 Aerial Photo

SCALE: 1 : 2500 @ A3

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FIGURE 6

PREPARED: BW
DATE: 07 August 2016
FILE: Q15004_Survey Sites.cdr

TITLE

SURVEY SITES

estimation. Foliage projective cover (FPC) of the mid and upper strata was calculated along each transect where foliage projection intersected the 50 m centre tape. The FPC of the ground layer was determined using visual estimation of cover within five (5) 1 m subplots spaced at equal intervals along the primary 5 m transect.

3.2.1.3 Quaternary Survey Sites

In addition to the tertiary transects, the field surveys utilised five (5) quaternary survey sites. Quaternary survey sites were used to ground truth vegetation communities and confirm dominant characteristic species. Locations of transects were recorded using a handheld GPS unit. The location of each quaternary survey site is shown in **FIGURE 6**.

Descriptive site information recorded at quaternary sites included location, orientation, aspect, slope, soil type, landform, disturbance, fire history and general notes on ecological integrity. Several digital photographs were taken at each plot as a visual reference.

Floristic analysis included determination of the dominant species within each canopy strata. Structural analysis included recording the height class and life form of the dominant species within the mid and canopy strata. The height of each stratum was recorded using ocular estimation. Foliage projective cover (FPC) was recorded using ocular estimation.

3.2.1.4 Random Meander Searches

The random meander technique (Cropper 1993) was used to identify changes in landform, identify vegetation community boundaries and to complete targeted searches for threatened flora species in accordance with the Flora Survey Guidelines – Protected Plants (DEHP 2014). The meander technique was also used to discover and record all other vascular flora observed on the site. After 30 minutes of no new plant species being observed and recorded, the meander was concluded.

Vegetation communities were mapped and described using the technique contained in Walker and Hopkins (1998). Vegetation structural formation classes were assessed according to Neldner *et al*. (2005). RE classification of vegetation communities were determined as per Sattler and Williams (1999) and in accordance with the Regional Ecosystems Description Database (REDD) (Queensland Herbarium 2014).

3.2.1.5 Weeds

Weeds were assessed for significance under the Queensland *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act) and the Commonwealth Weed of National Significance (WoNS) list.

The Queensland *LP Act* lists exotic flora and fauna that are considered Class 1, 2 or 3 pests under the Act. The different classes require different pest management strategies and landholder requirements to control pests on their land. Landowners are required to manage Class 1 and 2 declared weeds on their land (DAFF 2011).

Thirty-two (32) Weeds of National Significance (WoNS) have been identified by Australian governments based on their invasiveness, potential for spread and environmental, social and economic impacts. A list of twenty (20) WoNS endorsed in 1999 and a further twelve (12) were added in 2012. Individual landowners and managers are responsible for managing WoNS on their land.

3.2.1.6 Nomenclature

Taxonomic nomenclature used for the description of floral species is according to Henderson (2002). Introduced species are signified in all text by an asterix (*). Any additional changes in taxonomic nomenclature have been incorporated as described in Jessup (2002, 2003 and 2005). Field references utilised for the identification and description of floral species include: Stanley and Ross (1989); Harden *et al.* (2006); Brooker and Kleinig (1994a and 1994b); Leiper *et al.* (2008); Haslam (2004) and Queensland Museum (2003).

3.2.2 Site Fauna Surveys

3.2.2.1 Introduction

Incidental observations of fauna species were recorded during the 2015 vegetation surveys.

A targeted fauna survey was completed by one (1) JWA scientist between the 10th and 24th of June 2016. Techniques utilised during the fauna survey are described below.

3.2.2.2 Koala surveys

An initial Koala habitat assessment was undertaken during the 2015 survey. The vegetation was assessed for the presence of koala habitat trees, defined as a tree that has:

a) a height of more than four (4) metres; or
b) a trunk with a circumference of more than 31.5 centimetres at 1.3 metres above the ground (DERM 2010). Koala habitat trees must be of the species *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* or *Melaleuca*.

On the 10th and 24th of June 2016, the Spot Assessment Technique (SAT) (Phillips and Callaghan 2011) was used to determine habitat usage by Koalas. The methodology for this assessment involves determining appropriate sampling intervals (**FIGURE 6**) and completing SAT analysis at all "A" sampling sites. SAT analysis is then completed at each "B" site adjacent to any "A" site in which Koala activity was recorded.

The SAT involves a radial assessment of Koala "activity" within the immediate area surrounding a tree of any species that is known to have been utilised by the species, or otherwise considered to be of some importance for Koala conservation and/or management purposes. In the field the technique is applies as follows:

1. Locate and uniquely mark with flagging tape a tree (the centre tree) that meets one or more of the following selection criteria:

a) a tree of any species beneath which one or more Koala faecal pellets have been observed and/or
b) a tree in which a Koala has been observed and/or
c) any other tree known or considered to be potentially important for Koalas, or of interest for other assessment purposes.

2. Identify and uniquely mark the 29 nearest trees (DBH>100mm) to the centre tree.
3. Undertake a search for Koala faecal pellets beneath each of the 30 marked trees based on a cursory inspection of the undisturbed ground surface within a distance of 100 centimetres around the base of each tree, followed (if no faecal pellets are initially detected) by a more thorough inspection involving disturbance of the leaf litter and ground cover within the prescribed search area.

The activity level for a SAT site is simply expressed as the percentage equivalent of the proportion of surveyed trees within the site that had a Koala faecal pellet recorded within the prescribed search area. Koala activity can then be categorised into Low, Medium (normal) and High use categories based on the use of mean activity level ± 99 per cent confidence intervals (nearest percentage equivalents) from each of the three area/population density categories, from Phillips and Callaghan (2011), indicated in **TABLE 4**.

TABLE 4
CATEGORISATION OF KOALA ACTIVITY

Activity category Area (density)	Low use	Medium (normal) use	High use
East Coast (low)	-	≥ 3.33% but ≤ 12.59%	>12.59%
East Coast (med–high)	<22.52%	≥ 22.52% but ≤ 32.84%	>32.84%
Western Plains (med-high)	<35.84%	≥ 35.84% but ≤ 46.72%	>46.72%

3.2.2.3 Hair tubes

Hair tubes were placed on the site targeting the Spotted-tail quoll. A total of eighteen (18) tubes were placed at equal spacings throughout vegetated portions of the site (**FIGURE 6**). Tubes were baited with a mixture of sardines, tuna oil and flour (AMBS 2004) and positioned on tree trunks approximately 1m from the ground (**Plate 1**) for a total of fourteen (14) nights each, resulting in two hundred and fifty-two (252) trapping nights.

Plate 1 – Hair tube installed on site.

3.2.2.4 Spotlighting/Call playback

During the 2016 surveys, spotlighting was undertaken by one (1) person for two (2) hours on two nights, for a total of four (4) hours spotlighting. All vegetated areas were traversed on foot and spotlighting was carried out using a 50W spotlight powered by a 12V battery. The observer walked at approximately 1km/h allowing intensive listening as an adjunct to visual detection.

Calls of the Tusked frog were broadcast in the vicinity of dams and/or wet drainage lines in an attempt to elicit a response from this species.

3.2.2.5 Active Searching

During diurnal surveys, any logs, sheets of tin, cardboard, bark and leaves were overturned in search of reptiles and amphibians while traversing the site. Searches were undertaken for diggings, scats, bones and chewed *Allocasuarina* cones which would potentially indicate

the presence of Glossy black-cockatoos. Eucalypt trees were inspected for signs of Koala activity such as scratch marks and scats. Active observation of bird and amphibian activity, both aurally and visually, was undertaken during the site visit.

3.2.2.6 Opportunistic Sightings

The random meander technique (Cropper 1993) was used to traverse the site. All incidental records of fauna utilising the study area were recorded. Discoveries of scratch marks on trees, scats, footprints, diggings, bones and other animal traces were noted.

3.2.3 Habitat Suitability Assessment

The suitability of the habitats on the site for listed threatened flora and fauna species and migratory species identified in database searches was assessed to determine which of those species could potentially occur on the site. Assessments were based on the following:

- desktop research of scientific journal articles and botanical literature;
- consultations with specialist academic staff; and
- targeted field surveys within the subject site and surrounds.

The impacts associated with current land uses, vegetation clearing, land and waterway erosion/degradation, weed and feral invasion and previous fire regimes were all considered when completing habitat suitability assessments. Furthermore, the assessment determined whether it was likely for habitat features that typically support threatened species to be present on the subject site. Particular attention was paid to habitat features such as:

- the presence of mature trees with hollows, fissures and/or other suitable roosting/nesting places;
- the presence of Koala food trees;
- the presence of preferred glossy black cockatoo feed trees (forest oak and/or black she-oak);
- the presence of characteristic signs of foraging (e.g. chewed cones or glider feeding scars);
- condition, flow and water quality of drainage lines and bodies of water;
- areas of dense vegetation;
- presence of hollow logs/debris and areas of dense leaf litter;
- presence of fruiting flora species;
- presence of blossoming flora species, particularly winter-flowering species;
- vegetation connectivity and proximity to neighbouring areas of intact vegetation; and
- presence of caves and man-made structures suitable as microchiropteran bat roost sites.

Potential occurrences of threatened flora and fauna species and migratory species are discussed as *unlikely*, *possible* or *likely* to occur in habitats on the site. Possible occurrences are species which may occur sporadically or are provided with small areas of

potentially suitable habitat. Likely occurrences are provided with habitat of high quality on the subject site.

3.3 Results

3.3.1 Site Vegetation Survey

3.3.1.1 Background

A total of eighty-six (86) flora species were recorded on the site, including one (1) significant species – Weeping paperbark (*Melaleuca irbyana*) – which is listed as Endangered within the schedules of both the EPBC Act and the NC Act. A full flora species list is provided in **APPENDIX 1**.

A total of ten (10) *M. irbyana* individuals were recorded on and immediately adjacent to the subject site (**FIGURE 7**) and included:

- 5 x individuals occurring within a maintained powerline easement. These specimens ranged in height from 1-1.5m and showed obvious signs of having been repeatedly slashed during maintenance of the powerline easement (**Plate 2** and **Plate 3**); and
- 5 x mature individuals ranging in height from 5-7m within vegetation community 3 to the east of the powerline easement.

Four (4) broad vegetation communities were identified on the subject site (**FIGURE 7**). These communities are described in more detail in the Offset Strategy, provided in **APPENDIX 2**.

Regional Ecosystem mapping verification was also carried out as part of the Offset Strategy. The endangered REs mapped by DNRM were confirmed to be endangered RE, although the vegetation type does not match the RE descriptions of the mapping. The majority of the site is mapped by DNRM as RE 12.9-10-11. There is no RE 12.9-10.11 on the site. The site is dominated by RE 12.9-10.12, another endangered RE. The RE 12.9-10.12 is mixed in places with RE 12.9-10.7a, an of concern RE. The boundaries of the DNRM mapping are also slightly misaligned. **FIGURE 7** shows the ground truthed boundary of the endangered RE vegetation community. Details of ground-truthing and an assessment of remnant viability can also be found in **APPENDIX 2**.

Legend

- *Melaleuca irbyana*
- Koala scat
- Ground-truthed Endangered Regional Ecosystem Boundary On-site
- Community 1 - *Corymbia intermedia*, *Angophora leiocarpa*, *Eucalyptus tereticornis*, *Eucalyptus seeana* open forest with *Lophostemon suaveolens* sub canopy
- Community 2 - *Eucalyptus seeana*, *Angophora leiocarpa*, *Eucalyptus tereticornis*, *Eucalyptus siderophloia* open forest with *Lophostemon suaveolens* sub canopy
- Community 3 - *Eucalyptus tereticornis*, *Eucalyptus siderophloia*, *Corymbia intermedia*, *Angophora leiocarpa*, *Eucalyptus seeana*, *Lophostemon suaveolens* open regrowth forest
- Community 4 - *Casuarina glauca* low forest with emergent *Eucalyptus tereticornis*
- Cleared paddock with isolated trees
- Subject Site

N

0 100m

1 : 2500

SOURCE: JWA Site Investigations; QLD Globe Sept 2013 Aerial Photo

SCALE: 1 : 2500 @ A3

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FIGURE 7

PREPARED: BW
DATE: 07 August 2016
FILE: Q15004_Vegetation.cdr

TITLE

VEGETATION COMMUNITIES

Plate 2 – Damaged/Slashed *M. irbyana* individuals within powerline easement

Plate 3 – Damaged/Slashed *M. irbyana* individual within powerline easement

3.3.2 Habitat Suitability Assessment for Threatened Flora Species

As previously discussed, one (1) threatened flora species – *M. irbyana* – was recorded from the subject site. Habitat suitability assessments were completed for an additional seven (7) threatened flora species that are known to occur or considered possible occurrences in the locality (**APPENDIX 3**) and determined that none of these species are considered to be provided with suitable habitat within the subject site.

3.3.3 Site Fauna Survey

3.3.3.1 Introduction

This section provides details of the fauna species and associated habitats recorded on the site during the fauna survey.

3.3.3.2 Amphibians

Dams and drainage lines on the site contain suitable habitat for a range of native frog species. These habitats on site have been degraded due to damage by grazing cattle, invasive weeds and erosion.

Four (4) native and one (1) introduced amphibian species were observed on site during the site surveys:

- Eastern dwarf treefrog (*Litoria fallax*);
- Common eastern froglet (*Crinia signifera*);
- Common green treefrog (*Litoria caerulea*);
- Striped marshfrog (*Limnodynastes peronii*); and
- Cane toad (*Rhinella marinus**).

No threatened amphibian species were recorded.

3.3.3.3 Reptiles

Suitable habitat for a range of native reptile species occurs throughout the site. Vegetation within drainage lines and surrounding dams is likely to act as refuge for aquatic and semi-aquatic reptiles during dry periods. Fallen logs and areas of deep leaf litter, particularly in the areas of remnant vegetation on the site, provide good quality habitat for reptiles.

Six (6) native reptile species were observed on site during the site surveys:

- Bearded dragon (*Pogona barbata*);
- Lace monitor (*Varanus varius*);
- Elegant snake-eyed skink (*Cryptoblepharus pulcher pulcher*);
- Red-bellied black snake (*Pseudechis porphyriacus*);
- Friendly sunskink (*Lampropholis amicula*); and
- Garden skink (*Lampropholis delicata*).

No threatened reptile species were observed during the site surveys.

3.3.3.4 Birds

The subject site provides suitable habitat for a range of native forest and woodland bird species. Vegetation within drainage lines and surrounding the dams may provide habitat for semi-aquatic bird species such as ducks, rails and crakes.

Forty-six (46) native bird species were observed on site:

- Blue-faced honeyeater (*Entomyzon cyanotis*);
- Rainbow lorikeet (*Trichoglossus moluccanus*);
- Scaly-breasted lorikeet (*Trichoglossus chlorolepidotus*);
- Australian wood duck (*Chenonetta jubata*);
- Olive-backed oriole (*Oriolus sagittatus*);
- Peaceful dove (*Geopelia placida*);
- White-throated honeyeater (*Melithreptus albogularis*);
- Torresian crow (*Corvus orru*);
- Laughing kookaburra (*Dacelo novaeguineae*);
- Pied butcherbird (*Cracticus nigrogularis*);
- Scarlet honeyeater (*Myzomela sanguinolenta*);
- Black-faced cuckoo-shrike (*Coracina novaehollandiae*);
- Striated pardalote (*Pardalotus striatus*);
- Brown honeyeater (*Lichmera indistincta*);
- Sulphur-crested cockatoo (*Cacatua galerita*);
- Magpie (*Gymnorhina tibicen*);
- Forest kingfisher (*Todiramphus macleayii*);
- White-browed scrubwren (*Sericornis frontalis*);
- White-throated gerygone (*Gerygone olivacea*);
- Pied currawong (*Strepera graculina*);
- Galah (*Eolophus roseicapilla*);
- Masked lapwing (*Vanellus miles*);
- Crested pigeon (*Ocyphaps lophotes*);
- Common bronzewing (*Phaps chalcoptera*);
- Bar-shouldered dove (*Geopelia humeralis*);
- Pheasant coucal (*Centropus phasianinus*);
- Spangled drongo (*Dicrurus bracteatus*);
- Red-browed finch (*Neochmia temporalis*);
- Noisy friarbird (*Philemon corniculatus*);
- Lewin's honeyeater (*Meliphaga lewinii*);
- Magpie lark (*Grallina cyanoleuca*);
- Mistletoebird (*Dicaeum hirundinaceum*);
- Figbird (*Sphecotheres vieilloti*);
- Rufous whistler (*Pachycephala rufiventris*);
- Eastern yellow robin (*Eopsaltria australis*);
- Pale-headed rosella (*Platycercus adscitus*);
- Grey fantail (*Rhipidura albiscapa*);
- Silvereye (*Zosterops lateralis*);
- Willie wagtail (*Rhipidura leucophrys*);
- Noisy miner (*Manorina melanocephala*);
- Pied butcherbird (*Cracticus nigrogularis*);
- Variegated fairy-wren (*Malurus lamberti*);

- Red-backed fairy-wren (*Malurus melanocephalus*);
- Australian king parrot (*Alisterus scapularis*);
- Barn owl (*Tyto alba*); and
- Tawny frogmouth (*Podargus strigoides*).

No threatened bird species were observed during the site survey.

3.3.3.5 Mammals

A total of seven (7) species of mammal were observed during site surveys.

The subject site may provide suitable habitat for the larger macropod species. Numerous macropod scats were located throughout the site. One species, the Eastern grey kangaroo (*Macropus giganteus*), was observed on site.

Evidence of Koala activity (i.e. scats) was also observed at a number of SAT locations on the site during the site assessment (**FIGURE 7; Plate 4**) and preferred Koala food tree species were relatively common within site vegetation communities (i.e. *Eucalyptus tereticornis, E. seeana*). The activity level for a SAT site is expressed as the percentage equivalent of the proportion of surveyed trees within the site that had one or more Koala faecal pellets recorded within the prescribed search area. This is then compared to "normal" Koala activity (refer **Section 3.2.2.2**). Recorded activity levels from the subject site are provided in **Table 5** below.

TABLE 5
SAT ANALYSIS RESULTS

SAT Site	Scats Recorded?	Level of Activity	Activity Category East Coast (Med-high)
SAT-A1	No	-	-
SAT-A2	No	-	-
SAT-A3	Yes (2 locations)	6.66%	Low
SAT-A4	No	-	-
SAT-A5	Yes (1 location)	3.33%	Low
SAT-B2	Yes (2 locations)	6.66%	Low
SAT-B3	No	-	-
SAT-B5	No	-	-
SAT-B6	No	-	-
SAT-B7	No	-	-
SAT-B8	No	-	-

The SAT analysis recorded Low levels of Koala activity at three (3) survey locations on the subject site (i.e. SAT-A3, SAT-A5 and SAT-B2; 5 scat records in total), no Koala activity at a further eight (8) survey locations, and two (2) additional survey locations were not required to be survey.

Plate 4 – Evidence of Koala activity (i.e. scats).

Other mammal species observed during spotlighting surveys included:

- Common brushtail possum (*Trichosurus vulpecula*);
- Common rigtail possum (*Pseudocheirus peregrinus*);
- Red fox (*Vulpes vulpes**); and
- Brown hare (*Lepus europaeus**).

The hair tube surveys recorded the House mouse (*Mus musculs*) and an unidentified rodent species.

No other native and/or threatened mammal species were observed during the site assessment.

3.3.4 Habitat Suitability Assessment for Threatened Fauna Species

As previously discussed, one (1) threatened fauna species – the Koala – was recorded from the subject site. Habitat suitability assessments were completed for an additional twenty-two (22) threatened fauna species and eighteen (18) migratory fauna species that are known to occur or considered possible occurrences in the locality based on database searches (**APPENDIX 3**). Eight (8) of these species are considered to be provided with potentially suitable habitat on the subject site. These species are:

Threatened Fauna

- Grey-headed flying-fox (*Pteropus poliocephalus*);
- Glossy black-cockatoo (*Calyptorhynchus lathami*); and
- Spotted-tail quoll (*Dasyurus maculatus maculatus*).

Migratory Species

- Fork-tailed swift (*Apus pacificus*);
- Cattle egret (*Ardea ibis*);
- Great egret (*Ardea alba*);
- Rainbow bee-eater (*Merops ornatus*); and
- White-throated needletail (*Hirundapus caudacutus*).

4 CORRIDORS AND CONNECTIVITY

4.1 Background

The term 'connectivity' is used to describe the degree to which the landscape facilitates or impedes the movement of species among habitat areas (Bélisle 2005). The level of connectivity between habitat areas in the landscape can be described along a continuum from high, to medium, to low and isolated.

Landscapes with high levels of connectivity form an unbroken expanse of habitat through which a wide range of the inhabitant species are able to easily move and select high quality habitats. Landscapes with low levels of connectivity are characterised by habitat areas that are separated by wide gaps and where the quality and quantity of remaining habitat is reduced (habitat fragmentation). Habitat fragmentation impedes the movement of species among remaining suitable habitat areas (Andrén 1994; Fahrig 2003) and generally restricts movement to all but the most mobile of species.

At a broad landscape scale, maintaining habitat connectivity is necessary to maintain the viability of species populations in the long term (Beier and Noss 1998). In fragmented landscapes, corridors of native vegetation (ecological corridors) connect larger habitat areas and can enhance landscape connectivity by:

- providing habitat for fauna and flora species; and
- facilitating the movement and dispersal of fauna and flora species between larger and/or more suitable habitat areas in the landscape.

The following sections provide an assessment of the corridor and connectivity values of native vegetation on the site and surrounding areas.

4.2 Recognition of Corridor Values On or Near the Subject Site

State and regional corridors in South-east Queensland have been identified in the Biodiversity Planning Assessment (BPA): South East Queensland South Landscape Expert Panel Report (EPA 2006). No state or regional corridors are mapped on or adjacent to the site.

4.3 Site Assessment

The relatively intact vegetation in the eastern portion of the site is likely to provide movement opportunities for a range of native fauna species, providing connections to small areas of well vegetated land to the east and partially vegetation land to the north. Fauna movement in the located is likely to be impeded by large areas of pasture land, roadways and low density residential land uses. Highly mobile and disturbance adapted species are likely to benefit most from these opportunities.

5 IMPACTS AND AMELIORATION

5.1 Introduction

The following sections examine the likely direct and indirect impacts of the current proposed development layout and recommends amelioration measures to minimise and mitigate impacts on the biodiversity and habitat values of the site.

As previously noted, the current layout has been produced to give an indication on the footprint necessary (including for stormwater treatment devices) to assist in the development application noting that the final lot layout and servicing arrangements is likely to change pending buyer demand and servicing constraints, and also in response to any ecological constraints identified in this report. In particular, the identified stormwater treatment area may need to expand slightly depending on detailed design, potentially requiring additional offset area. In this regard, it is noted that sufficient additional offset area is likely to be available within the required 25m vegetated buffer along the northern site boundary.

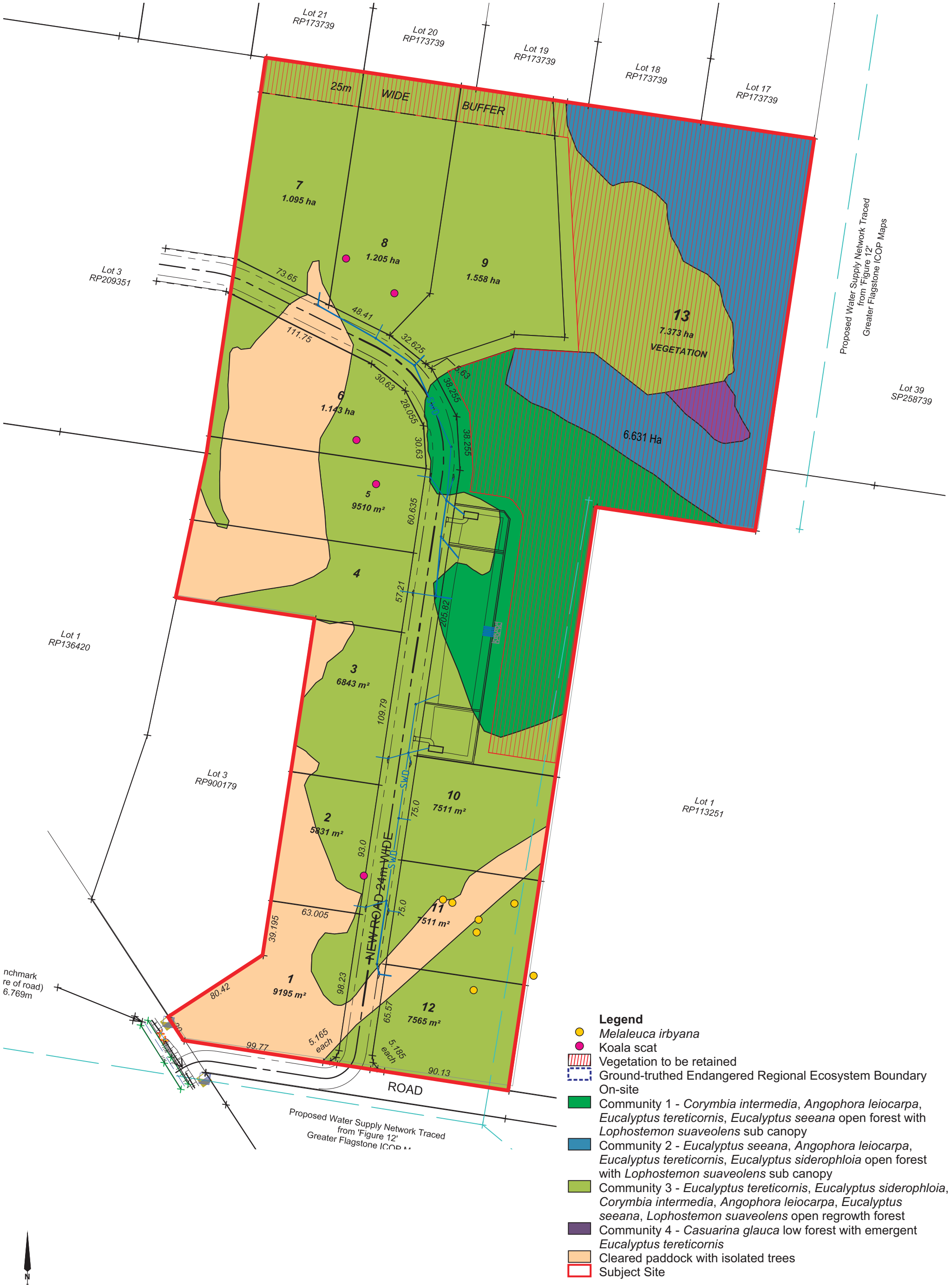
5.2 Potential Impacts of the Current Proposed Layout

5.2.1 Habitat Loss/Vegetation Clearing

The current proposed development will result in vegetation and habitat loss associated with the construction of building pads, roads and infrastructure. The impact of the proposed works on vegetation communities on the site is shown in **FIGURE 8**. The impacts of clearing on vegetation communities are provided in **TABLE 6**.

TABLE 6
IMPACTS OF CLEARING ON VEGETATION COMMUNITIES

Vegetation Community	Total Area (ha)	Area to be Removed (ha)	% Removed
Community 1 - Corymbia intermedia, Angophora leiocarpa, E. tereticornis Eucalyptus seeana, open forest with Lophostemon suaveolens sub canopy	2.48	0.75	30.2%
Community 2 - Eucalyptus seeana, Angophora leiocarpa, E. tereticornis, E. siderophloia open forest with Lophostemon suaveolens sub canopy	2.72	0	0%
Community 3 - E. tereticornis, E. siderophloia, Corymbia intermedia, Angophora leiocarpa, Eucalyptus seeana, Lophostemon suaveolens open regrowth forest	11.59	9.63	83.1%
Community 4 – Allocasuarina littoralis low forest with emergent Eucalyptus tereticornis	0.15	0	0%
Cleared with paddock trees	3.32	3.32	100%
TOTAL	**20.25**	**13.69**	**67.6%**



Legend

- *Melaleuca irbyana*
- Koala scat
- Vegetation to be retained
- Ground-truthed Endangered Regional Ecosystem Boundary On-site
- Community 1 - *Corymbia intermedia*, *Angophora leiocarpa*, *Eucalyptus tereticornis*, *Eucalyptus seeana* open forest with *Lophostemon suaveolens* sub canopy
- Community 2 - *Eucalyptus seeana*, *Angophora leiocarpa*, *Eucalyptus tereticornis*, *Eucalyptus siderophloia* open forest with *Lophostemon suaveolens* sub canopy
- Community 3 - *Eucalyptus tereticornis*, *Eucalyptus siderophloia*, *Corymbia intermedia*, *Angophora leiocarpa*, *Eucalyptus seeana*, *Lophostemon suaveolens* open regrowth forest
- Community 4 - *Casuarina glauca* low forest with emergent *Eucalyptus tereticornis*
- Cleared paddock with isolated trees
- Subject Site

SOURCE: JWA; Civil Dimensions (CD14-053Greenbank Rd North Maclean CSBSMP Addendum Letter to DILGP 16-0...pdf); ONF Surveyors (5443_P1D_170516.dwg)

SCALE: 1 : 2500 @ A3

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Ecological Consultants

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PROJECT
Ecological Assessment
Lot 2 on RP868726
820 Greenbank Road, North Maclean QLD
Logan City Council LGA

FIGURE 8

PREPARED: BW
DATE: 08 August 2016
FILE: Q15004_Impact Veg.cdr

TITLE

IMPACT ON VEGETATION COMMUNITIES

Additional impacts that may occur as a result of the removal of vegetation communities on the subject site are summarised as follows:

- Clearance of vegetation on the subject site will reduce the size and area of habitats available for the dispersal and recruitment of native flora species and may reduce dispersal and visits by pollinators which may negatively impact on the reproductive success of remaining flora in the area.
- Disturbance to the subject site will create opportunities for weeds to colonise both the site and adjacent vegetation. Weeds are likely to be introduced to the subject site and adjacent vegetation in construction materials or by vehicles.
- The removal of vegetation from the subject site will result in a decrease in organic material and biomass on the site.
- The removal of vegetation will disturb the soil structure and integrity which can reduce the health and longevity of adjacent areas of remaining vegetation and result in increased soil erosion which may cause sedimentation of watercourses.
- Clearing may result in injury, displacement and death to fauna.
- Clearing physically removes food sources, shelter and other habitat attributes that fauna use.
- Vegetation clearing may result in fragmentation of remaining habitat areas leading to reduced habitat connectivity and a reduction in dispersal opportunities for fauna and flora species.

5.2.2 Waterways and Wetlands

No waterways or wetlands are mapped as occurring on the site.

5.2.3 Threatened Flora

One threatened flora species, the Swamp tea-tree (*M. irbyana*) was recorded on site (**FIGURE 7**). Based on the current layout, it is anticipated that nine (9) out of the ten (10) individuals may be impacted by the proposed development (**FIGURE 8**).

5.2.4 Threatened Fauna

Evidence of low levels of Koala activity was recorded at three (3) SAT survey site (5 scat locations in total) within the site (**FIGURE 7**). In addition, the following threatened or migratory fauna species are considered a possible or likely occurrence on site based on the availability of suitable habitat (**Section 3.3.4, APPENDIX 3**):

Threatened species:

- Grey-headed flying-fox (*Pteropus poliocephalus*);
- Glossy black cockatoo (*Calyptorhynchus lathami*); and
- Spotted-tail quoll (*Dasyurus maculatus maculatus*).

Migratory species:

- Fork-tailed swift (*Apus pacificus*);
- Cattle egret (*Ardea ibis*);
- Great egret (*Ardea alba*);
- Rainbow bee-eater (*Merops ornatus*); and
- White-throated needletail (*Hirundapus caudacutus*).

Whilst areas of potentially suitable habitat may be removed as a result of the current proposal, the layout has been designed to generally retain the best quality existing vegetation (i.e. remnant vegetation communities) and is not considered to result in the loss of significant habitat for the above species.

5.2.5 Remnant Vegetation

The endangered RE's mapped by DNRM were confirmed to be endangered RE although the vegetation type does not match the RE descriptions of the mapping. The majority of the site is mapped by DNRM as RE 12.9-10-11. There is no RE 12.9-10.11 on the site. The site is dominated by RE 12.9-10.12, another endangered RE. The RE 12.9-10.12 is mixed in places with RE 12.9-10.7a, an of concern RE. The boundaries of the DNRM mapping are also slightly misaligned. **FIGURE 7** shows the ground-truthed boundary of the endangered RE vegetation community.

TABLE 7 details impacts of the current proposed development on ground-truthed regional ecosystems and these impacts are shown in **FIGURE 8**.

TABLE 7
IMPACTS OF CLEARING ON REGIONAL ECOSYSTEMS

Regional Ecosystem (status)	Total Area (ha)	Area to be Removed (ha)	% Removed
12.9-10.12 (Endangered) i.e. Communities 1 & 2	5.2	0.75	14.4%
TOTAL	**5.2**	**0.75**	**14.4%**

Compliance with the Greater Flagstone Priority Development Area Development Scheme will be required and as such any environmental impacts will be offset in line with EDQ's *Priority Development Areas (PDA) Guideline No. 17 – Remnant vegetation and koala habitat obligations in Greater Flagstone and Yarrabilba PDAs*. These requirements are discussed further in **Section 6.3** and **APPENDIX 2**.

5.2.6 Mapped Koala Habitat

As previously discussed, the Koala SPP mapping shows the subject site as a combination of medium value rehabilitation and medium value bushland habitat (**FIGURE 5**). The site survey confirmed that the majority of mature trees on site qualify as koala habitat trees.

As the entire site is mapped as koala habitat, either as bushland or as rehabilitation habitat, any development on site will result in the disturbance of koala habitat. **TABLE 8** details impacts of the current proposed development on Koala habitat and these impacts are shown in **FIGURE 9**.

TABLE 8
IMPACTS OF CLEARING ON MAPPED KOALA HABITAT

Koala habitat	Total Area (ha)	Area to be Removed (ha)	% Removed
Medium value bushland habitat	5.64	2.88	51.1%
Medium value rehabilitation habitat	14.61	10.82	74.1%
TOTAL	**20.25**	**13.70**	**67.7%**

Compliance with the Greater Flagstone Priority Development Area Development Scheme will be required and as such any environmental impacts will be offset in line with EDQ's *Priority Development Areas (PDA) Guideline No. 17 – Remnant vegetation and koala habitat obligations in Greater Flagstone and Yarrabilba PDAs*. These requirements are discussed further in **Section 6.3** and **APPENDIX 2**.

5.2.7 Corridor Values

The current proposed development will result in the removal of vegetation for the construction of building pads, roads and infrastructure. Whilst areas of regrowth vegetation potentially providing movement opportunities for fauna may be removed as a result of the current proposal, the layout has been designed to generally retain the best quality corridor habitat (i.e. Remnant vegetation communities).

5.3 Amelioration Strategies

5.3.1 Habitat Loss/Vegetation Clearing

The proposed development will result in the loss of 13.69 ha of vegetation, the majority of which will take place in disturbed terrestrial grassland with scattered trees and/or regrowth vegetation (i.e. Community 3).

Vegetation of significance to be removed includes:

- 0.75 ha, or 14.4% of Regional Ecosystem 12.9-10.12.

The removal of Endangered Regional Ecosystem vegetation requires offsets in compliance with PDA Guideline 17. These requirements are discussed further in **Section 6.3**. An Offset Strategy has been prepared for the site (JWA 2016) in order to meet obligations under the Guideline and to ameliorate the loss of remnant vegetation and other ecological values on the site (**APPENDIX 2**).

Legend

- Vegetation to be retained
- Medium Value Bushland Habitat
- Medium Value Rehabilitation
- Subject Site

N

0 100m

1 : 2500

SOURCE: QLD DEHP Koala Habitat in SEQ; Civil Dimensions (CD14-053 Greenbank Rd North Maclean CSBSMP Addendum Letter to DILGP 16-0...pdf); ONF Surveyors (5443_P1D_170516.dwg)
SCALE: 1 : 2500 @ A3

JWA PTY LTD
Ecological Consultants

CLIENT
Anna Properties

PROJECT
Ecological Assessment
Lot 2 on RP868726
820 Greenbank Road, North Maclean QLD
Logan City Council LGA

FIGURE 9

PREPARED: BW
DATE: 08 August 2016
FILE: Q15004_Impact koala.cdr

TITLE

IMPACT ON KOALA HABITAT

5.3.2 Threatened Flora

Based on the current layout, it is anticipated that nine (9) out of the ten (10) *M. irbyana* individuals may be impacted by the proposed development (**FIGURE 8**). However, it is recommended that the design of current proposed Lots 10-12 should be amended to allow for the retention and replanting of *M. irbyana* (refer **Section 7**).

5.3.3 Mapped Koala habitat

The proposed development will result in the loss of 13.7 ha of mapped Koala habitat. The removal of mapped Koala habitat requires offsets in compliance with PDA Guideline 17. These requirements are discussed further in **Section 6.3**. An Offset Strategy has been prepared for the site (JWA 2016) in order to meet obligations under the Guideline and to ameliorate the loss of Koala habitat and other ecological values on the site (**APPENDIX 2**).

6 CONSIDERATION OF STATUTORY REQUIREMENTS

6.1 Introduction

This section includes assessments of the impacts of the proposed works with regard relevant Commonwealth, State and Local legislation. Detailed assessment of compliance with relevant legislative requirements is provided in the following sections.

6.2 Commonwealth EPBC Act (1999)

6.2.1 Background

The *Environment Protection Biodiversity and Conservation (EPBC) Act (1999)* was passed by Commonwealth Parliament in June 1999 and came into force on 16 July 2000. A person must not, without an approval under the Act, take an action that has or will have, or is likely to have, a significant impact on a Matter of National Environmental Significance (MNES). These MNES are listed as follows:

- the world heritage values of a declared World Heritage property;
- the ecological character of a declared Ramsar wetland;
- a threatened species or endangered community listed under the Act;
- a migratory species listed under the Act; or
- the environment in a Commonwealth marine area or on Commonwealth land.

The Act also prohibits the taking, without an approval under the Act, of:

- a nuclear action; or
- an action in a Commonwealth marine area or on Commonwealth land that has or will have, or is likely to have, a significant impact on the environment.

MNES in Queensland are:

- declared World Heritage areas;
- declared Ramsar wetlands;
- listed threatened species (Schedule 1 and 2 of the Commonwealth Endangered Species Protection Act 1992);
- listed ecological communities; and
- listed migratory species (JAMBA and CAMBA).

An action includes a project, development, undertaking or an activity or series of activities. An action does not require approval if it is a lawful continuation of a use of land, sea or seabed that was occurring before the commencement of the Act. An enlargement, expansion or intensification of a use is not a continuation of a use.

The *EPBC Act (1999)* does not require Commonwealth approval for the rezoning of land. It does, however, suggest that when rezoning land, planning authorities should consider

whether to allow actions that could significantly affect NES matters or the environment of Commonwealth land.

A Commonwealth Assessment will be required for proposed activities on the subject site if they affect a MNES. The Commonwealth Department of the Environment has prepared *EPBC Act* Policy Statements, including the Matters of National Environmental Significance – Significant Impact Guidelines 1.1 (DotE 2013) which provides a self-assessment process to assist in determining whether an action should be referred to the Commonwealth for a decision on whether assessment and approval is required under the Act. The proposed development has been considered against the Principal Significant Impact Guidelines for each of the MNES identified on the subject site. This assessment is provided in the following sections.

6.2.2 Declared World Heritage Areas On or Near the Site

There are no declared World Heritage areas located on or near the subject site.

6.2.3 Declared Ramsar Wetlands On or Near the Site

The Moreton Bay Ramsar Wetlands are located approximately 20 – 30km downstream of the subject site.

6.2.4 Commonwealth Listed Threatened Flora and Fauna Species

6.2.4.1 Significant Impact Criteria

An action is likely to have a significant impact on a Critically Endangered, Endangered or Vulnerable species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of a population;
- reduce the area of occupancy of the species;
- fragment an existing population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;
- introduce disease that may cause the species to decline; or
- interfere with the recovery of the species.

A 'population of a species' is defined under the *EPBC Act* as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to a geographically distinct

regional population, or collection of local populations, or a population, or collection of local populations that occur within a particular bioregion.

An 'invasive species' is an introduced species, including an introduced (translocated) native species, which out-competes native species for space and resources or which is a predator of native species. Introducing an invasive species into an area may result in that species becoming established. An invasive species may harm listed threatened species or ecological communities by direct competition, modification of habitat or predation.

6.2.4.2 Site Assessment

The presence of one (1) threatened fauna species listed within schedules of the EPBC Act (Koala) was detected on the subject site through scats and scratch marks. This Ecological Assessment has identified the following Threatened fauna species as further potential occurrences on the subject site:

Significant Fauna Species

- Grey-headed flying-fox (*Pteropus poliocephalus*); and
- Spotted-tail quoll (*Dasyurus maculatus maculatus*).

Although small areas of potentially suitable habitat for the above species will be disturbed during development, no significant impacts (as listed in the significant impact criteria above) to threatened fauna or their habitats are considered possible or likely. Habitat occurring on site is likely to be of minimal value in the context of the broader locality. Any loss of potential habitat for species possibly occurring on the site from time to time will be ameliorated through offsets to be provided on the site.

6.2.5 Listed Ecological Communities

No Listed Ecological Communities were observed to occur on the site. Although some isolated specimens of *M. irbyana* are present, these do not form a community as per the description of 'Swamp Tea-tree (*Melaleuca irbyana*) Forest of South-east Queensland'.

6.2.6 Listed Migratory Species On or Near the Site

6.2.6.1 Significant Impact Criteria

An action will require approval if the action has, will have, or is likely to have a significant impact on a listed migratory species. Note that some migratory species are also listed as threatened species. The significant impact criteria below are relevant to migratory species that are not threatened.

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles; or

- altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species; or
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

An area of 'important habitat' for a migratory species is:

- habitat used by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- habitat that is of critical importance to the species at particular life-cycle stages; and/or
- habitat utilized by a migratory species which is at the limit of the species range; and/or
- habitat within an area where the species is declining.

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, the definition of what an 'ecologically significant proportion' of the population is varies with the species (each circumstance needs to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species specific behavioural patterns (for example, site fidelity and dispersal rates).

The term 'population' in relation to migratory species, means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one (1) or more national jurisdictional boundaries including Australia.

6.2.6.2 Site Assessment

No migratory species were recorded during the site assessment. Habitat assessment determined that five (5) migratory species are considered a possible or likely occurrence on site:

- Fork-tailed swift (*Apus pacificus*);
- Cattle egret (*Ardea ibis*);
- Great egret (*Ardea alba*);
- Rainbow bee-eater (*Merops ornatus*); and
- White-throated needletail (*Hirundapus caudacutus*).

While these species may occur on the site from time to time, it is not considered that any significant populations of these species occur on the site. The proposed development will not have a significant impact on these migratory species due to the availability of suitable habitat in the wider landscape. Any loss of potential habitat will be ameliorated with the provision of offsets on the site.

6.2.1 Commonwealth Referral Guidelines for the Koala

6.2.1.1 Significant Impact Criteria

The EPBC Act referral guidelines for the vulnerable koala (DotE 2014) were prepared to provide guidance that can be applied consistently across the entire distribution of the listed koala. The guidelines break down the significant impact decision and guide proponents on important requirements, particularly on information expectations, survey planning, standards for mitigating impacts and guidance on significant impact. This is provided in the context of long term recovery planning for the koala. The guidelines should be read in their entirety in order to make a robust EPBC Act assessment of impacts on the koala, however the following points and the diagram in **FIGURE 10** summarise the guidelines:

- Impacts on 'habitat critical to the survival of the species' and impacts that 'substantially interfere with the recovery of the species' are the focus of assessing significance.
- Habitat protection and impact mitigation is focused on areas of habitat that are large and well-connected. This habitat is considered to be habitat critical to the survival of the species as it is the most likely to remain viable in the medium to long-term.
- The loss of twenty (20) hectares or more of high quality habitat critical to the survival (habitat score of ≥ 8) is highly likely to have a significant impact for the purposes of the EPBC Act.
- Loss of habitat that is not habitat critical to the survival of the species is highly unlikely to have a significant impact on the koala for the purposes of the EPBC Act.
- The loss of two (2) hectares or less of marginal quality habitat critical to the survival (habitat score of 5) is highly unlikely to have a significant impact on the koala for the purposes of the EPBC Act.
- The loss of between two (2) and twenty (20) hectares of habitat critical to the survival may have a significant impact on the koala for the purposes of the EPBC Act. Whether this is more likely or unlikely depends on the characteristics of your action.
- Actions with indirect impacts on the koala may constitute a significant impact, particularly where they occur in habitat critical to the survival of the koala, are new impacts or exacerbate an existing impact. Mitigation measures are available to reduce the impact of such actions.
- Mitigation measures must be monitored and maintained for the duration of the impact (this often means in perpetuity). If this standard is not met, the proposed mitigation will not be considered effective for reducing impact.
- Urban areas are not likely to contain habitat critical to the survival of the koala, as the existing effects of habitat loss, fragmentation, vehicle strike, dog attack and other threats are likely to continue to degrade these areas over the medium to long-term. These existing threats are best addressed by local remedial action, rather than through regulation under the EPBC Act.

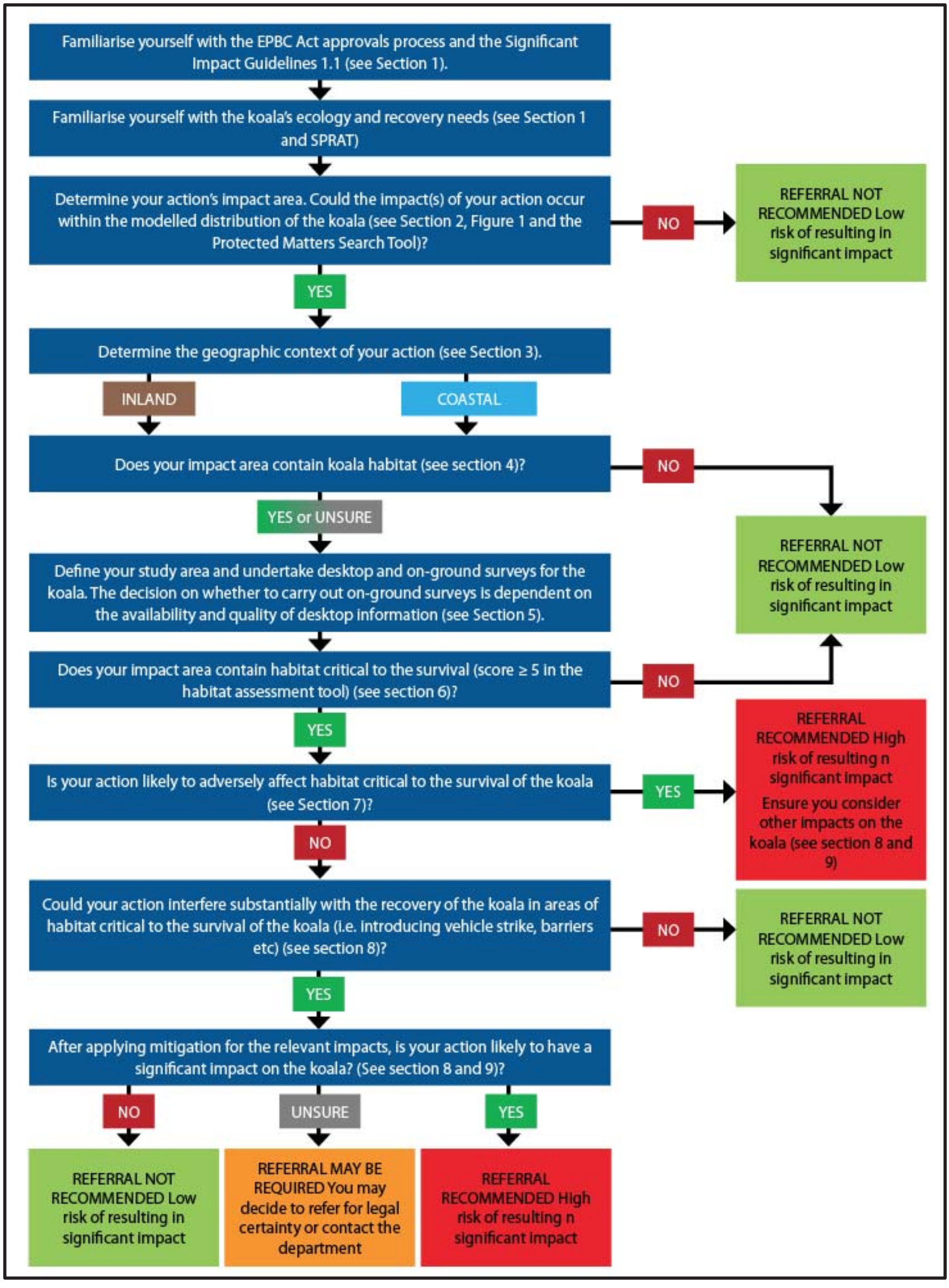

FIGURE 10 – SUMMARY OF EBPC ACT REFERRAL GUIDELINES FOR THE KOALA

As the entire site is mapped as koala habitat, either as bushland or as rehabilitation habitat, any development on site will result in the disturbance of koala habitat. **TABLE 8** details impacts of the current proposed development on Koala habitat and these impacts are shown in **FIGURE 9**.

TABLE 8
IMPACTS OF CLEARING ON MAPPED KOALA HABITAT

Koala habitat	Total Area (ha)	Area to be Removed (ha)	% Removed
Medium value bushland habitat	5.64	2.88	51.1%
Medium value rehabilitation habitat	14.61	10.82	74.1%
TOTAL	**20.25**	**13.70**	**67.7%**

Compliance with the Greater Flagstone Priority Development Area Development Scheme will be required and as such any environmental impacts will be offset in line with EDQ's *Priority Development Areas (PDA) Guideline No. 17 – Remnant vegetation and koala habitat obligations in Greater Flagstone and Yarrabilba PDAs*. These requirements are discussed further in **Section 6.3** and **APPENDIX 2**.

5.2.7 Corridor Values

The current proposed development will result in the removal of vegetation for the construction of building pads, roads and infrastructure. Whilst areas of regrowth vegetation potentially providing movement opportunities for fauna may be removed as a result of the current proposal, the layout has been designed to generally retain the best quality corridor habitat (i.e. Remnant vegetation communities).

5.3 Amelioration Strategies

5.3.1 Habitat Loss/Vegetation Clearing

The proposed development will result in the loss of 13.69 ha of vegetation, the majority of which will take place in disturbed terrestrial grassland with scattered trees and/or regrowth vegetation (i.e. Community 3).

Vegetation of significance to be removed includes:

- 0.75 ha, or 14.4% of Regional Ecosystem 12.9-10.12.

The removal of Endangered Regional Ecosystem vegetation requires offsets in compliance with PDA Guideline 17. These requirements are discussed further in **Section 6.3**. An Offset Strategy has been prepared for the site (JWA 2016) in order to meet obligations under the Guideline and to ameliorate the loss of remnant vegetation and other ecological values on the site (**APPENDIX 2**).

Section 5: Have you surveyed for the koala and koala habitat?
Yes. Koala habitat was confirmed to occur on site and evidence of the presence of Koalas on the subject site (i.e. scats) was confirmed during the site inspection completed in June 2016.

Section 6: Could your impact area contain habitat critical to the survival of the koala?
These guidelines encourage the assessment of significant impacts on the koala primarily through the assessment of habitat critical to the survival of the koala and actions that interfere substantially with the recovery of the koala. This approach aims to avoid and address habitat loss, a key threat to the koala, as well as promote a streamlined assessment and approval process.

To determine if the subject site contains 'habitat critical to the survival of the koala', the site has been assessed using the koala habitat assessment tool within the referral guidelines (**TABLE 9** below).

TABLE 9
ASSESSMENT OF THE SITE USING THE KOALA HABITAT ASSESSMENT TOOL

Attribute	Score	Coastal context	Habitat Appraisal
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 2 years.	**Yes. Evidence of recent Koala activity observed on site (i.e. June 2016).**
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 5 years.	
	0 (low)	None of the above.	
Vegetation composition	+2 (high)	Has forest or woodland with 2 or more known koala food tree species, OR 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	**Yes. Vegetation communities on site contains two (2) or more known koala food tree species.**
	+1 (medium)	Has forest or woodland with only 1 species of known koala food tree present.	
	0 (low)	None of the above.	
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 500 ha.	
	+1 (medium)	Area is part of a contiguous landscape < 500 ha, but ≥ 300 ha.	
	0 (low)	None of the above.	**The subject site itself is 20.25 ha and is partially covered by remnant vegetation with the remainder comprised of regrowth and cleared**

Attribute	Score	Coastal context	Habitat Appraisal
			grazing land. Surrounding lands alternate between cleared or partially vegetated, with land uses including grazing and low density residential.
Key existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. Areas which score 0 for koala occurrence and have no dog or vehicle threat present	
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, OR Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.	
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, OR Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.	**There is evidence of frequent and regular koala mortality throughout the South-east Qld Bioregion as a whole. Furthermore, the increasingly urbanised nature of the locality presents a significant existing dog and vehicle threat to the local Koala population.**
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	**The Interim Recovery Objectives for the Koala are to:** • **Protect and conserve large, connected areas of koala habitat, particularly large, connected areas that support koalas that are:**

Attribute	Score	Coastal context	Habitat Appraisal
			– Of sufficient size to be genetically robust / operate as a viable sub-population or – Free of disease or have a very low incidence of disease or – Breeding. • Maintain corridors and connective habitat that allow movement of koalas between large areas of habitat. Due to the restricted size of the contiguous landscape, vegetation composition and level of threats already present the habitat is considered unlikely to be important for the recovery of the koala. Other larger patches in the broader landscape are more likely to be important for the recovery of the koala, however, the habitat that will be impacted is not considered to effectively contribute to those areas, as it is isolated (and/or will become increasingly so), and unlikely to support a viable population of koalas.
TOTAL SCORE	**4**	**Decision: Not habitat critical to the survival of the koala—assessment of significance not required.**	

Section 7: Will your action adversely affect habitat critical to the survival of the koala?

The Significant Impact Guidelines 1.1 state that actions are likely to have a significant impact on a vulnerable species if they adversely affect habitat critical to the survival of the species. Habitat destruction is recognised as the primary adverse effect on habitat critical to the survival of the koala. Whether or not there are other impacts, the loss of habitat critical to the survival of the koala can be sufficient to trigger a significant impact. **FIGURE 11** helps determine whether the habitat loss associated with the action is likely to adversely affect habitat critical to the survival of the koala and so require referral to the Department.

The koala habitat assessment tool within the referral guidelines determined that the subject site does not contain 'habitat critical to the survival of the koala' (**Table 9** above). In accordance with **FIGURE 11**, the assessment must proceed to Section 9.

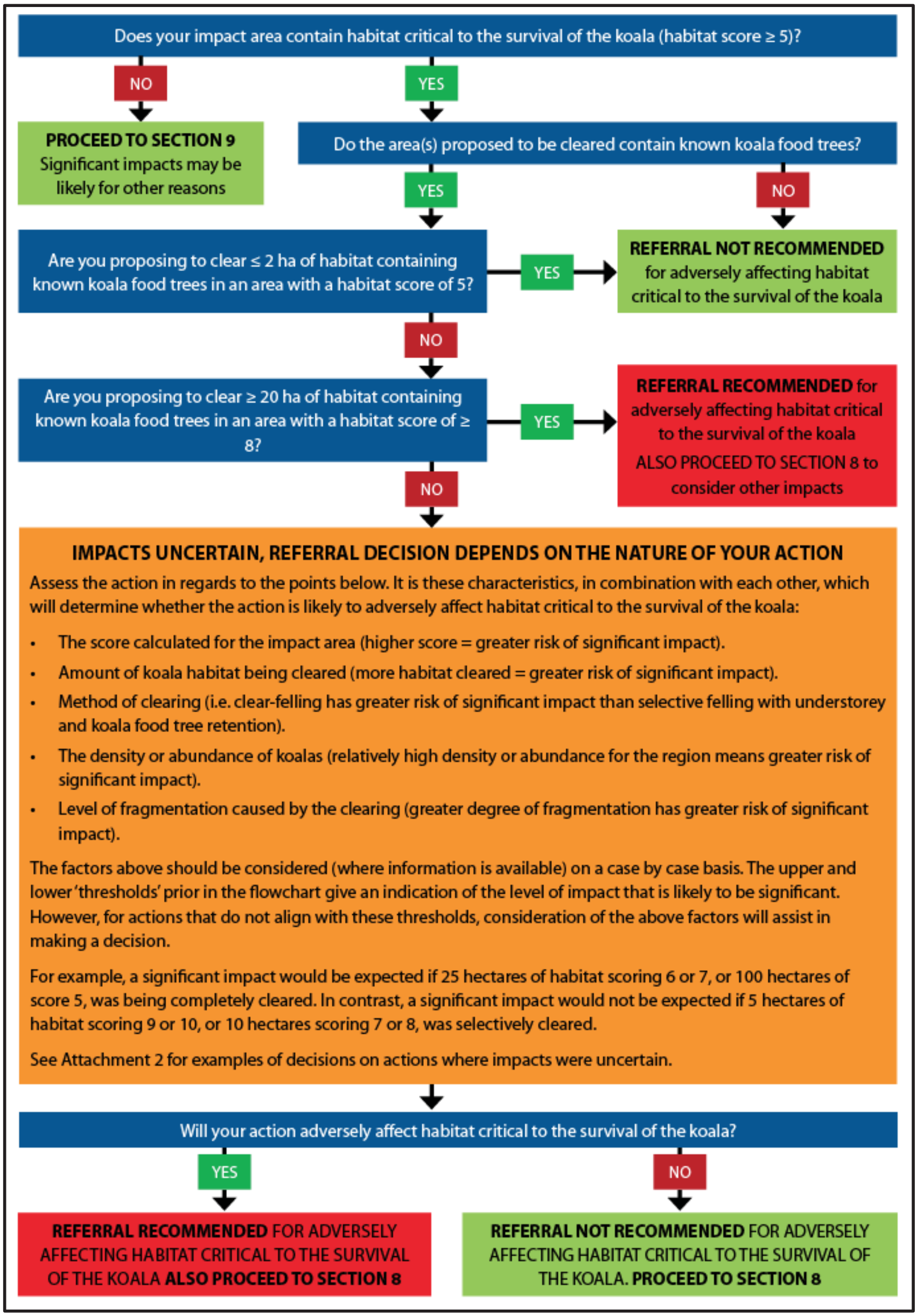

FIGURE 11 – ASSESSING ADVERSE EFFECTS ON KOALA HABITAT CRITICAL

Section 8: Could your action interfere substantially with the recovery of the koala?
Assessment of Section 8 not required (as per **FIGURE 11**).

Section 9: Could your action require a referral to the Minister for significant impacts on the koala?
If an action will have or is likely to have a significant impact on the koala, the proponent is legally obliged to refer the action to the Minister. The final decision as to whether the proposed development will have a significant impact on the Koala can be determined by two key considerations outlined in these guidelines:

- Adversely affecting habitat critical to the survival of the koala (section 7) **and/or**
- Interfering substantially with the recovery of the koala through the introduction or exacerbation of key threats in areas of habitat critical to the survival of the koala (section 8).

This assessment has determined that the proposed development will not affect habitat considered to be critical to the survival of the Koala. Furthermore, due to the restricted size of the contiguous landscape, vegetation composition and level of threats already present the habitat is considered unlikely to be important for the recovery of the koala. Other larger patches in the broader landscape are more likely to be important for the recovery of the koala, however, the habitat that will be impacted is not considered to effectively contribute to those areas, as it is isolated (and will become increasingly so), and unlikely to support a viable population of koalas.

6.2.2 Requirement for Commonwealth Referral

Based on the results of the above assessment in accordance with the Matters of National Environmental Significance – Significant Impact Guidelines 1.1 (DotE 2013) it is considered that there is no requirement for Commonwealth referral. No offsets will be required under the Commonwealth *EPBC Act* Environmental Offsets Policy (2012).

6.3 Queensland Department of Infrastructure, Local Government and Planning PDA Guidelines

6.3.1 Background

The PDA (Priority Development Area) Guidelines have been prepared by the Queensland government's Department of Infrastructure, Local Government and Planning to outline the standards for development within PDAs. The following sections summarise the requirements of the guidelines and their implications for the proposed development.

6.3.2 PDA Guideline 14 – Environmental Values and Sustainable Resource Use

6.3.2.1 Introduction

This Guideline outlines the environmental values of interest within PDAs, and provides strategies for their conservation and ongoing management.

6.3.2.2 Assessment

An assessment of the current proposed development against the requirements of PDA Guideline 14 is provided in **Table 10** below.

TABLE 10
ASSESSMENT OF COMPLIANCE WITH PDA GUIDELINE 14

Values	Strategies	Assessment
Ecological Processes and Natural Systems		
1. Significant terrestrial biodiversity values: • Land mapped in the applicable PDA development scheme as having significant biodiversity values; • mapped biodiversity corridors identified in the applicable PDA development scheme; • other areas of significance identified in the applicable PDA development scheme » • viable areas of remnant vegetation containing endangered regional ecosystems; and • listed threatened species habitat.	Identify significant terrestrial biodiversity values within and adjoining the development area by undertaking: • robust field surveys (appropriately timed and conducted for expected biodiversity) • desktop assessments using local, state and commonwealth environment databases and mapping searches.	This ecological assessment has involved both desktop and field assessments as described. Field assessments were targeted towards significant species known from the area, including threatened species searches, spotlighting, call playback, hair tube surveys, and Koala Spot Assessment Technique.
	Demonstrate how the development minimises impacts on significant biodiversity values by minimising vegetation clearing generally within the area and by specifically: • Retaining and enhancing areas of viable remnant vegetation containing endangered regional ecosystems as defined in Appendix 1 • Avoiding, minimising or off-setting the clearing of non-viable remnant vegetation containing endangered regional ecosystems as defined in Appendix 1 • Minimising the clearing of remnant and regulated regrowth vegetation within the area	The development has been designed to minimise vegetation clearing by locating the proposed allotments in areas mapped as non-remnant. Remnant vegetation will be retained within a reserve, which will be separated from the development with a 10m buffer. Any unavoidable clearing of remnant vegetation will be offset at a ratio of 2.1 in accordance with PDA Guideline 17 (**APPENDIX 2**). Appropriate management plans will be prepared to direct construction and manage potential impacts.

Values	Strategies	Assessment
	• Providing adequate buffers between development and any identified significant biodiversity value within or adjoining the development site. • Providing management plans to reduce and control clearing and manage other development and construction impacts on the area.	
2. Ecological connectivity	• Identify priority vegetation patches, fauna habitat features and fauna movement corridors in and beyond the application site through detailed site assessments completed in accordance with the relevant local government authority guidelines or planning scheme policies for ecological assessment. • Retain vegetation connections between priority vegetation patches, fauna habitat features and fauna linkages to ensure ecological connectivity is maintained or enhanced. • Minimise locating major infrastructure through identified corridor linkages. • Undertake strategic rehabilitation of degraded land where required to	The development will not result in the fragmentation of habitat or the reduction of movement opportunities for fauna in the broader locality. No infrastructure will be positioned so as to impeded fauna movement, and the majority of remnant vegetation will be retained. Small areas to be removed from the periphery will be offset at a ratio of 2:1 in an adjoining area that will result in an overall wider habitat area, and a net gain in remnant vegetation (**APPENDIX 2**).

Values	Strategies	Assessment
	improve or create functioning corridors.	
3. Sustainable landscaping practices	• Incorporate biodiversity friendly landscape principles and practices such as retaining habitat trees in road reserves and open space areas • Maximise use of locally occurring native species in landscaping • Identify opportunities for revegetation and rehabilitation along waterways and biodiversity corridors.	Native vegetation and habitat trees will be retained within road reserves and other areas where possible and appropriate. Landscaping will be undertaken in a manner sympathetic to the local environment and will comprise of locally endemic species. While no watercourses occur on the site, rehabilitation as part of the offset strategy will augment existing remnant vegetation on site, resulting in increased habitat values for wildlife (**APPENDIX 2**).
4. Bushfire risk management	• Ensure significant biodiversity values are protected from exempt clearing by ensuring new built infrastructure is adequately set back from identified biodiversity areas. • Where a firebreak is required to protect new infrastructure ensure clearing associated with the firebreak is located external to significant biodiversity areas. Note: Protection from bushfire is not considered suitable justification for impacts on significant biodiversity values.	All bushfire protection requirements will be contained within individual lots.
Wetlands and Waterways		

Values	Strategies	Assessment
1. Wetlands	• Identify and accurately map the extent of, and describe the values for, any identified wetlands of high ecological significance and referable wetlands. • Provide adequate buffers between development and wetlands that are in and adjacent to the PDA (where feasible incorporate low intensity land uses including open space, storm water treatment or fauna corridors within wetland buffers). • Where a wetland of high ecological significance occurs, a minimum buffer of 50 metres between the development proposal and the wetland is recommended. Note: Trigger for assessment of wetland areas is where the stage of works occurs within 100m of the wetland area.	No wetlands are mapped on the site. No wetland areas were observed on the site during site assessments.
2. Waterways	• Identify and accurately map waterways in accordance with DEHP's stream order hierarchy (1-5). • Determine existing and proposed waterway values of site stream orders (e.g. Intact remnant vegetation,	No watercourses are mapped on the site. No watercourses were observed on the site during site assessments.

Values	Strategies	Assessment
	riparian values, fauna connectivity, natural water quality function, watercourse stability). • Retain waterways in their undisturbed condition by minimising disturbance to natural drainage. Where this is not proposed provide a detailed waterway assessment report justifying encroachment or removal of waterway areas. • Provide adequate buffers between development and retained waterways to provide waterway protection including temperature, bank stability, light, aquatic habitat, terrestrial habitat. • Where waterways have been designated or identified to provide dual use (fauna corridor, open space connection, stormwater conveyance) provide additional buffer setbacks.	
3. Water quality	• Water discharge to on-site and adjacent water systems (freshwater, estuarine and marine) must meet water quality standards under current Queensland legislation.	As no watercourses or wetlands are present on the site, the development will not result in any adverse impacts on water quality in local water systems. However, a stormwater management plan will be prepared for the site to ensure that impacts on soil and groundwater managed appropriately.

Values	Strategies	Assessment
	• Soil disturbance must be managed to avoid associated contaminants entering adjacent water systems. • Identify nutrient hazard areas and appropriately manage soil and groundwater disturbance to avoid or minimise nutrient mobilisation that may increase the risk of coastal algal blooms. • Avoid or minimise waste water discharge from the site in accordance with a waste water management plan prepared by a suitably qualified person. • Avoid areas with highly permeable soils or a high water table when locating waste disposal activities or facilities. • Provide adequate buffers for water quality between development and retained waterways.	

6.3.3 PDA Guideline 17 – Remnant Vegetation and Koala Habitat Obligations in Greater Flagstone and Yarrabilba PDAs

6.3.3.1 Introduction

This Guideline outlines the obligations that results when development results in the clearing of non-viable endangered Regional Ecosystems or Koala habitat areas within the Greater Flagstone or Yarrabilba PDAs. The intention of the Guideline is to ensure that no net loss of endangered Regional Ecosystems occurs, and that development contributes appropriately to the net gain of Koala habitat.

The Guideline states: 'When development results in the clearing of confirmed nonviable remnant vegetation containing endangered regional ecosystems - compensation planting must be undertaken. When development results in the necessary clearing of koala areas - koala habitat planting must be undertaken or a monetary contribution made'.

Where a PDA development application proposes the clearing of non-viable remnant vegetation containing endangered regional ecosystems or koala habitat areas details of the proposed compensation planting or monetary contribution must be submitted with the application. The application must also include the following supporting documentation:

In relation to remnant vegetation containing endangered regional ecosystems:

- the extent of remnant vegetation containing endangered regional ecosystems on the site
- remnant vegetation containing endangered regional ecosystems immediately adjoining the site
- the identification of viable and non-viable remnant vegetation containing endangered regional ecosystems
- details of the analysis used to determine the viability/non-viability of the vegetation.

In relation to koala habitat areas:

- the extent of koala habitat areas within the site
- details of the methodology used to confirm the extent of koala habitat areas within the site
- likely koala habitat area immediately adjoining the site
- the proposed extent of clearing of koala habitat areas
- justification for why the clearing is necessary.

6.3.3.2 Assessment

This ecological assessment has provided:

- Details of the extent of endangered regional ecosystems occurring on or adjacent to the site;
- Details on the extent of Koala habitat occurring on the site and locality;
- The methodology (SAT) used to determine Koala habitat and presence of Koalas;

- The proposed extent of and justification for clearing of Koala habitat.

Further details regarding proposed offsetting arrangements can be found in the Offsets Strategy Report included as **APPENDIX 2**.

7 RECOMMENDATIONS

As previously noted the current layout has been produced to give an indication on the footprint necessary (including for stormwater treatment devices) to assist in the development application noting that the final lot layout and servicing arrangements is likely to change pending buyer demand and servicing constraints, and also in response to ecological constraints identified in this report. In this regard, the following recommendations are made in relation to future layout changes to reduce/ameliorate potential impacts on ecological values of the site:

1. The design of current proposed Lots 10-12 should be amended to allow for the retention of the 5x mature specimens of *M. irbyana* in-situ. The 5x damaged/slashed saplings to be removed could then be offset through plantings amongst the retained mature trees;
2. Any bushfire mitigation requirements (i.e. setbacks to vegetation, APZs etc.) should be provided for and fully contained within development lots;
3. In the event that habitat trees must unavoidably be removed, the installation of nest boxes of appropriate design within designated habitat areas should be included in mitigation works as well as the recycling of hollow limbs as ground habitat within corridor areas;
4. Future development of the site should also be considerate of the Koala-sensitive Design Guideline (DEHP 2012) to determine appropriate measures to help avoid and minimise the impact of development and land-use planning on the local koala population. Measures to be implemented may include:
    a) using speed reduction devices such as speed bumps and speed warning sign on roads;
    b) incorporating koala-friendly fencing where appropriate to allow koala movement between areas of habitat; and
    c) use of native vegetation in landscaping activities that provides food, shelter and movement opportunities for koalas.
5. Weeds should be controlled during construction through vehicle, tool and plant hygiene measures. Weeds should be controlled in landscaped areas and known environmental weeds (e.g. Umbrella tree) should be avoided in landscape plantings.
6. The effects of light on adjoining vegetation could be managed by the capping of night lights to reduce glare into the sky and the careful positioning of lighting and use of screening vegetation.
7. Appropriate flora and fauna management strategies including the use of a spotter-catcher and tree protection fencing should be implemented during site clearing operations to minimise potential adverse impacts on flora and fauna.
8. Vegetation removed during construction should be mulched for use on the site (with the exception of hollow-bearing trees). This will prevent the introduction of weeds from seeds in mulch brought in from elsewhere and will retain biomass that would otherwise be removed from the system.

9. In the event that the identified stormwater treatment area needs to expand slightly based on detailed design, triggering additional offset requirements, it is noted that sufficient additional offset area is likely to be available within the required 25m vegetated buffer along the northern site boundary.

8 SUMMARY AND CONCLUSIONS

JWA Pty Ltd were engaged by Anna Properties Pty Ltd to complete an Ecological Assessment on land at 820 Greenbank Road, North Maclean. The site is formally described as Lot 2 on RP868726 and covers an area of approximately 20.25 ha.

The site is located within the Greater Flagstone Priority Development Area (PDA), and is therefore within a region that has been identified for accelerated development with the goal of economic growth. PDA Guidelines 14 (Environmental Values and Resource Use) and 17 (Remnant Vegetation and Koala Habitat Obligations in Greater Flagstone and Yarrabilba PDAs) set the requirements for ecological site surveys and offsets for proposed developments within the Greater Flagstone PDA. These guidelines have been addressed as part of the ecological assessment.

The proposed development includes the subdivision of the land into twelve (12) industrial Lots. An industrial connector road will traverse the site from the western boundary, south through the centre of the site to Greenbank Road. It is expected that services will be co-located within this road reserve. A stormwater detention basin will be located in the vicinity of the existing dam on site and will be approximately 7,350m^2 in size. The remainder of the site will be retained as a reserve and offset area.

It is noted that the current layout has been produced to give an indication on the footprint necessary (including for stormwater treatment devices) to assist in the development application noting that the final lot layout and servicing arrangements is likely to change pending buyer demand and servicing constraints, and also in response to any ecological constraints identified in this report.

A total of eighty-six (86) flora species were recorded on the site. Including one (1) significant species – Weeping paperbark (*Melaleuca irbyana*) – which is listed as Endangered within schedules of both the EPBC Act and the NC Act. A total of ten (10) *M. irbyana* individuals were recorded on and immediately adjacent to the subject site. All but one (1) of these individuals will be removed under the current development proposal.

The endangered RE's mapped by DNRM were confirmed to be endangered RE although the vegetation type does not match the RE descriptions of the mapping. The majority of the site is mapped by DNRM as RE 12.9-10-11. There is no RE 12.9-10.11 on the site. The site is dominated by RE 12.9-10.12, another endangered RE.

Fauna surveys recorded 5 species of amphibian, 6 reptile species, 46 bird species and 7 species of mammals on the subject site. The SAT analysis recorded Low levels of Koala activity at three (3) survey locations on the subject site.

The current proposed development will result in vegetation and habitat loss associated with the construction of building pads, roads and infrastructure. Impacts of the development will include the removal of 0.75ha (14.4%) of the Endangered RE and 13.7ha (67.7%) of the mapped Koala habitat from the site.

The removal of Endangered Regional Ecosystems and Koala habitat requires offsets in compliance with PDA Guideline 17. An Offset Strategy has been prepared for the site (JWA 2016) in order to meet obligations under the Guideline and to ameliorate the loss of remnant vegetation, Koala habitat and other ecological values on the site.

A number of recommendations are made in **Section 7** of this report in relation to layout changes to reduce/ameliorate potential impacts on ecological values of the site. In particular, the retention of the five (5) mature *M. irbyana* in-situ should be a priority when considering any future layout changes.

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APPENDIX 1 – FLORA SPECIES LIST

Family	Botanical Name	Common Name
Apocynaceae	*Parsonsia straminea*	Monkey rope
Araceae	*Gymnostachys anceps*	Settler's flax
Araliaceae	*Schefflera actinophylla**	Umbrella tree
Asclepiadaceae	*Gomphocarpus physocarpus**	Balloon cotton bush
Asparagaceae	*Asparagus africanus**	Asparagus fern
Asparagaceae	*Lomandra longifolia*	Spiny-head matrush
Asparagaceae	*Lomandra multiflora*	Many flowered matrush
Asteraceae	*Ageratina adenophora**	Crofton weed
Asteraceae	*Ageratina riparia**	Mistflower
Asteraceae	*Ageratum houstonianum**	Blue billygoat weed
Asteraceae	*Bidens pilosa**	Cobbler's pegs
Asteraceae	*Chyrsocephalum apiculatum*	Yellow buttons
Asteraceae	*Senecio madagascariensis**	Fireweed
Casuarinaceae	*Allocasuarina littoralis*	Black she-oak
Commelinaceae	*Commelina diffusa*	Native wandering jew
Commelinaceae	*Murdannia graminea*	Murdannia
Davalliaceae	*Nephrolepis cordifolia*	Fishbone fern
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Dilleniaceae	*Hibbertia vestita*	Rough guinea flower
Dioscoreaceae	*Dioscorea transversa*	Native yam
Euphorbiaceae	*Petalostigma pubescens*	Bitter bark
Fabaceae	*Desmodium uncinatum**	Silver-leaf desmodium
Fabaceae	*Hardenbergia violacea*	False sarsaparilla
Fabaceae	*Indigofera australis*	Australian indigo
Fabaceae	*Jacksonia scoparia*	Dogwood
Goodeniaceae	*Goodenia rotundifolia*	Star goodenia
Lauraceae	*Cinnamomum camphora**	Camphor laurel
Menyanthaceae	*Nymphoides indica*	Water snowflake
Mimosaceae	*Acacia concurrens*	Black wattle
Mimosaceae	*Acacia disparrima*	Hickory wattle
Mimosaceae	*Acacia fimbriata*	Brisbane golden wattle
Mimosaceae	*Acacia leiocalyx*	Early black wattle
Mimosaceae	*Acacia maidenii*	Maiden's wattle
Myrtaceae	*Angophora leiocarpa*	Rusty gum
Myrtaceae	*Angophora woodsiana*	Smudgee apple
Myrtaceae	*Corymbia citriodora*	Spotted gum
Myrtaceae	*Corymbia intermedia*	Pink bloodwood
Myrtaceae	*Corymbia tessellaris*	Moreton Bay ash
Myrtaceae	*Corymbia torelliana**	Cadaghi
Myrtaceae	*Eucalyptus crebra*	Narrow leaved ironbark
Myrtaceae	*Eucalyptus microcorys*	Tallowwood

Family	Botanical Name	Common Name
Myrtaceae	*Eucalyptus propinqua*	Small-fruited grey gum
Myrtaceae	*Eucalyptus seeana*	Narrow-leaved red gum
Myrtaceae	*Eucalyptus siderophloia*	Grey ironbark
Myrtaceae	*Eucalyptus tereticornis*	Queensland blue gum
Myrtaceae	*Leptospermum polygalifolium*	Tantoon
Myrtaceae	*Lophostemon suaveolens*	Swamp box
Myrtaceae	*Melaleuca decora*	
Myrtaceae	*Melaleuca irbyana*	**Weeping paperbark**
Myrtaceae	*Melaleuca linarifolia*	Snow in summer
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved paperbark
Myrtaceae	*Melaleuca viminalis*	Weeping bottlebrush
Onagraceae	*Ludwigia peploides**	Water primrose
Passifloraceae	*Passiflora foetida**	Stinking passionfruit
Philydraceae	*Philydrum lanuginosum*	Woolly frogmouth
Phyllanthaceae	*Glochidion ferdinandi*	Cheese tree
Phytolaccaceae	*Phytolacca octandra**	Inkweed
Pinaceae	*Pinus elliottii*	slash pine
Poaceae	*Aristida personata*	
Poaceae	*Chloris gayana**	Rhodes grass
Poaceae	*Cymbopogon refractus*	Barb wire grass
Poaceae	*Heteropogon contortus*	Black speargrass
Poaceae	*Imperata cylindrica*	Blady grass
Poaceae	*Paspalum conjugatum**	Sourgrass
Poaceae	*Paspalum dilatatum**	Paspalum
Poaceae	*Paspalum notatum**	Bahia grass
Poaceae	*Themeda triandra*	Kangaroo grass
Poaceae	*Urochloa mutica**	Para grass
Primulaceae	*Myrsine howittiana*	Muttonwood
Pteridaceae	*Adiantum aethiopicum*	Common maidenhair fern
Pteridaceae	*Pellaea falcata*	Sickle fern
Rhamnaceae	*Alphitonia excelsa*	Red ash
Santalaceae	*Exocarpos cupressiformis*	Cherry ballart
Sapindaceae	*Dodonaea viscosa*	Hopbush
Smilacaceae	*Smilax australis*	Prickly smilax
Solanaceae	*Solanum seaforthianum**	Brazilian nighshade
Thelypteridaceae	*Christella dentata*	
Thymelaeaceae	*Pimelea glauca*	Smooth rice flower
Thymelaeaceae	*Pimelea linifolia*	Slender rice flower
Thymelaeaceae	*Wikstroemia indica*	Tie bush
Verbanaceae	*Lantana montevidensis**	Creeping lantana
Verbenaceae	*Lantana camara**	Lantana
Violaceae	*Hybanthus stellarioides*	
Xanthorrhoeaceae	*Dianella caerulea*	Blue flax lily

Family	Botanical Name	Common Name
Xanthorrhoeaceae	*Dianella longifolia*	Blue flax lily
Xanthorrhoeaceae	*Geitonoplesium cymosum*	Scrambling lily

APPENDIX 2 – OFFSET STRATEGY (JWA 2016)

JWA PTY LTD
Ecological Consultants

ABN 18 862 767 739

OFFSET STRATEGY

Lot 2 on RP868726
820 Greenbank Road, North Maclean

A Report Prepared for
Anna Properties Pty Ltd

August 2016

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DOCUMENT CONTROL

Document

Title	Offset Strategy
Job Number	Q15004
File Reference	\\SERVER\data\QLD CLIENT FILES\15004_820 Greenbank Road, North Maclean\Report
Version and Date	RW8 09/08/16
Client	Anna Properties Pty Ltd

Revision History (office use only)

Issue	Version	Draft/Final	Date Sent	Distributed To	No. Copies	Media	Delivery Method
1	RW1	DRAFT	03/03/15	JWA	1	Word	Email
2	RW2	DRAFT	12/03/15	JWA	1	Word	Email
3	RW3	DRAFT	18/03/15	JWA	1	Word	Email
4	RW4	DRAFT	25/03/15	Client	1	PDF	Email
5	RW4	FINAL	13/04/15	Client	1	PDF	Email
6	RW5	DRAFT	05/08/15	Client	1	PDF	Email
7	RW6	DRAFT	11/09/15	Client	1	PDF	Email
8	RW7	FINAL	15/10/15	Client	1	PDF	Email
9	RW8	DRAFT	09/08/16	Client	1	PDF	Email
10	RW9	FINAL	18/08/16	Client	1	PDF	Email

Client Issue

Version	Date	Author		Approved by	
		Name	Initials	Name	Initials
RW4	25/03/15	Kirsty Macpherson	KM	James Warren	JW
RW5	05/08/15	Adam McArthur	AM	Adam McArthur	AM
RW6	11/09/15	Adam McArthur	AM	Adam McArthur	AM
RW7	15/10/15	Adam McArthur	AM	Adam McArthur	AM
RW8	09/08/15	Phoebe Chapman	PC	Adam McArthur	AM
RW9	18/08/15	Phoebe Chapman	PC	Adam McArthur	AM

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1 Introduction

1.1 Background

JWA Pty Ltd has been engaged by Anna Properties to complete an Offset Strategy for land at 820 Greenbank Road, North Maclean. Offsets will be required to compensate for the vegetation cleared as part of the development.

An Ecological Assessment Report has been prepared for the site (JWA 2016) in order to meet obligations under PDA Guideline 14 and should be read in conjunction with this Offset Strategy.

1.2 The Subject Site

The site is located at 820 Greenbank Road, North Maclean and is formally described as Lot 2 on RP868726 (**FIGURE 1**). The site is located within the Greater Flagstone Priority Development Area (PDA). The site is approximately 20.25ha in area. An aerial photograph of the site is shown in **FIGURE 2**.

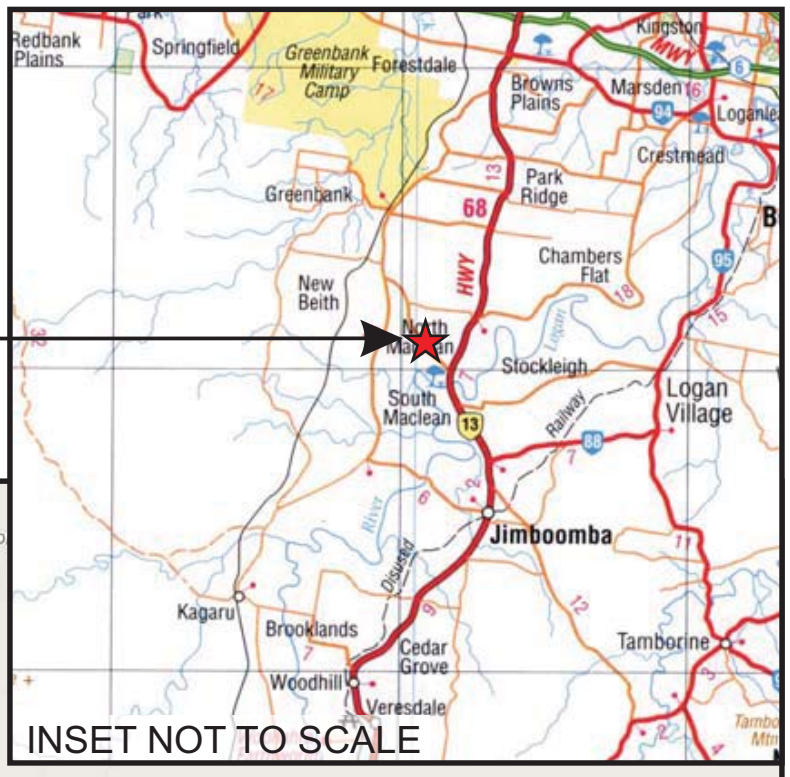
1.3 The Proposed Development

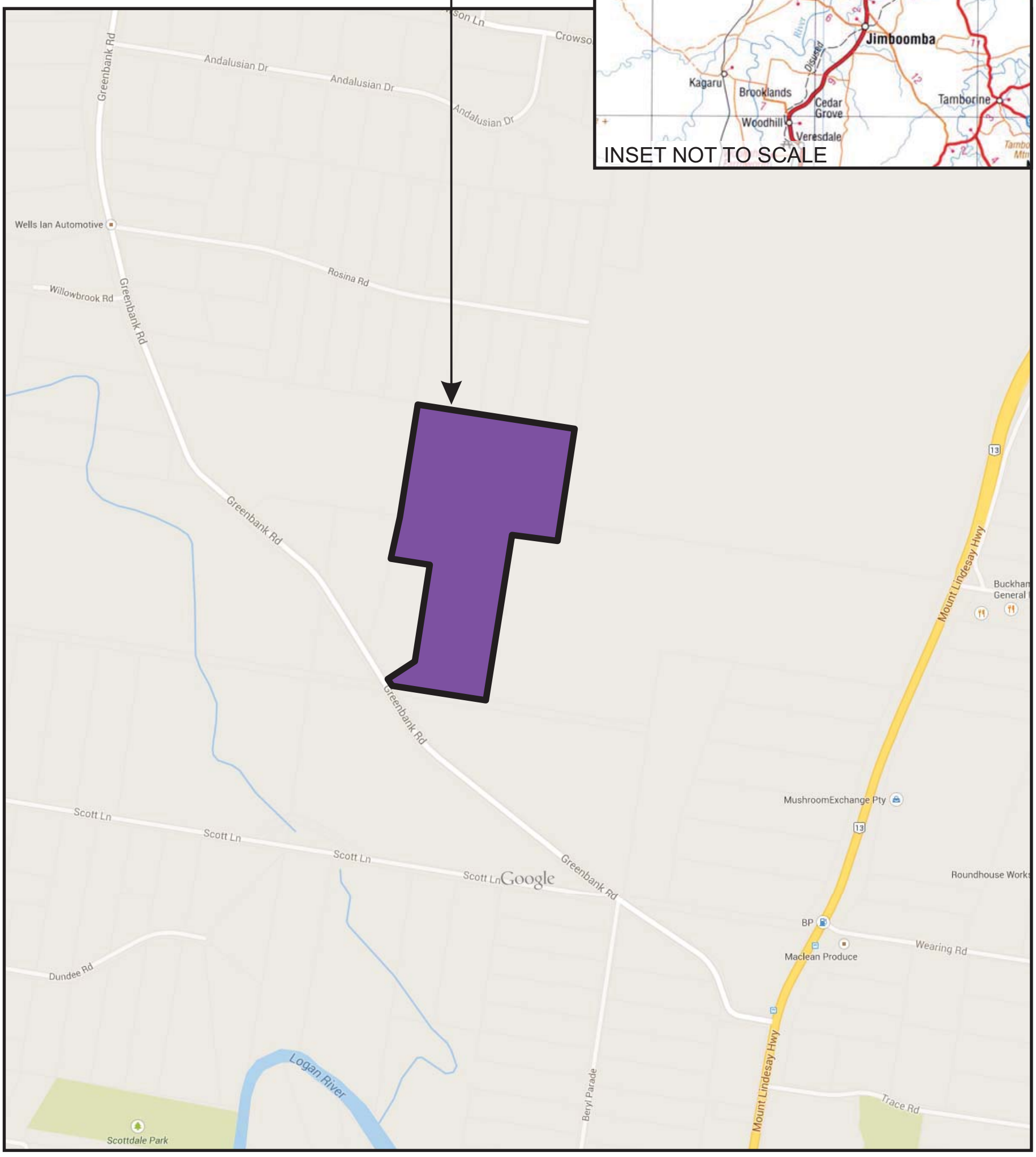
The proposed development includes the subdivision of the land into twelve (12) industrial Lots (**FIGURE 3**). An industrial connector road will traverse the site from the western boundary, south through the centre of the site to Greenbank Road. It is expected that services will be co-located within this road reserve. A stormwater detention basin will be located in the vicinity of the existing dam on site and will be approximately 7,350m^2 in size. The remainder of the site will be retained as a reserve and offset area.

It is noted that the current layout has been produced to give an indication on the footprint necessary (including for stormwater treatment devices) to assist in the development application noting that the final lot layout and servicing arrangements is likely to change pending buyer demand and servicing constraints, and also in response to any ecological constraints identified in this report. In this regard, a number of recommendations are made at in the Ecological Assessment Report (JWA 2016) in relation to layout changes to reduce/ameliorate potential impacts on ecological values of the site.

N

SUBJECT SITE





0 500m

SOURCE: Google Maps SCALE: 1 : 15 000 @ A4 JWA PTY LTD Ecological Consultants	CLIENT Anna Properties PROJECT Offset Strategy Lot 2 on RP868726 820 Greenbank Road, North Maclean QLD Logan City Council LGA	**FIGURE 1** PREPARED: BW DATE: 07 August 2016 FILE: Q15004_Locality.cdr	TITLE **LOCALITY PLAN**

Legend
Subject Site

N

0 100m
1 : 2500

SOURCE: QLD Globe Sept 2013 Aerial Photo

SCALE: 1 : 2500 @ A3

JWA PTY LTD
Ecological Consultants

CLIENT
Anna Properties

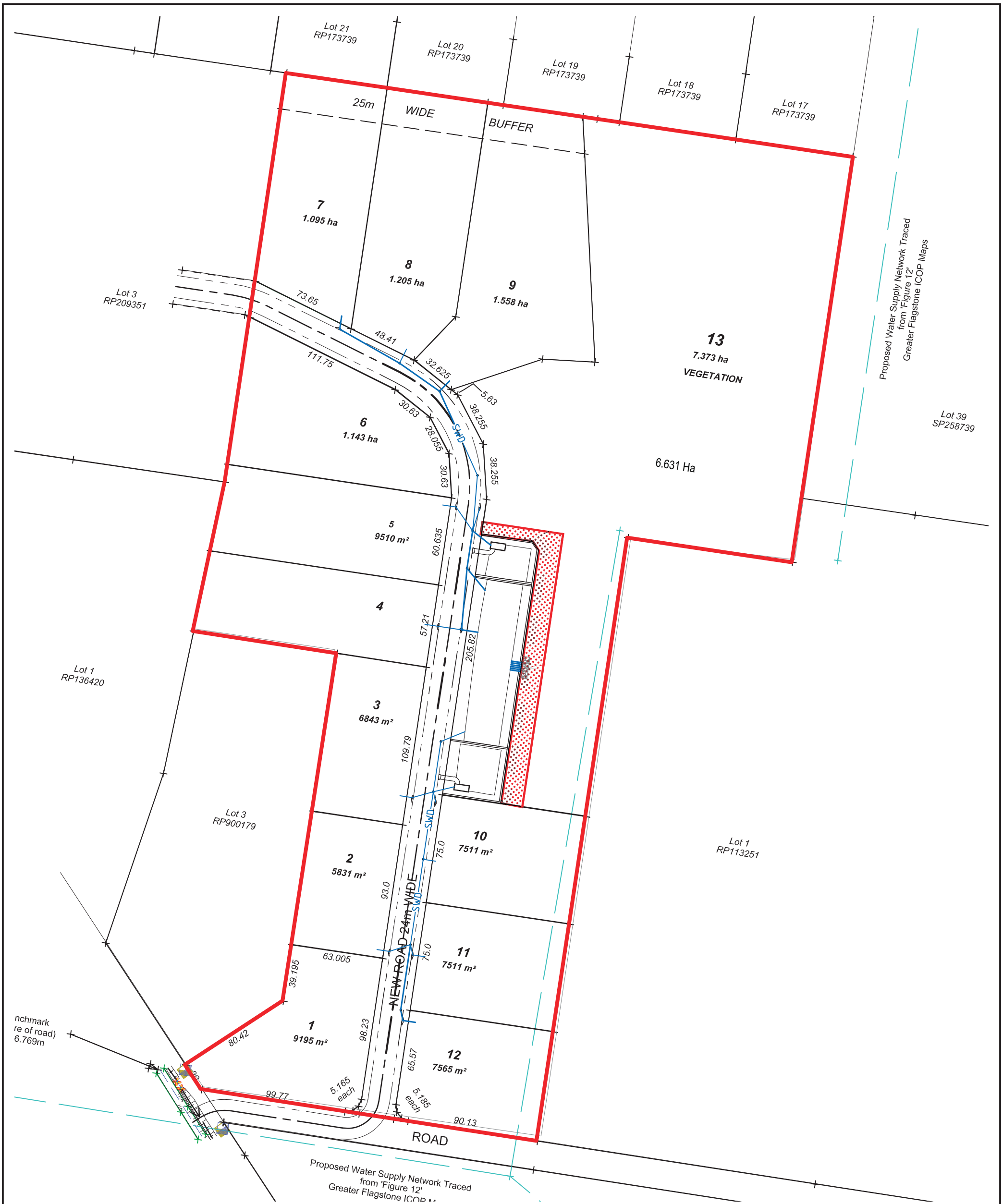
PROJECT
Offset Strategy
Lot 2 on RP868726
820 Greenbank Road, North Maclean QLD
Logan City Council LGA

FIGURE 2

PREPARED: BW
DATE: 07 August 2016
FILE: Q15004_Aerial.cdr

TITLE

AERIAL PHOTOGRAPH



Legend

- Potential buffer zone required for basin refinement in future DCBDMP
- Proposed lots
- Proposed stormwater drainage
- Subject Site

N

0 100m

1 : 2500

SOURCE: Civil Dimensions (CD14-053 Greenbank Rd North Maclean CSBSMP Addendum Letter to DILGP 16-0...pdf); ONF Surveyors (5443_P1D_170516.dwg)

SCALE: 1 : 2500 @ A3

JWA PTY LTD
Ecological Consultants

CLIENT
Anna Properties

PROJECT
Offset Strategy
Lot 2 on RP868726
820 Greenbank Road, North Maclean QLD
Logan City Council LGA

FIGURE 3

PREPARED: BW
DATE: 08 August 2016
FILE: Q15004_Layout.cdr

TITLE

PROPOSED DEVELOPMENT LAYOUT

2 Offset Requirements

2.1 Introduction

The proposed development is administered by Economic Development Queensland (EDQ) under the State Department of Development, Infrastructure and Planning (DSDIP). It is to be assessed under the Greater Flagstone Priority Development Area Development Scheme and as such any environmental impacts will be offset in line with EDQ's *Priority Development Areas (PDA) Guideline No. 17 – Remnant vegetation and koala habitat obligations in Greater Flagstone and Yarrabilba PDAs*. The requirements for offsets on the site in relation to Guideline No. 17 are discussed below.

2.2 Guideline No. 17

2.2.1 Background

Guideline No. 17 outlines the obligations that apply in the Greater Flagstone PDA when development results in the clearing of:

- remnant vegetation containing endangered regional ecosystems; and
- areas defined in Schedule 1 as koala habitat areas.

Guideline No. 17 further defines these areas as follows:

- Endangered remnant vegetation - areas of remnant vegetation containing endangered regional ecosystems as shown on the regional ecosystem map prepared under the Vegetation Management Act 1999 and confirmed by on-site investigations using a methodology accepted by EDQ.
- Koala habitat areas - an area mapped on State Planning Policy 2/10 (SPP): Koala Conservation in South East Queensland, SEQ Koala Protection Area Koala Habitat Values maps as:
    - bushland habitat; and
    - having high and medium value suitable for rehabilitation habitat types.

The purpose of Guideline No. 17 is to ensure that, as a result of development within the PDAs:

- there is no net loss of remnant vegetation containing endangered regional ecosystems within the region; and
- an appropriate contribution is made towards the achievement of a net gain in bushland koala habitat within the region.

2.2.2 Nature of the Obligation

The Greater Flagstone PDA Development Scheme requires:

- the protection of viable remnant vegetation containing endangered regional ecosystems; and
- development to:
    - avoid (to the greatest extent possible) the clearing of areas mapped as having High Value Bushland on the relevant State Planning Policy 2/10: Koala Conservation in South East Queensland (SPP) Koala Habitat Values maps;
    - cater for koala movement between conserved areas of bushland koala habitat; and
    - incorporate koala sensitive urban design.

Guideline No. 17 defines non-viable areas of endangered regional ecosystems as areas of remnant vegetation containing endangered regional ecosystems (as shown on the regional ecosystem map prepared under the Vegetation Management Act 1999) that:

- are smaller than 5ha;
- are not connected to:
    - other remnant or high value regrowth communities;
    - a watercourse or waterbody;
    - a mapped corridor within or external to the PDA (including State and local government corridor mapping).
- are not confirmed endangered communities located within a:
    - State or Regional Corridor;
    - Local Government Strategic Biodiversity Corridor;
    - adjacent to a Protected Area Estate.
- has become, or is likely to become, isolated or fragmented as a result of the surrounding land use pattern; and
- has greater than 50 per cent weed species through the understorey and ground layer.

The clearing of confirmed non-viable remnant vegetation containing endangered regional ecosystems may be approved by EDQ if an offset is provided. If the clearing of high value bushland koala habitat can be shown to be necessary EDQ may approve the clearing if an offset is provided. Koala habitat mapped as medium or low value bushland habitat, or rehabilitation habitat can be cleared if approved by EDQ and an offset is provided.

2.2.3 Offset Types

2.2.3.1 Background

Guideline No. 17 stipulates the type of offset that may be required. A PDA development condition will set out the details of the applicable obligation.

The types of offset that may be required include:

- compensatory habitat for:

  - clearing of confirmed non-viable remnant vegetation containing endangered regional ecosystems; and
  - necessary clearing of koala areas.
- monetary contributions for necessary clearing of koala areas.

2.2.3.2 Remnant Endangered Regional Ecosystem

The areas required for offset of non-viable remnant vegetation containing endangered regional ecosystems will be determined by the quality of the vegetation being offered as the offset. If the offset is provided on the same land as the development the following conditions will determine the amount of vegetation required:

- **2:1** ratio - compensatory habitat area must:
  - be non-remnant vegetation;
  - have less than 10% weed cover;
  - with management attain remnant status within five (5) years; and
  - not require revegetation.

- **2.5:1** ratio- compensatory habitat area must:
  - be non-remnant vegetation;
  - have less than 25% weed cover;
  - with management attain remnant status within five (5) years;
  - not require revegetation across more than 10% of the compensatory habitat area; and
  - provide connectivity or a buffer to other remnant vegetation.

- **4:1** ratio - compensatory habitat area must:
  - be non-remnant vegetation;
  - have less than 25% weed cover;
  - with management attain remnant status within twenty (20) years;
  - not require revegetation across more than 60% of the compensatory habitat area; and
  - provide connectivity or a buffer to other remnant vegetation.

2.2.3.3 Koala Habitat Areas

To ensure development contributes to the achievement of a net increase in bushland koala habitat in the region, development within the Greater Flagstone PDA must:

1. For each dwelling approved in the PDA - contribute $150 to koala habitat management in the region (only applicable to residential developments); **AND**
2. Where the clearing of koala habitat areas is approved by EDQ and the payment of a monetary contribution is proposed – pay:
   a. for land mapped as having high, medium or low value bushland habitat proposed to be cleared - $15,000 for each hectare cleared;
   b. for land mapped as having high to medium value suitable for rehabilitation habitat types:
      i. $5,000 for each hectare cleared; or

ii. $920 per non-juvenile koala habitat tree cleared; **OR**

3. Where the clearing of a koala habitat area is approved by EDQ and suitable land exists upon which the undertaking of planting is proposed - plant:
    a. for each hectare of land mapped as having high, medium or low value bushland habitat proposed to be cleared - 1.2 hectares of koala habitat on land legally secured in accordance with the provisions of Guideline No. 17;
    b. for each hectare of land mapped as having high or medium value suitable for rehabilitation habitat types - 0.5 hectares of koala habitat on land legally secured in accordance with the provisions of Guideline No. 17;
    c. for each non-juvenile koala habitat tree cleared – five (5) new koala habitat trees within an area legally secured in accordance with the provisions of Guideline No. 17.

2.2.4 Suitable Offset Areas

2.2.4.1 Remnant Endangered Regional Ecosystem

When providing compensatory habitat as an offset for clearing of non-viable remnant vegetation containing endangered RE the proposed habitat area must not be:

- mapped as remnant vegetation, unless:
    a) the area has a valid clearing approval that would result in the area being cleared; or
    b) it is reasonably foreseeable that the remnant vegetation will fall below the criteria for remnant vegetation and appear as white on a regional ecosystem map through an identified and immediate threatening process.
- a category C area on a Property Map of Assessable Vegetation; or
- an area on which vegetation is protected by another instrument of state government unless a. or b. above apply.

2.2.4.2 Koala Habitat Areas

When providing compensatory habitat as an offset for clearing of high (where necessary only), medium or low value bushland habitat the proposed habitat area must be:

- in an area identified as high value or medium value rehabilitation habitat;
- where an area of high value or medium value suitable for rehabilitation habitat is not available low value rehabilitation habitat, or where appropriate, rehabilitation within bushland habitat to enhance the quality of bushland within the local government area may be used;
- within the same local government area.

The species of koala habitat trees planted in the compensatory habitat area must be endemic to the area used for the offset. The compensatory habitat area should also form part of, or contribute to, strategic koala habitat networks within the local government area or the South East Queensland region where possible.

2.2.5 Legally Securing Offset Areas

Offset areas must be legally protected under a legally binding mechanism. Examples of legally binding mechanisms include:

- dedication as a protected area under the Nature Conservation Act 1992 (e.g. Nature Refuge, National park);
- declaration of an area of high nature conservation value under the Vegetation Management Act 1999; and
- use of a covenant under the Land Act 1994 or Land Title Act 1994.

3 Site Assessment

3.1 Background

The site assessment requirements under Guideline No. 17 in relation to remnant vegetation containing endangered regional ecosystems state that:

- the extent of remnant vegetation containing endangered regional ecosystems on the site be ground-truthed and mapped;
- remnant vegetation containing endangered regional ecosystems immediately adjoining the site be ground-truthed; and
- the identification of the viable and non-viable portions of the remnant vegetation containing endangered regional ecosystems on site and details of the analysis used to determine the viability / non-viability of the vegetation.

The site assessment requirements under Guideline No. 17 in relation to koala habitat areas require that:

- the extent of koala habitat areas within the site be ground truthed;
- details of the methodology used to confirm the extent of koala habitat areas within the site;
- likely koala habitat areas immediately adjoining the site identified; and
- the proposed extent of clearing of koala habitat areas and justification for why the clearing is necessary.

This section provides the methods, results and discussion of the site assessment undertaken in line with the requirements of Guideline No. 17.

3.2 Methods

3.2.1 Desktop Assessment

A desktop assessment was completed to identify any potential conservation significant vegetation or habitat on the site. The following State environmental mapping was reviewed as part of the desktop assessment:

- Regulated Vegetation Management Mapping (DNRM 2014);
- Regional Ecosystem (RE) Mapping (version 8) (DNRM 2014);
- Essential Habitat Mapping and species database (version 4) (DNRM 2014);
- Greater Flagstone PDA Development Scheme; and
- State Planning Provisions (SPP) Koala Habitat Mapping (DEHP 2012).

3.2.2 Vegetation Survey

3.2.2.1 Background

A site inspection and survey of existing flora communities within the subject site was completed by one (1) JWA scientist on the 3rd of March 2015. The survey was undertaken to ground truth and map endangered RE's and other vegetation on the site. A total of approximately seven (7) person hours were spent on this component of the survey.

Preliminary identification of the vegetation communities was completed prior to the commencement of fieldwork. This was completed by interpretation of current RE mapping (Version 8) and aerial photographs.

Field surveys involved a botanical assessment at a number of representative sites within remnant and non-remnant vegetation communities (**FIGURE 4**). The surveys utilised a number of standard methods (Neldner *et al*. 2005) including erection and assessment of tertiary and quaternary transect sites. Random meander searches were also completed.

Further vegetation surveys, including random meander searches for threatened species, were undertaken on the 10th and 24th of June 2016. A total of approximately eleven (11) hours were spent on these surveys.

2016 surveys included the methodology described in the Nature Conservation Act's (1992) Flora Survey Guidelines - Protected Plants (DEHP 2014) as timed random meander searches. The random meander technique original described by Cropper (1993) and adapted by the Flora Survey Guidelines was used to search for threatened flora species. The meander technique was used to discover and record all the vascular flora observed on the site. After 30 minutes of no new plant species being observed and recorded, the meander was concluded.

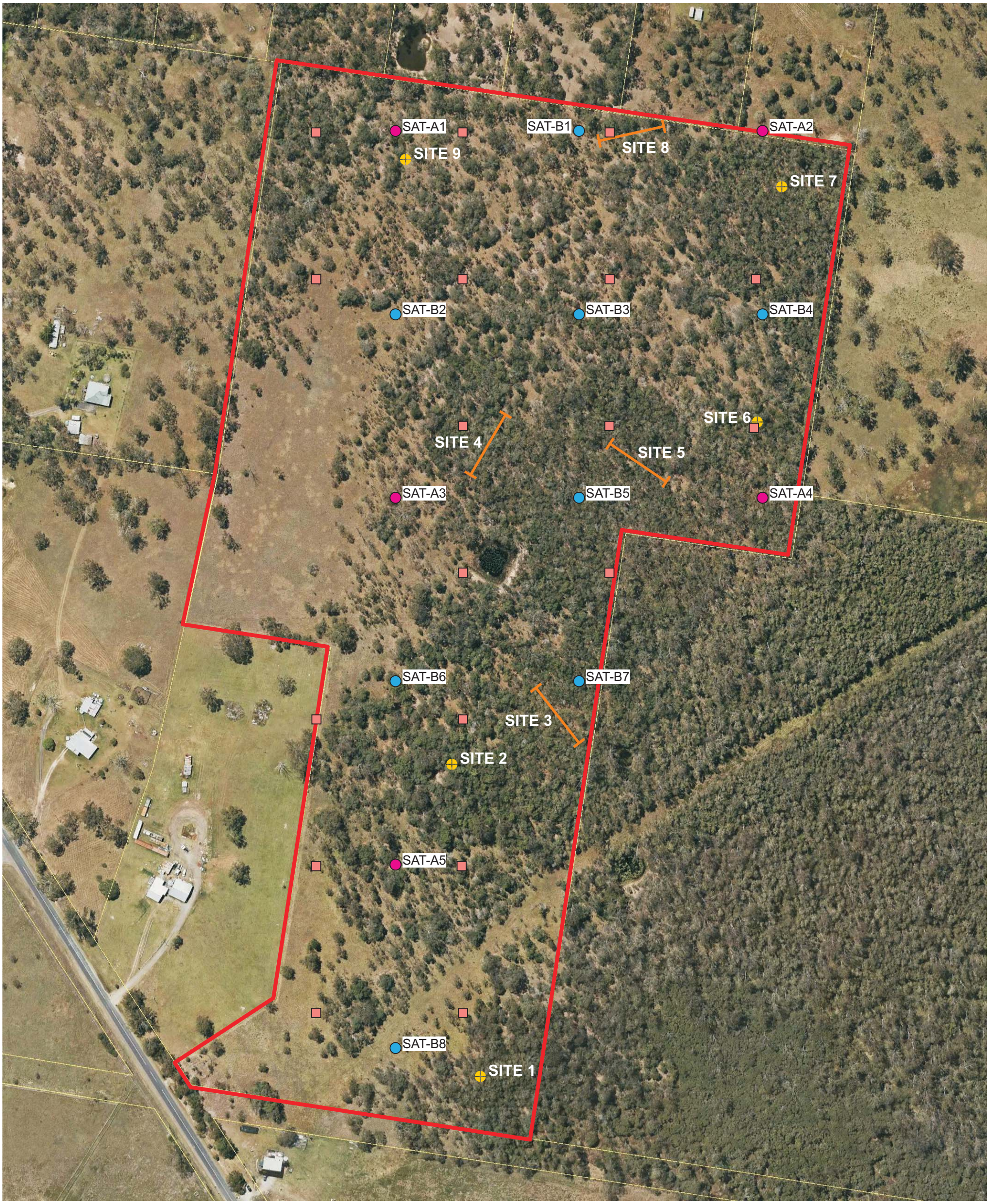
3.2.2.2 Tertiary Survey Sites

The field survey utilised four (4) tertiary transects within the site. Each of which comprised a 10 x 50 m (500m^2) area. Locations of transects were recorded using a handheld GPS unit. The location of each tertiary survey site is shown in **FIGURE 4**.

Descriptive site information recorded at tertiary transects included location, orientation, aspect, slope, soil type, landform, disturbance, fire history and general notes on ecological integrity. Several digital photographs were taken at each plot as a visual reference.

Floristic analysis included plant identification and species diversity characterisation of all flora present. Relative abundance was assigned for all species recorded.

The structural analysis included recording the height class and life form of the dominant species within each strata present. The height of each stratum was recorded using ocular estimation. Foliage projective cover (FPC) of the mid and upper strata was calculated along each transect where foliage projection intersected the 50 m centre tape. The FPC



Legend

- Quaternary Survey Site
- Tertiary Survey Site
- Hair Tubes
- SAT A Sites
- SAT B Sites
- Subject Site

N

0 100m

1 : 2500

SOURCE: JWA Site Investigations; QLD Globe Sept 2013 Aerial Photo

SCALE: 1 : 2500 @ A3

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Ecological Consultants

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FIGURE 4

PREPARED: BW
DATE: 07 August 2016
FILE: Q15004_Survey Sites.cdr

TITLE

SURVEY SITES

of the ground layer was determined using visual estimation of cover within five (5) 1 m subplots spaced at equal intervals along the primary 5 m transect.

3.2.2.3 Quaternary Survey Sites

In addition to the tertiary transects, the field surveys utilised five (5) quaternary survey sites. Quaternary survey sites were used to ground truth vegetation communities and confirm dominant characteristic species. Locations of transects were recorded using a handheld GPS unit. The location of each quaternary survey site is shown in **FIGURE 4**.

Descriptive site information recorded at quaternary sites included location, orientation, aspect, slope, soil type, landform, disturbance, fire history and general notes on ecological integrity. Several digital photographs were taken at each plot as a visual reference.

Floristic analysis included determination of the dominant species within each canopy strata. Structural analysis included recording the height class and life form of the dominant species within the mid and canopy strata. The height of each stratum was recorded using ocular estimation. Foliage projective cover (FPC) was recorded using ocular estimation.

3.2.2.4 Random Meander Searches

The random meander technique (Cropper 1993) was used to identify changes in landform, identify vegetation community boundaries and to complete targeted searches for threatened flora species. The floral characteristics of each vegetation community that was evident from detailed aerial photographs were examined by 'on foot' inspections. Vegetation communities were mapped and described using the technique contained in Walker and Hopkins (1998). Vegetation structural formation classes were assessed according to Neldner *et al*. (2005). Regional ecosystem classification of vegetation communities were determined in accordance with methodology contained in Sattler and Williams (1999), and with the Regional Ecosystems Description Database (REDD) (Queensland Herbarium 2014).

3.2.2.5 Koala Habitat Trees

The vegetation was assessed for the presence of koala habitat trees. Koala habitat trees are defined as a tree that has:

a) a height of more than four (4) metres; or
b) a trunk with a circumference of more than 31.5 centimetres at 1.3 metres above the ground (DERM 2010).

Koala habitat trees must be of the species *Eucalyptus, Corymbia, Angophora, Lophostemon* or *Melaleuca*.

3.2.2.6 Weeds

Weeds were assessed for significance under the Queensland *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act) and the Commonwealth Weed of National Significance (WoNS).

The Queensland *LP Act* lists exotic flora and fauna that are considered Class 1, 2 or 3 pests under the Act. The different classes require different pest management strategies and landholder requirements to control pests on their land. Landowners are required to manage Class 1 and 2 Declared weed on their land (DAFF 2011).

Thirty-two (32) Weed of National Significance (WoNS) have been identified by Australian governments based on their invasiveness, potential for spread and environmental, social and economic impacts. A list of twenty (20) WoNS endorsed in 1999 and a further twelve (12) were added in 2012. Individual landowners and managers are responsible for managing WoNS on their land.

3.2.3 Assessment Against Guideline No. 17 - Non-Viable Endangered Regional Ecosystems

Remnant vegetation communities were ground-truthed and mapped using tertiary and quaternary transects and a GPS mapping device. Each remnant vegetation community was assessed against the criteria outlined in Guideline No. 17 for non-viable endangered regional ecosystems.

As this is a guideline and not a specific policy item the expectations of the guidelines are those described by the EDQ i.e. to ensure that, as a result of development within the PDAs: there is no net loss of remnant vegetation containing endangered regional ecosystems within the region.

The assessment criteria and the possible results are listed in **TABLE 1**.

TABLE 1
ASSESSMENT CRITERIA EXPLANATIONS

Non-viable Criteria Question	**Possible Results**
Is the DNRM mapped RE confirmed on-site as an endangered RE?	Yes = Either a viable or non-viable endangered RE
	No = Not considered further as not an endangered RE
Is the patch (may include off-site areas) of endangered RE area smaller than 5 ha?	Yes = Likely non-viable endangered RE depending on other criteria
	No = Possibly non-viable endangered RE depending on other criteria
Is the patch connected to: - other remnant or high value regrowth communities; - a watercourse or waterbody;	Yes = Likely viable endangered RE

Non-viable Criteria Question	Possible Results
- a mapped corridor within or external to the PDA (including State and local government corridor mapping)?	No = Possibly non-viable endangered RE depending on other criteria
Has the vegetation community become, or is likely to become, isolated or fragmented as a result of the surrounding land use pattern?	Yes = Likely non-viable endangered RE
	No = Likely viable endangered RE
Does the vegetation community have greater than 50 per cent weed species through the understorey and ground layer?	Yes = Non-viable endangered RE
	No = Possibly viable endangered RE depending on other criteria

3.3 Results

3.3.1 Introduction

This section provides the results of the database searches and the site vegetation survey. The results are divided into three (3) sections. Section 3.3.2 addresses endangered RE vegetation communities which will require an offset if they are disturbed by the development. Section 3.3.3 addresses regrowth vegetation communities which can be used for offset areas. Section 3.3.4 addresses koala habitat on the site.

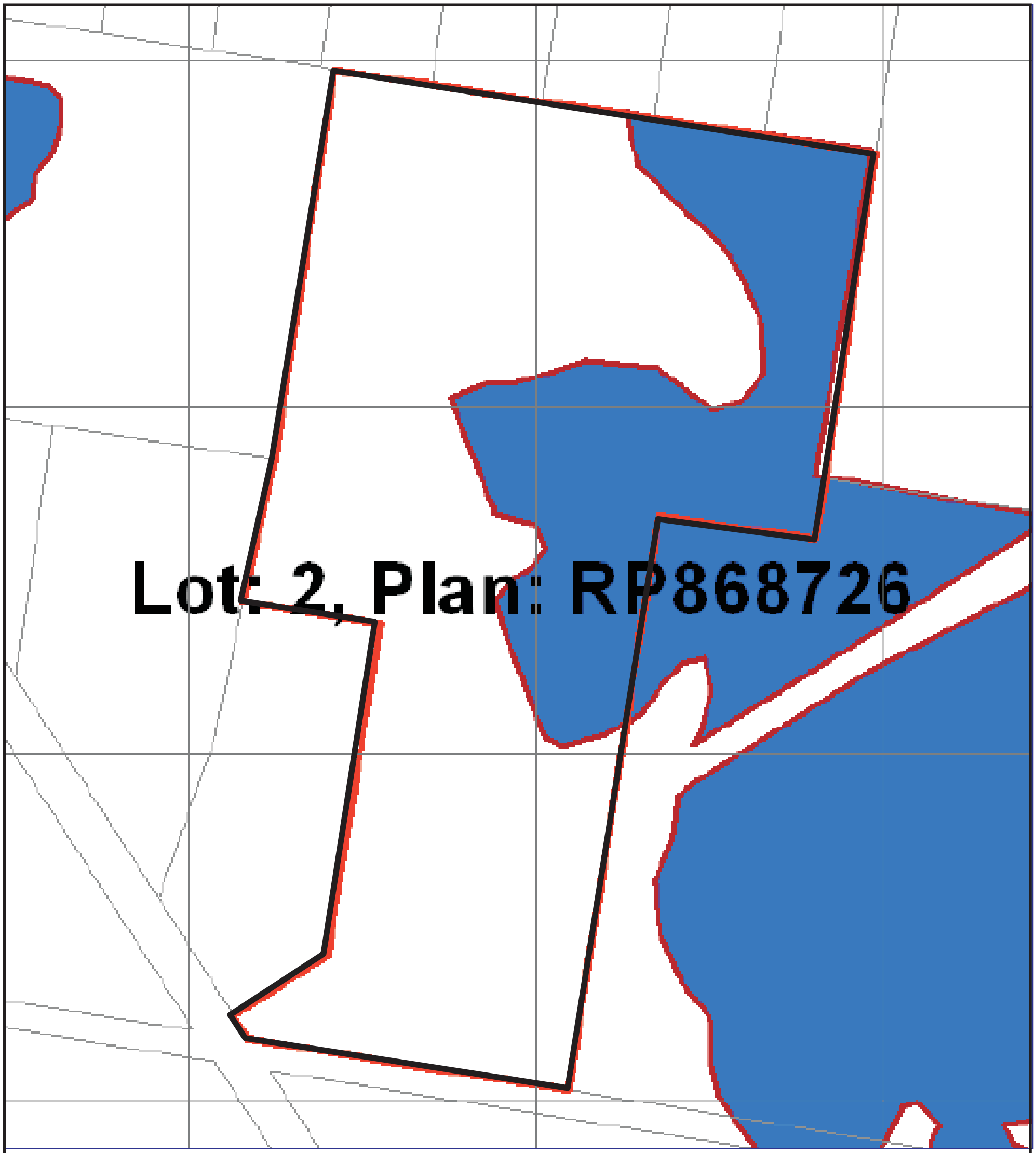
3.3.2 Endangered Remnant Vegetation

3.3.2.1 DNRM Regulated Vegetation Mapping

The current regulated vegetation management map of the subject site includes both Category B (remnant vegetation) and Category X (vegetation not regulated under the VMA) areas (**FIGURE 5**). The Category B areas are mapped as Endangered REs on the vegetation management supporting map (**FIGURE 6**).

The DNRM mapping identifies the regulated vegetation as the following REs (**FIGURE 6)**:

- Endangered RE 12.9-10.11 *Melaleuca irbyana* low open forest on sedimentary rocks; and
- Endangered RE 12.9-10.2/12.9-10.12/12.9-10.7 *Corymbia citriodora* subsp. *variegata*, with-or-without *Eucalyptus crebra*, open forest on sedimentary rocks / *Eucalyptus seeana*, *Corymbia intermedia*, *Angophora leiocarpa*, with-or-without *E. siderophloia*, *E. tereticornis*, *E. racemosa* subsp. *racemosa*, *C. citriodora* subsp. *variegata*, woodland to open forest with *Lophostemon suaveolens* sub canopy / *Eucalyptus crebra* with-or-without *E. tereticornis*, *Corymbia tessellaris*, *Angophora leiocarpa*, *E. melanophloia* woodland.



Legend

Category B Area (Remnant vegetation)

Category X Area (Vegetation not regulated under the VMA)

Subject Site

N

0 50m 100m

SOURCE: QLD DEHP Regulated Vegetation Management Map

SCALE: 1 : 4000 @ A4

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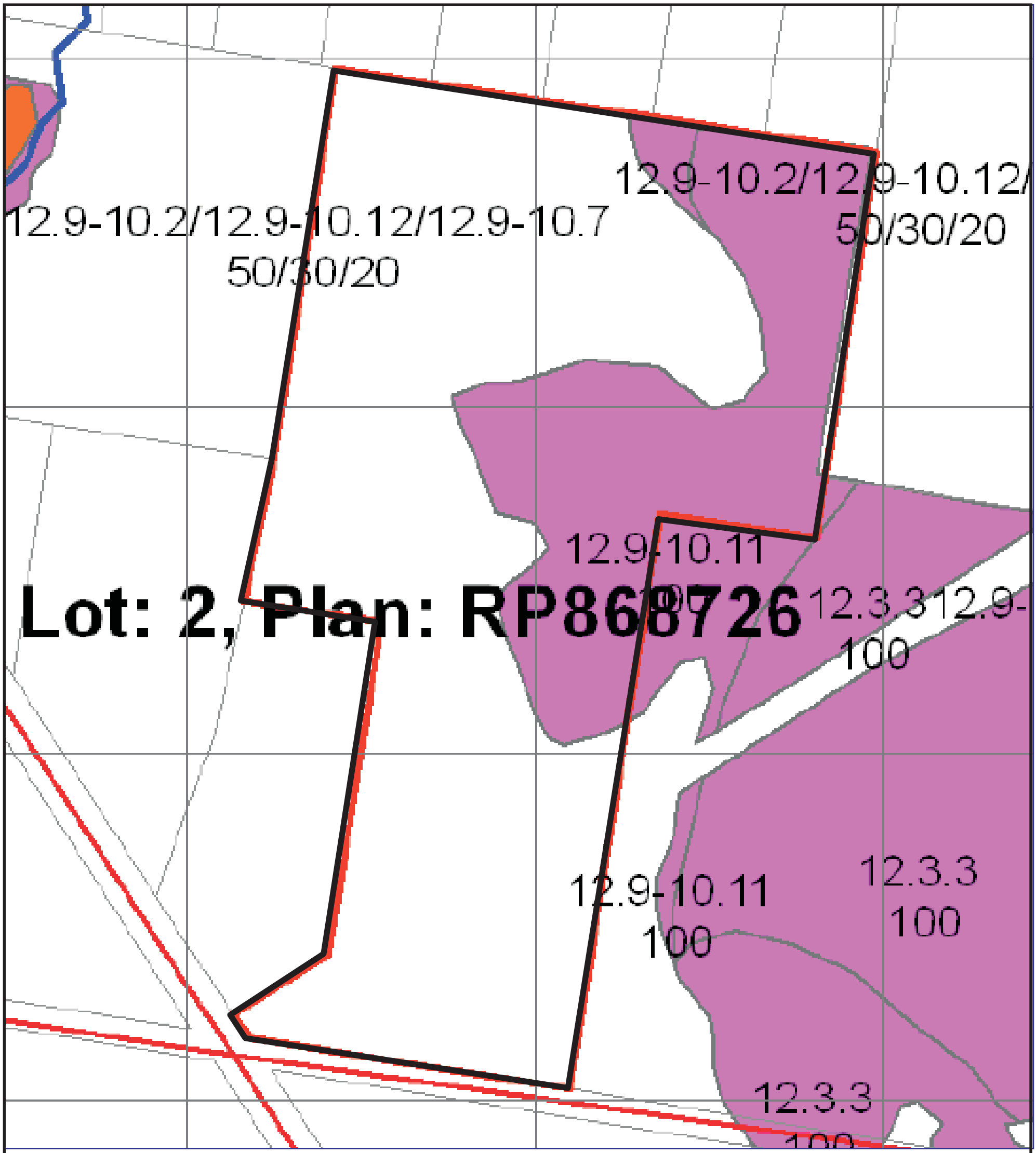
FIGURE 5

PREPARED: BW
DATE: 08 August 2016
FILE: Q15004_RVM Map.cdr

TITLE
REGULATED VEGETATION MANAGEMENT MAP



Legend

- Category A or B area containing endangered remnant vegetation
- Category A or B area containing of concern remnant vegetation
- Non-remnant
- Watercourse on the vegetation management watercourse map
- Subject Site

N

0 50m 100m

SOURCE: QLD DEHP Vegetation Management Supporting Map

SCALE: 1 : 4000 @ A4

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FIGURE 6

PREPARED: BW
DATE: 08 August 2016
FILE: Q15004_RE Map.cdr

TITLE

REGIONAL ECOSYSTEMS

3.3.2.2 Greater Flagstone PDA Development Scheme

The Greater Flagstone PDA Development Scheme's figure 10 shows the Category B vegetation as 'Potential Greenspace' areas. The Development Scheme's figure 11 shows an industrial connector road. This road dissects the site through the greenspace area. The Greater Flagstone PDA Development Scheme figures are included in **Annexure 1**.

3.3.2.3 Vegetation Survey

3.3.2.3.1 Background

Two (2) remnant vegetation communities were identified on the subject site. This section provides a description of each of these vegetation communities and the condition and conservation status of each. The remnant vegetation communities are also assessed against the viable/non-viable endangered RE criteria of Guideline No. 17.

3.3.2.3.2 Community 1 - Corymbia intermedia, Angophora leiocarpa, E. tereticornis Eucalyptus seeana, open forest with Lophostemon suaveolens sub canopy

Location and Area

This community is located in the eastern portion of the site within the southern portion of the mapped DNRM remnant vegetation. This community covers an area of 2.5 ha. Survey sites 3 and 4 are located within this vegetation community (**FIGURE 7**). There is a manmade dam located adjacent to the western boundary of this community. Survey site descriptions with species list are located in **Annexure 2**.

Description

This vegetation community is heterogeneous with monospecific patches of *Lophostemon sauveolens* with occasional emergent Eucalyptus trees and patches of *Corymbia intermedia*, *Eucalyptus tereticornis, Angophora leiocarpa* and *Eucalyptus seeana* canopy trees with *Lophostemon sauveolens* as the sub-canopy. The sub-canopy also contains *Acacia disparrima* and *Alphitonia excelsa*.

The shrub layer consists mostly of young *Acacia disparrima* and *Alphitonia excelsa* trees.

The ground layer is mainly leaf litter, clear of vegetation with occasional clumps of *Imperata cylindrica, Murdannia graminea, Brachyscome* sp., *Lomandra longifolia, Leptospermum polygalifolium* and seedling *Eucalyptus* species.

There were few weed in the community. Occasional asparagus weed (*Asparagus africanus*) and lantana (*Lantana camara*) were found, both of which are declared weeds under the *LP Act* and WoNS.

Condition

This community is in good condition with no signs of grazing or erosion impacts. There are few weeds on site and there is natural growth and succession of the native vegetation. There is evidence of historical logging with numerous old stumps. There are recreational dirt bike tracks in the less densely vegetated areas.

Legend

- *Melaleuca irbyana*
- Koala scat
- Ground-truthed Endangered Regional Ecosystem Boundary On-site
- Community 1 - *Corymbia intermedia*, *Angophora leiocarpa*, *Eucalyptus tereticornis*, *Eucalyptus seeana* open forest with *Lophostemon suaveolens* sub canopy
- Community 2 - *Eucalyptus seeana*, *Angophora leiocarpa*, *Eucalyptus tereticornis*, *Eucalyptus siderophloia* open forest with *Lophostemon suaveolens* sub canopy
- Community 3 - *Eucalyptus tereticornis*, *Eucalyptus siderophloia*, *Corymbia intermedia*, *Angophora leiocarpa*, *Eucalyptus seeana*, *Lophostemon suaveolens* open regrowth forest
- Community 4 - *Casuarina glauca* low forest with emergent *Eucalyptus tereticornis*
- Cleared paddock with isolated trees
- Subject Site

N

0 100m

1 : 2500

SOURCE: JWA Site Investigations; QLD Globe Sept 2013 Aerial Photo

SCALE: 1 : 2500 @ A3

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FIGURE 7

PREPARED: BW
DATE: 08 August 2016
FILE: Q15004_Vegetation.cdr

TITLE

VEGETATION COMMUNITIES

Conservation Status

It should be noted that whilst the RE mapping shows this area as RE 12.9-10.11 (Endangered), this vegetation community is in fact consistent with RE 12.9-10.7a/12.9-10.12 which also has a conservation status of Endangered under the *VMA (1999).*

This vegetation community is mapped as medium value koala habitat on the SPP mapping.

The community was assessed against the viable/non-viable criteria of Guideline No. 17 in its current location and condition. The results of the assessment are provided in **TABLE 2**. The community is considered to be a non-viable endangered RE in its current condition as the vegetation complies with 4 out of the 7 non-viable criteria.

TABLE 2
ASSESSMENT AGAINST NON-VIABLE CRITERIA OF GUIDELINE NO. 17

Non-viable Criteria	Site Assessment
Confirmed endangered RE	Yes
Within a patch smaller than 5 ha	The patch of remnant vegetation to which this community is part of is 7.9 ha (including adjacent land).
Not connected to other remnant or high value regrowth communities	This vegetation patch is not directly connected to other areas of remnant vegetation or areas of good condition regrowth vegetation (as mapped by DEHP).
Not connected to a watercourse or waterbody	The only waterbody on the site occurs in the form of a manmade dam.
Not connected to a mapped corridor	The site is not connected to the local biodiversity corridors mapped by the Greater Flagstone Urban Development Area; Development Scheme. The site is not connected to the state biodiversity corridors mapped by the Biodiversity Planning Assessment (BPA) (EPA 2006). However, the site is mapped as part of a Biodiversity corridor within the Logan Planning Scheme (2015).
Likely to become, isolated or fragmented as a result of the surrounding land use pattern	As the area is part of the Greater Flagstone PDA it is likely that the surrounding regrowth vegetation areas will be developed, isolating the remaining remnant vegetation within the local area.
Greater than 50 per cent weed species	The site has an approximate weed cover of <10%.

3.3.2.3.3 *Community 2 - Eucalyptus seeana, Angophora leiocarpa, E. tereticornis, E. siderophloia open forest with Lophostemon suaveolens sub canopy*

Location and Area

This community is located in the north eastern portion of the site within the northern portion of the mapped DNRM remnant vegetation. This community covers an area of 2.7 ha. Survey sites 7 and 8 are located within this community (**FIGURE 7**).

Description

This vegetation community is dominated in places by *Eucalyptus seeana.* In other areas it is a mix of canopy trees including *Eucalyptus tereticornis, Eucalyptus seeana, Angophora leiocarpa* and the occasional *E. siderophloia*. The sub-canopy layer contains *Lophostemon sauveolens, A. leiocarpa*, and *Acacia disparrima*.

The shrub layer consists mostly of young *Lophostemon sauveolens, Acacia disparrima* and *Alphitonia excelsa* trees with the occasional *Allocasuarina littoralis* small tree.

The ground layer is sparse in places to more heavily vegetated toward the edge of the community. Species included *Lomandra longifolia, Imperata cylindrica, Poaceae* sp., *Aristida* sp., *Murdannia graminea, Dianella* sp., *Brachyscome* sp., and *Hybanthus stellarioides.*

Weeds included environmental weed *Bidens pilosa* (cobbler's pegs).

Condition

This community is in good condition with no signs of grazing or erosion impacts. There are few weeds in this community and there is natural growth and succession of the native vegetation.

Conservation Status

It should be noted that whilst the RE mapping shows this area as RE 12.9-10.11 (Endangered), this vegetation community is in fact consistent with RE 12.9-10.12 which has a conservation status of Endangered under the *VMA (1999).*

Part of this vegetation community is mapped as medium value koala habitat on the SPP mapping. The remainder is mapped as medium value rehabilitation koala habitat.

The community was assessed against the viable/non-viable criteria of Guideline No. 17 in its current location and condition. The results of the assessment are provided in **TABLE 3**. The community is considered to be a non-viable endangered RE in its current condition as the vegetation complies with 4 out of the 7 non-viable criteria.

TABLE 3
ASSESSMENT AGAINST NON-VIABLE CRITERIA OF GUIDELINE NO. 17

Non-viable Criteria	Site Assessment
Confirmed endangered RE	Yes
Within a patch smaller than 5 ha	The patch of remnant vegetation to which this

Non-viable Criteria	Site Assessment
	community is part of is 7.9 ha.
Not connected to other remnant or high value regrowth communities	This vegetation patch is not directly connected to other areas of remnant vegetation or areas of good condition regrowth vegetation (as mapped by DEHP).
Not connected to a watercourse or waterbody	The only waterbody on the site occurs in the form of a manmade dam.
Not connected to a mapped corridor	The site is not connected to the local biodiversity corridors mapped by the Greater Flagstone Urban Development Area; Development Scheme. The site is not connected to the state biodiversity corridors mapped by the Biodiversity Planning Assessment (BPA) (EPA 2006). However, the site is mapped as part of a Biodiversity corridor within the Logan Planning Scheme (2015).
Likely to become isolated or fragmented as a result of the surrounding land use pattern	As the area is part of the Greater Flagstone PDA it is likely that the surrounding regrowth vegetation areas will be developed, isolating the remaining remnant vegetation within the local area.
Greater than 50 per cent weed species	The site has an approximate weed cover of <10%.

3.3.3 Regrowth Vegetation

3.3.3.1 Background

Two (2) regrowth vegetation communities were identified on the subject site. This section provides a description of the regrowth vegetation communities and a discussion of the condition and conservation status of each.

3.3.3.2 Community 3 - *E. tereticornis, E. siderophloia, Corymbia intermedia, Angophora leiocarpa, Eucalyptus seeana, Lophostemon suaveolens* open regrowth forest

Location and Area

This community is located in the southern and western portions of the site. This community covers an area of 11.6 ha. Survey sites 1, 2, and 9 are located within this vegetation community (**FIGURE 7**). Survey site descriptions with species list are located in **Annexure 2**.

Description
This vegetation community is patchy in its density and species composition. It also contained areas of different maturity. Mature canopy Eucalyptus trees include *E. tereticornis, C. intermedia, E. seeana, A. leiocarpa,* and the occasional *C. citriodora*. The sub-canopy consisted of the regrowth Eucalypt trees mentioned above, as well as *Lophostemon sauveolens, Allocasuarina littoralis, Melaleuca quinquenervia, Alphitonia excelsa* and *Acacia disparrima*. Should this vegetation reach maturity it would be consistent with RE 12.9-10.7a/12.9-10.12/12.9-10.2.

The shrub layer consists of regrowth trees listed above in the canopy and subcanopy layers and *Lantana camara.*

The ground layer is sparse to mid-dense vegetation including *Imperata cylindrica, Murdannia graminea, Paspalum* sp*., Poaceae* sp*. Dianella* sp*., Brachyscome* sp*., Hybanthus stellarioides, Aristida* spp*., Cymbopogon refractus* and non-fruiting sedges.
The density of weed was low. Species included declared weeds (LP Act) *Lantana camara* and *Asparagus africanus*, and environmental weeds *Passiflora foetida* (corky passion vine), *Commelina diffusa* (wandering jew), *Bidens pilosa* (cobbler's pegs) and *Paspalum* sp. (pasture grasses).

Condition
This regrowth community is in good condition with no signs of grazing or erosion impacts. The weed density is low and there is strong natural regrowth of the native vegetation. Some areas are more mature than in other areas. This is seen in the height of the canopy species.

Conservation Status
As this is a regrowth community it has no conservation status under the *VMA (1999).*

Part of this vegetation community is mapped as medium value koala habitat on the SPP mapping. The remainder is mapped as medium value rehabilitation koala habitat.

As this community was not remnant vegetation (and not Endangered RE) it was not assessed against the viable/non-viable criteria of Guideline No. 17.

3.3.3.3 Community 4 – *Allocasuarina littoralis* low forest with emergent *Eucalyptus tereticornis*

Location and Area
This community is located in the central east portions of the site. Survey site 6 is located within this vegetation community (**FIGURE 7**). This community covers an area of 0.1 ha. Survey site descriptions with species list are located in **Annexure 2**.

Description
This vegetation community contains emergent *Angophora leiocarpa* and *Eucalyptus seeana* trees with *Allocasuarina littoralis* as the sub-canopy. This community is not consistent with any RE. However, it has some of the species found in RE 12.9-10.11 such

as *Allocasuarina littoralis* and RE 12.9-10.12 such as *Eucalyptus seeana*. There were no *Melaleuca irbyana* plants observed.

The shrub layer consists mostly of young *Lophostemon sauveolens, Acacia disparrima* and *Alphitonia excelsa* trees. The cover of shrubs is very sparse.

The ground layer is mainly *Allocasuarina littoralis* cladodes and clear of vegetation with occasional clumps of *Murdannia graminea, Aristida* sp., *Poaceae* sp., and non-fruiting sedges.

There were few weeds in this community. The occasional *Paspalum* sp. (pasture grass) was observed.

Condition
This community is in good condition with no signs of grazing or erosion impacts. There were few weeds on site and there is natural growth and succession of the native vegetation.

Conservation Status
This community is not consistent with any RE and has no conservation status under the *VMA (1999).*

This vegetation community is mapped as medium value koala habitat and medium value rehabilitation habitat on the SPP mapping.

As this community was not remnant vegetation (and not Endangered RE), it was not assessed against the viable/non-viable criteria of Guideline No. 17.

3.3.4 Koala Habitat Areas

3.3.4.1 SPP Koala Mapping

The SPP koala habitat mapping (DEHP 2012) shows the site to contain Medium Value Bushland Habitat and Medium Value Rehabilitation Habitat (**FIGURE 8**). The location of the Medium Value Bushland Habitat does not entirely align with the RE mapping (**FIGURE 6**). There are approximately 5.7 ha of mapped Medium Value Bushland Habitat on the site. The remainder of the site (14.6 ha) is mapped as Medium Value Rehabilitation Habitat.

3.3.4.2 DNRM Essential Habitat Mapping

The regulated vegetation mapping (DNRM 2014) does not show any Essential Habitat for koala (or any other species) on the site.

Legend

- Medium Value Bushland Habitat
- Medium Value Rehabilitation
- Subject Site

N

0 50m 100m

SOURCE: QLD DEHP Koala Habitat in South East Queensland

SCALE: 1 : 4000 @ A4

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Lot 2 on RP868726
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Logan City Council LGA

FIGURE 8

PREPARED: BW
DATE: 08 August 2016
FILE: Q15004_Koala SPP Map.cdr

TITLE

KOALA HABITAT MAPPING

3.3.4.3 Vegetation Survey

The site was assessed for the presence of koala habitat trees. The majority of mature *Eucalyptus* spp., *Corymbia* spp*., Angophora leiocarpa,* and *Lophostemon sauveolens* trees on the site qualify as koala habitat trees. This includes areas of non-remnant regrowth vegetation. Due to the forested nature of the majority of the site it was considered impractical to survey the number of koala trees on the site.

3.4 Discussion

3.4.1 Endangered Regional Ecosystems

The endangered RE's mapped by DNRM have been confirmed to be endangered RE although the vegetation type does not match the RE descriptions of the mapping. The majority of the site is mapped by DNRM as RE 12.9-10-11. There is no RE 12.9-10.11 on the site. The site is dominated by RE 12.9-10.12, another endangered RE. The RE 12.9-10.12 is mixed in places with RE 12.9-10.7a, an of concern RE. The boundaries of the DNRM mapping are also slightly misaligned. **FIGURE 7** shows the ground truthed boundary of the endangered RE vegetation community.

The endangered REs were assessed in their current state against the viable/non-viable criteria of Guideline No. 17 and considered to be viable (i.e. complied with only 4 out of the 7 non-viable criteria). According to the obligations that apply in the Greater Flagstone PDA under Guideline No. 17, viable endangered REs are to be protected.

As previously discussed however, this is a guideline and not a specific policy item. Whilst the endangered RE on the site has been assessed as viable, an opportunity exists to provide a better environmental outcome by providing offsets for the minor removal (i.e. 0.75ha or 14.4%) of endangered RE from the site. Offsets for the minor removal of a viable endangered RE are considered appropriate in this instance as:

a) Impacts of the proposed development will not result in the viable endangered RE patch becoming non-viable; and
b) Proposed offsets will actually result in a significant net gain of endangered RE on the subject site.

The proposed development and associated vegetation offsets described herein are therefore considered to comply with the expectations of the guidelines i.e. to ensure that, as a result of development within the PDAs: there is no net loss of remnant vegetation containing endangered regional ecosystems within the region.

3.4.2 Koala Habitat Areas

As the entire site is mapped as koala habitat, either as bushland or as rehabilitation habitat, any development on site will result in the disturbance of koala habitat. The site survey confirmed that the majority of mature trees on site qualify as koala habitat trees.

The location of the Medium Value Bushland Habitat (**FIGURE 8**) does not align with the RE mapping (**FIGURE 6**) which is unusual. It is unclear why some areas of the Endangered RE are mapped as koala bushland habitat and other areas are not. However, as the provision of offsets under Guideline No. 17 is required to be based on the SPP mapping the areas shown on the mapping will be used in the calculation of offsets.

The guideline does allow for the offset of individual trees, however due to the forested nature of the majority of the site it was considered impractical to survey the number of koala trees on the site. Therefore, koala habitat areas will be dealt with as areas measured in hectares.

4 Offset Strategy

4.1 Introduction

This section provides details on the offset requirements of the development and how those requirements will be met.

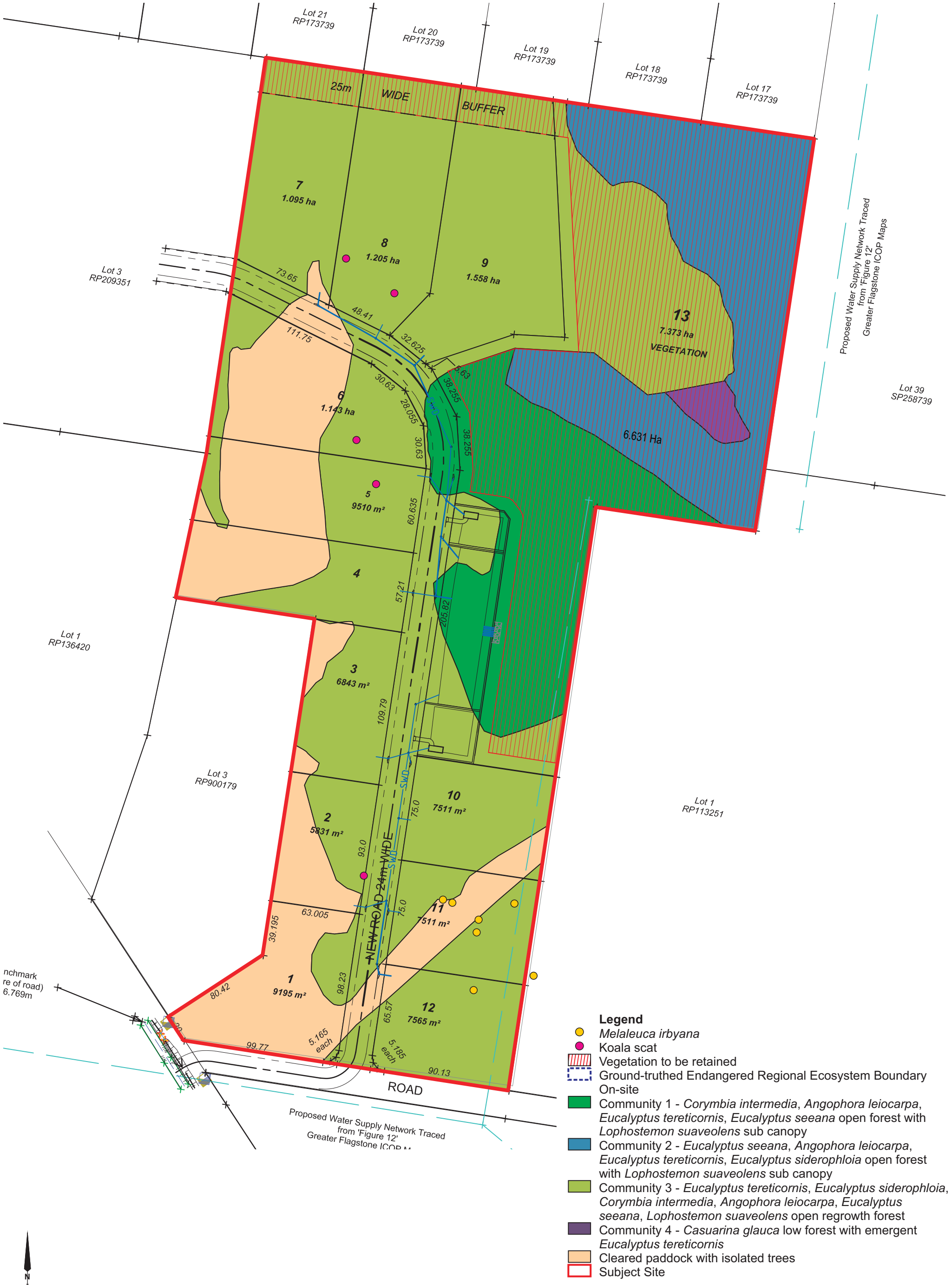
4.2 Offset Requirements

The proposed development will result in the clearing of Endangered RE (**FIGURE 9**) and Medium Value Bushland Habitat and Medium Value Rehabilitation Habitat for koalas (**FIGURE 10**). The proposed development will include clearing for lots, roads, a stormwater detention basin and a 10m setback to lot boundaries. The offset requirements for the site are listed in **TABLE 5**. It should be noted that Endangered RE can only be offset with compensatory habitat areas, whereas koala habitat can be offset through compensatory habitat areas and/or financially.

TABLE 5
SITE OFFSET REQUIREMENTS

Value Type	Area Onsite	Area Impacted	Offset Requirements
Endangered RE	5.19ha	0.75ha (14.4%)	**Compensatory Habitat** (#) **1.5ha** (Ratio of 1:2) OR **1.875ha** (Ratio of 1:2.5) OR **3.0ha** (Ratio of 1:4)
Koala Medium Value Bushland Habitat	5.67ha	2.91ha (51.1%)	**Compensatory Habitat** **3.49ha** (Ratio of 1:1.2) OR **Financial Offsets** **$43,650** ($15,000 for each hectare cleared)
Koala Medium Value Rehabilitation Habitat	14.58ha	11.34ha (74.1%)	**Compensatory Habitat** **5.67ha** (Ratio of 1:0.5) OR **Financial Offsets** **$56,700** ($5,000 for each hectare cleared)

The ratio required for Endangered RE offsets is determined by the condition of the proposed offset areas. Refer to **SECTION 2.2.3.2** for details.



Legend

- *Melaleuca irbyana*
- Koala scat
- Vegetation to be retained
- Ground-truthed Endangered Regional Ecosystem Boundary On-site
- Community 1 - *Corymbia intermedia*, *Angophora leiocarpa*, *Eucalyptus tereticornis*, *Eucalyptus seeana* open forest with *Lophostemon suaveolens* sub canopy
- Community 2 - *Eucalyptus seeana*, *Angophora leiocarpa*, *Eucalyptus tereticornis*, *Eucalyptus siderophloia* open forest with *Lophostemon suaveolens* sub canopy
- Community 3 - *Eucalyptus tereticornis*, *Eucalyptus siderophloia*, *Corymbia intermedia*, *Angophora leiocarpa*, *Eucalyptus seeana*, *Lophostemon suaveolens* open regrowth forest
- Community 4 - *Casuarina glauca* low forest with emergent *Eucalyptus tereticornis*
- Cleared paddock with isolated trees
- Subject Site

SOURCE: JWA; Civil Dimensions (CD14-053Greenbank Rd North Maclean CSBSMP Addendum Letter to DILGP 16-0...pdf); ONF Surveyors (5443_P1D_170516.dwg)

SCALE: 1 : 2500 @ A3

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Offset Strategy
Lot 2 on RP868726
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Logan City Council LGA

FIGURE 9

PREPARED: BW
DATE: 08 August 2016
FILE: Q15004_Impact Veg.cdr

TITLE

IMPACT ON VEGETATION COMMUNITIES

Legend

- Vegetation to be retained
- Medium Value Bushland Habitat
- Medium Value Rehabilitation
- Subject Site

N

0 100m

1 : 2500

SOURCE: QLD DEHP Koala Habitat in SEQ; Civil Dimensions (CD14-053 Greenbank Rd North Maclean CSBSMP Addendum Letter to DILGP 16-0...pdf); ONF Surveyors (5443_P1D_170516.dwg)
SCALE: 1 : 2500 @ A3

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FIGURE 10

PREPARED: BW
DATE: 08 August 2016
FILE: Q15004_Impact koala.cdr

TITLE

IMPACT ON KOALA HABITAT

4.3 Offset Availability

There are several areas of regrowth vegetation on site at different stages of maturity that are suitable for offsets. These areas of regrowth vegetation are all located within the mapped medium value rehabilitation koala habitat or in some cases small areas of medium bushland habitat. These regrowth areas have been divided into areas of similar maturity, which correspond to the ratios listed in **SECTION 2.2.3.2. FIGURE 11** shows the location of these areas available post development.

4.4 Offset Strategy

4.4.1.1 Remnant Endangered Regional Ecosystem

Offsets for the clearing of Endangered RE will be provided through the provision of 1.56ha of compensatory habitat on site (**FIGURE 11**). Areas to be used for offsets are located within a proposed reserve, and are adjacent to existing areas of remnant vegetation to be retained on site. These offset areas meet the criteria of Guideline No. 17 for compensatory habitat ratio of 1:2 as they:

- Are not remnant vegetation or category C on a Property Map of Assessable Vegetation;
- Are not protected by another instrument of state government;
- Have less than 10% weed cover;
- With management are likely to attain remnant status within five (5) years; and
- Will not require revegetation.

4.4.1.2 Koala Habitat Areas

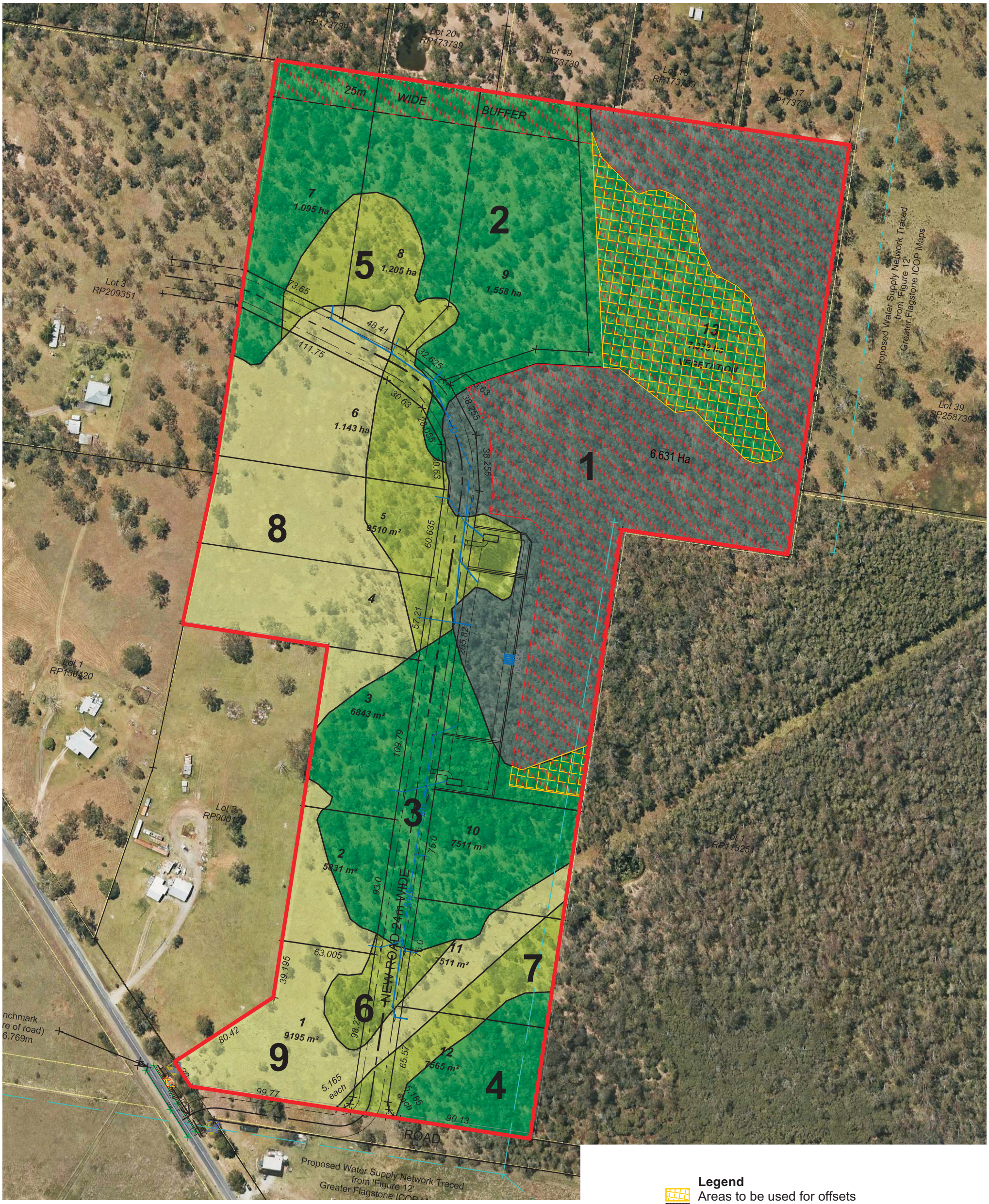
Offsets for the clearing of Medium Value Koala Bushland Habitat will be provided through a combination of onsite compensatory habitat and financial offset. Approximately 44% of the required offset for Medium Value Koala Bushland Habitat will be fulfilled through the provision of 1.56ha of compensatory habitat on site (**FIGURE 11**). This compensatory habitat for Medium Value Koala Bushland Habitat will be co-located in the same area as offsets for Endangered RE.

These offset areas meet the criteria of Guideline No. 17 for compensatory habitat as they are:

- Located within either Medium Value Koala Rehabilitation Habitat or Medium Value Koala Bushland Habitat; and
- Located within the same local government area.

The remaining 56% of the required offset for Medium Value Koala Bushland Habitat will be fulfilled by a financial offset of $24,444 ($15,000 for each hectare cleared).

The 11.34ha of Medium Value Koala Rehabilitation Habitat to be impacted by the development will be compensated through a financial offset of $56,700 ($5,000 for each hectare cleared).



Legend

- Areas to be used for offsets
- Vegetation to be retained
- # Area Number
- Remnant Vegetation
- No Revegetation - Offset Ratio 2:1
- <10% Revegetation - Offset Ratio 2.5:1
- <60% Revegetation - Offset Ratio 4:1
- Subject Site

N

0 100m

1 : 2500

SOURCE: JWA; Civil Dimensions (CD14-053Greenbank Rd North Maclean CSBSMP Addendum Letter to DILGP 16-0...pdf); ONF Surveyors (5443_P1D_170516.dwg)

SCALE: 1 : 2500 @ A3

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Offsets Strategy
Lot 2 on RP868726
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Logan City Council LGA

FIGURE 11

PREPARED: BW
DATE: 08 August 2016
FILE: Q15004_Offsets.cdr

TITLE

PROPOSED OFFSET AREAS

4.5 Offset Management

Management of the offset areas will be required for a period of five (5) to twenty (20) years or until the vegetation reaches remnant status. Once the compensatory habitat areas have been negotiated with EDQ, an offset management plan will be prepared so the offsets can be legally secured.

5 Summary and Conclusion

JWA Pty Ltd has been engaged by Anna Properties to complete an Offset Strategy for land at 820 Greenbank Road, North Maclean in accordance with Guideline No. 17 of the Greater Flagstone PDA Development Scheme. This has been achieved by calculating the impacted areas, calculating the land available for offset on the site, calculating the potential financial offsets, and finding suitable locations for offset areas on the site.

Endangered RE, Medium Value Koala Bushland Habitat and Medium Value Koala Rehabilitation Habitat will be impacted by the development. In order to satisfy the offset requirements under Guideline No. 17 the following offsets will be provided:

- Clearing of 0.75ha of Endangered RE will be offset through the provision of 1.56ha of compensatory habitat on site;
- Clearing of 2.91ha of Medium Value Koala Bushland Habitat will be offset through the provision of 1.56ha of compensatory habitat on site and a financial offset of $24,444; and
- Clearing of 11.34ha of Medium Value Koala Rehabilitation Habitat will be compensated through a financial offset of $56,700.

This offset strategy has been prepared so as to ensure that as a result of this development within the Greater Flagstone PDA, there is no net loss of remnant vegetation containing endangered regional ecosystems and an appropriate contribution is made towards the achievement of a net gain in bushland koala habitat within the region.

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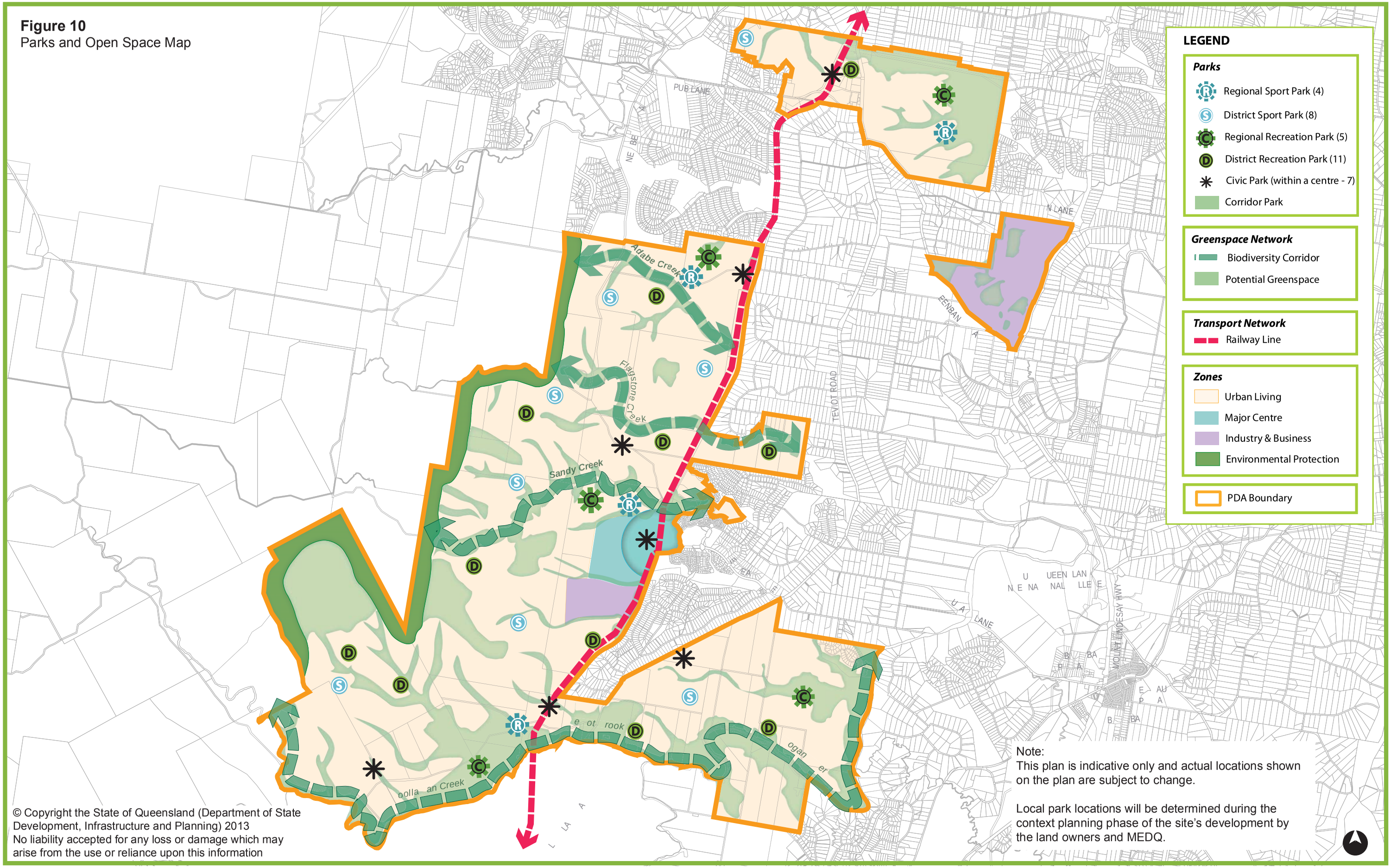
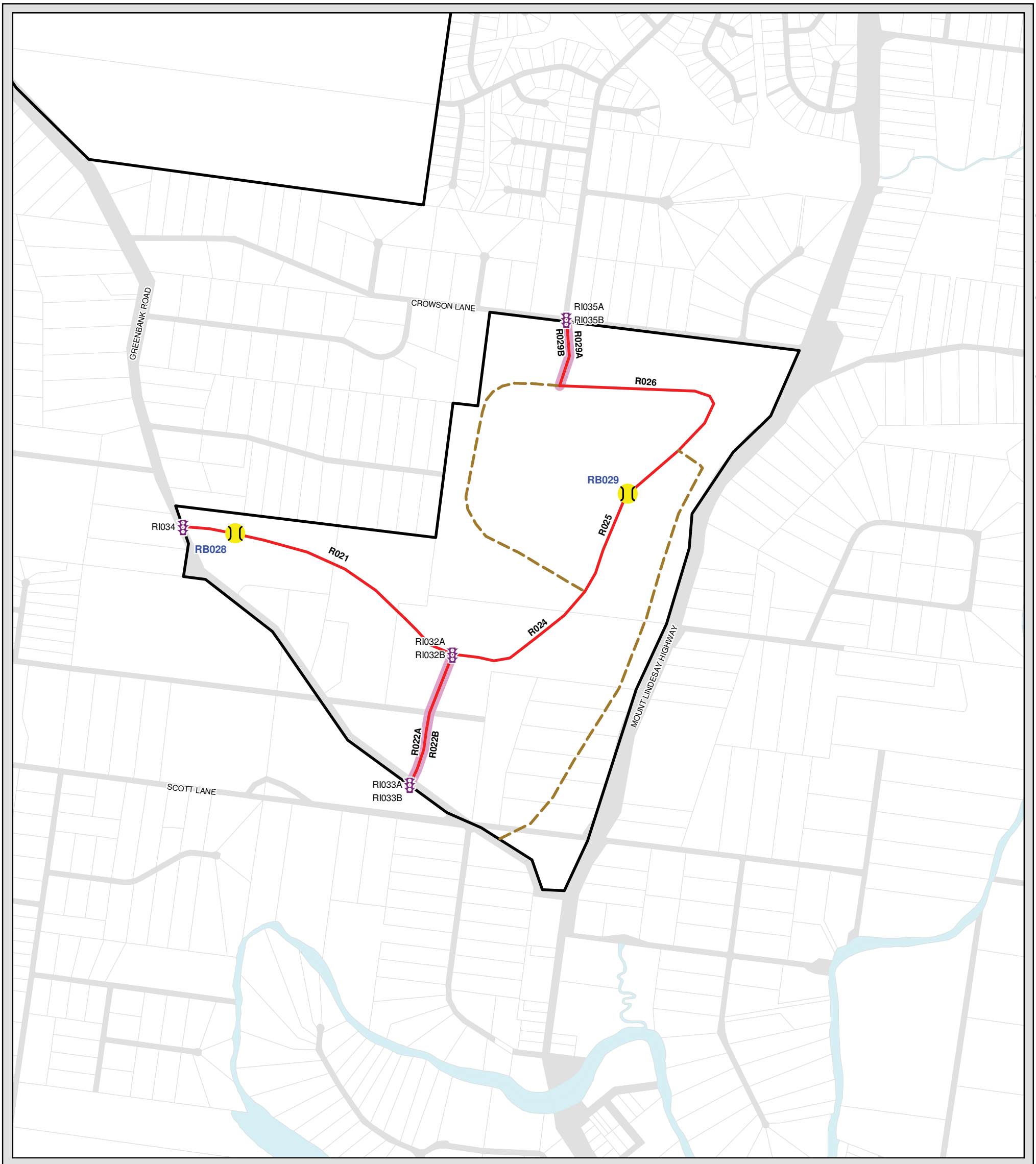
Annexure 1- Greater Flagstone PDA Development Scheme Maps

Figure 10
Parks and Open Space Map





File Path: L:\7902-70 - ULDA\011 LIP GIS Flagstone\MapInfo\Figures\Maclean\Figures_Roads_v4.wor

Cardno
Shaping the Future

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
Level 11, North Tower, 515 St Pauls Terrace
Locked Bag 4006, Fortitude Valley QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722

SHEET	A3
Project No:	7902-70.011
Date:	17/07/2013
Revision Number:	
Designed by:	
Client Name:	EDQ

LEGEND

- Industrial Collector Road
- Internal Road
- 4 Lane Industrial Road
- Development Area (PDA) Boundary
- Culvert / Bridge

Intersections

- Signal

N W E S

Figure 11
North Maclean Roads and Intersections Network Map

Scale: 1:15,000

150 0 150 300 450
Metres

Annexure 2 - Survey Site Descriptions

Site 1

Assessment site	**1**
Vegetation Assessment level	Quaternary
Survey point (zone 56)	E500492.972
	N6928297.755
Aspect	east
Slope (%)	5
Geology	low hills
Soil type	Sand
Soil colour	pale, with red coarse sand grains
Declared Weeds	asparagus weed, Lantana camara
Erosion	none
Grazing impacts	Nil
Fire history	> 10 year
Fauna habitat	lantana under growth, small trees
General notes	dirt bike impacts

Strata	**Dominant Species**	**Height**	**FPC%**
Canopy T1	Lophostemon sauveolens, Acacia disparrima, E. tereticornis, C. intermedia	10	85
T2	Alphitonia excelsa	6	10
Shrubs	Lantana camara, Acacia concurrens, Alphitonia excelsa	2	30
Ground cover	Commelina diffusa, Passiflora foetida, Poaceae sp., Asparagus africanus	0.5	50
Ground Truthed Regional Ecosystem	non-remnant		

Site 2

Assessment site	**2**
Vegetation Assessment level	Quaternary
Survey point (zone 56)	E500473.537
	N6928510.557
Aspect	east
Slope (%)	2
Geology	upper low slope
Soil type	Sand
Soil colour	pale
Declared Weeds	Lantana camara
Erosion	none
Grazing impacts	Nil
Fire history	> 10 year
Fauna habitat	large fallen tree, kangaroos recorded
General notes	-

Strata	**Dominant Species**	**Height**	**FPC%**
Canopy T1	E. tereticornis	18	8
T2	Lophostemon sauveolens, Acacia disparrima, Alphitonia excelsa, Melaleuca quinquenervia	14	85
Shrubs	Lantana camara, Passiflora foetida	2	30
Ground cover	Imperata cylindrica, sedges, Murdannia graminea	0.5	10
Ground Truthed Regional Ecosystem	non-remnant		

Site 3

Assessment site	**3**
Vegetation Assessment level	Tertiary
Survey point start (zone 56)	E500530, N6928562
Survey point finish	E500559, N6928525
Baring of transect	NW-SE
Aspect	east
Slope (%)	2
Geology	low hill
Soil type	Sand
Soil colour	pale with red
Declared Weeds	asparagus weed
Erosion	Nil
Grazing impacts	Nil
Fire history	> 10 year
Fauna habitat	hollow log, fallen tree branches
General notes	-

Strata	**Dominant Species**	**Height**	**FPC%**
Canopy T1	C. intermedia, Lophostemon sauveolens	16	85
T2	Lophostemon sauveolens, Alphitonia excelsa, Acacia disparrima	8	40
Shrubs	Acacia concurrens, Alphitonia excelsa, Lophostemon sauveolens, Asparagus africanus	3	20
Ground cover	Imperata cylindrica, Murdannia graminea, Brachyscome sp.	1	Veg cover 5.4%, Litter cover 91%, Bear ground 3.6%
Ground Truthed Regional Ecosystem	12.9-10.7a/12.9-10.12		

Basal Count Species	**Count**
Lophostemon sauveolens	24
C. intermedia	8
Alphitonia excelsa	2

Site 4

Assessment site	**4**
Vegetation Assessment level	Tertiary
Survey point start (zone 56)	E500486, N6928707
Survey point finish	E500509, N6928748
Baring of transect	SW-NE
Aspect	SE
Slope (%)	0
Geology	low hill
Soil type	Sand
Soil colour	light brown
Declared Weeds	lantana
Erosion	Nil
Grazing impacts	Nil
Fire history	5 - 10 year
Fauna habitat	leaf litter
General notes	-

Strata	**Dominant Species**	**Height**	**FPC%**
Canopy T1	emergent E. seeana, E. tereticornis, T1 C. intermedia, A. leiocarpa	20	90
T2	Lophostemon sauveolens, Acacia disparrima, C. intermedia, Casuarina glauca	10	90
Shrubs	Alphitonia excelsa, A. disparrima, Lophostemon sauveolens, Leptospermum polygalifolium, Lantana camara	4	10
Ground cover	lomandra longifolia, Leptospermum polygalifolium, Eucalyptus sp., Imperata cylindrica	1	Veg cover 7%, Litter cover 93%, Bear ground 0%

Ground Truthed Regional Ecosystem	12.9-10.12/12.9-10.7a
Basal Count Species	**Count**
Lophostemon sauveolens	33
Acacia disparrima	8
E. seeana/ E. tereticornis	3
C. intermedia	2

Site 5

Assessment site	**5**
Vegetation Assessment level	Tertiary
Survey point start (zone 56)	E500619, N6928703
Survey point finish	E500509, N6928748
Baring of transect	E-W
Aspect	east
Slope (%)	2
Geology	top of low rise
Soil type	Sand
Soil colour	pale with red
Declared Weeds	lantana
Erosion	Nil
Grazing impacts	Nil
Fire history	5 - 10 year
Fauna habitat	large dead standing tree
General notes	-

Strata	**Dominant Species**	**Height**	**FPC%**
Canopy T1	E. seeana, A. leiocarpa,	20	49
T2	Lophostemon sauveolens, Acacia disparrima, Alphitonia excelsa	0	85
Shrubs	Alphitonia excelsa, Acacia concurrens, Lophostemon sauveolens	4	0
Ground cover	Imperata cylindrica, Brachyscome sp., Pimelea glauca, Poaceae spp.	1	Veg cover 20%, Litter cover 69%, Bear ground 11%

Ground Truthed Regional Ecosystem	12.9-10.12
Basal Count Species	**Count**
E. seeana	10
Lophostemon sauveolens	29
A. leiocarpa	2

Site 6

Assessment site	**6**		
Vegetation Assessment level	Quaternary		
Survey point (zone 56)	E500681.441		
	N6928742.023		
Aspect	east		
Slope (%)	2		
Geology	mid slope		
Soil type	Sand		
Soil colour	light brown with red sand grains		
Declared Weeds	Nil		
Erosion	none		
Grazing impacts	Nil		
Fire history	> 10 year		
Fauna habitat	hollow log, branch piles		
General notes	-		
Strata	**Dominant Species**	**Height**	**FPC%**
Canopy T1	E. seeana, A. leiocarpa	18	10
T2	Casuarina glauca	8	80
Shrubs	Lophostemon sauveolens, Acacia concurrens, Melaleuca quinquenervia	4	2
Ground cover	Paspalum sp., sedges, Murdannia graminea, Aristida sp., Poaceae sp.	1	20
Ground Truthed Regional Ecosystem	non-remnant		

Site 7

Assessment site	**7**
Vegetation Assessment level	Quaternary
Survey point (zone 56)	E500698.449
	N6928904.449
Aspect	NE
Slope (%)	5
Geology	upper slope
Soil type	Sand
Soil colour	light brown
Declared Weeds	Nil
Erosion	none
Grazing impacts	Nil
Fire history	5 - 10 year
Fauna habitat	closed canopy, thick undergrowth
General notes	-

Strata	**Dominant Species**	**Height**	**FPC%**
Canopy T1	E. seeana, E. tereticornis, A. leiocarpa	16	20
T2	Lophostemon sauveolens, Acacia disparrima, E. seeana, E. tereticornis	12	80
Shrubs	Lophostemon sauveolens, Acacia disparrima, Alphitonia excelsa	4	50
Ground cover	Imperata cylindrica, Poaceae sp. Dianella sp., Murdannia graminea, Brachyscome sp., Bidens pilosa, Poaceae sp., Hybanthus stellarioides	1	40
Ground Truthed Regional Ecosystem	12.9-10.12		

Site 8

Assessment site	**8**
Vegetation Assessment level	Tertiary
Survey point start (zone 56)	E500617, N6928945
Survey point finish	E500573, N6928935
Baring of transect	NE-SW
Aspect	east
Slope (%)	2
Geology	top of slope
Soil type	Sand
Soil colour	light brown
Declared Weeds	Nil
Erosion	Nil
Grazing impacts	Nil
Fire history	5 - 10 year
Fauna habitat	open canopy, grassy areas
General notes	-

Strata	**Dominant Species**	**Height**	**FPC%**
Canopy T1	E. siderophloia, E. seeana, E. tereticornis,	16	35
T2	Lophostemon sauveolens, A. leiocarpa, Acacia disparrima	12	40
Shrubs	Casuarina glauca, Lophostemon sauveolens, Acacia concurrens, Alphitonia excelsa	4	10
Ground cover	lomandra longifolia, Poaceae sp., Aristida sp., Murdannia graminea	0	Veg cover 33%, Litter cover 60%, Bear ground 7%
Ground Truthed Regional Ecosystem	12.9-10.12		

Basal Count Species	**Count**
Acacia disparrima	7
E. seeana	2
E. tereticornis	1
A. leiocarpa	2
Lophostemon sauveolens	13

Site 9

Assessment site	**9**
Vegetation Assessment level	Quaternary
Survey point (zone 56)	E500441.928
	N6928923.063
Aspect	SW
Slope (%)	2
Geology	top of slope
Soil type	Sand
Soil colour	light red brown
Declared Weeds	Nil
Erosion	none
Grazing impacts	Nil
Fire history	5 - 10 year
Fauna habitat	open woodland
General notes	-

Strata	**Dominant Species**	**Height**	**FPC%**
Canopy T1	emergent A. leiocarpa T1 C. citriodora, A. leiocarpa	20	30
T2	Acacia disparrima, A. leiocarpa, C. citriodora, E. tereticornis, E. seeana, Casuarina glauca	10	35
Shrubs	Acacia concurrens, Casuarina glauca, Alphitonia excelsa	4	5
Ground cover	Aristida spp., Cymbopogon refractus, Poaceae sp.	1	70
Ground Truthed Regional Ecosystem	non-remnant		

APPENDIX 3 - HABITAT SUITABILITY ASSESSMENTS

Threatened flora species

Scientific Name	Common Name	Likelihood of Occurring on the Site
Bosistoa transversa	Three-leaved bosistoa	**Unlikely**: Suitable habitat not observed onsite. Three-leaved Bosistoa grows in wet sclerophyll forest, dry sclerophyll forest and rainforest up to 300 m in altitude. Associated vegetation includes *Argyrodendron trifoliolatum, Syzygium hodgkinsoniae, Endiandra pubens, Dendrocnide photinophylla, Acmena ingens, Diploglottis australis* and *Diospyros mabacea* (Department of the Environment 2016).
Cycas ophiolitica	Marlborough blue	**Unlikely**: Suitable habitat not observed onsite. Occurs from Marlborough to Rockhampton on hills and slopes in sparse, grassy woodland or open eucalypt woodlands at altitude ranges from 80–400m above sea level. Often found on shallow, stony, infertile soils which are developed on sandstone and serpentinite, and is associated with species such as *Corymbia dallachiana*, *C. erythrophloia*, *C. xanthope* and *Eucalyptus fibrosa*. Has also been found on mudstone in association with *Corymbia dallachiana*, *C. erythrophloia* and *Eucalyptus crebra*, and on alluvial loams with *Corymbia intermedia*, *Eucalyptus drepanophylla* and *E. tereticornis* (DoE 2016).
Notelaea ipsviciensis	Cooneana olive	**Unlikely**: Suitable habitat not observed onsite. Occurs as an understorey plant in open woodlands with open canopies, and is primarily associated with degraded eucalypt-dominated dry sclerophyll communities situated on poor, depauperate and sandstone-based soils. This species is known from only three (3) closely clustered sub-populations in the Ipswich area (Dinmore) (DoE 2016).
Notelaea lloydii	Lloyd's olive	**Unlikely**: Suitable habitat not observed onsite.

Scientific Name	Common Name	Likelihood of Occurring on the Site
		Occurs in the ecotone between eucalypt open forests and vine thickets at 80-480m above sea level. Associated species include Narrow-leaved Ironbark (Eucalyptus crebra), Spotted Gum (Corymbia maculata), White Mahogany (E. acmenoides), Lemon-scented gum (C. citriodora) and Curracabah (Acacia concurrens) with associated trees and shrubs of Kurrajong (Brachychiton populneus), Red Ash (Alphitonia excelsa), Brown Salwood (A. aulacocarpa), Burra (A. falcata) and Ebony (Diospyros ferrea var. geminata). The species occurs on undulating to hilly terrain either in moist gullies or on gentle to steep dry slopes, but is rarely found on rocky outcrops. Soil types are mostly shallow, well drained and stony to very rocky in texture. Records indicate species is restricted to 5 locations south – southwest of Brisbane (within 100km of Brisbane) (DoE 2016).
Phaius australis	Lesser swamp-orchid	**Unlikely**: Suitable habitat not observed onsite. The Lesser Swamp-Orchid is commonly associated with coastal wet heath/sedgeland wetlands, swampy grassland or swampy forest and often where Broad-leaved Paperbark or Swamp Mahogany are found. Typically, the Lesser Swamp-orchid is restricted to the swamp-forest margins, where it occurs in swamp sclerophyll forest (Broad-leaved Paperbark/Swamp Mahogany/Swamp Box (*Lophostemon suaveolens*)), swampy rainforest (often with sclerophyll emergents), or fringing open forest. It is often associated with rainforest elements such as Bangalow Palm (*Archontophoenix cunninghamiana*) or Cabbage Tree Palm (*Livistona australis*) (DoE 2016).
Phebalium distans	My Berryman phebalium	**Unlikely**: Suitable habitat not observed onsite. Mt Berryman Phebalium is found in semi-evergreen vine thicket on red volcanic soils, or in communities adjacent to this vegetation type. Geology of the area in which this species occurs is deeply weathered basalt with undulating to hilly terrain. Soils range from red-brown earths to brown clays (derived from siltstone and mudstones), and lithosols to shallow, gravelly krasnozems (very dark brown

Scientific Name	Common Name	Likelihood of Occurring on the Site
		loam), derived from the Main Range Volcanics of the Tertiary period. Vegetation associations in which Mt Berryman Phebalium occur include microphyll to notophyll vine forest with or without *Araucaria cunninghamii* and low microphyll vine forest and semi-evergreen vine thicket with or without *Araucaria cunninghamii* which can be divided further into regional ecosystems depending on substrate, geography and associated vegetation species (DoE 2016).
Thesium australe	Austral toadflax	**Unlikely**: Suitable habitat not observed onsite. Austral toadflax is semi-parasitic on roots of a range of grass species, notably Kangaroo Grass (*Themeda triandra*). It occurs in shrubland, grassland or woodland, often on damp sites, in subtropical, temperate and subalpine climates over a wide range of altitudes. It occurs on soils derived from sedimentary, igneous and metamorphic geology on a range of soils including black clay loams to yellow podzolics and peaty loams. Vegetation types include open grassy heath dominated by Swamp Myrtle (*Leptospermum myrtifolium*), Small-fruit Hakea (Hakea microcarpa), Alpine Bottlebrush (*Callistemon sieberi*), Woolly Grevillea (*Grevillea lanigera*), Coral Heath (*Epacris microphylla*) and *Poa* spp.; Kangaroo Grass grassland surrounded by Eucalyptus woodland; and grassland dominated by Barbed-wire Grass (*Cymbopogon refractus*) (Dept. Environment 2012).

Threatened fauna and Migratory species

Scientific Name	Common Name	Likelihood of Occurring on the Site
Adelotus brevis	Tusked frog	**Unlikely**: Suitable habitat not observed onsite. This species prefers rainforests, wet sclerophyll forests and grasslands. It is generally found under logs and leaf-litter along streams and dams (NSW OEH 2014). No watercourses occur on the site, except for one dam which is not connected to other aquatic or vegetated areas.
Anseranas semipalmata	Magpie goose	**Unlikely**: Suitable habitat not observed onsite. A waterbird that is mainly found in shallow wetlands, where the depth of water is less than 1m and dense reeds and rushes are present.
Anthochaera phrygia	Regent honeyeater	**Unlikely**: Suitable habitat not observed onsite. The regent honeyeater is found from Dalby in Queensland, south to Bendigo in Victoria, especially along the ranges and the western slopes. However, its distribution is extremely patchy with only a small number of known breeding sites. The estimated total population is between 350 and 400 mature individuals. In south-east Queensland it is found ranging from Cooloola, Great Sandy National Park to near the Queensland-New South Wales border. In Queensland, breeding occurs regularly west of Warwick by a small number of individual regent honeyeaters. Potential habitat for this species includes dry eucalypt woodland and open forest, rural and urban areas with mature eucalypts. It favours ironbark-box associations, mugga ironbark *Eucalyptus sideroxylon*, white box (*E. albens*), and yellow box (E. *melliodora*). Other habitat includes swamp mahogany (*E. robusta*), or spotted gum (*Corymbia maculatus*) or river she-oak (*Casuarina cunninghamiana*) with associated needle-leaf mistletoe (*Amyema cambagei*). This species generally prefers wetter, more fertile sites that are reliable nectar producers (both in timing and quantity), such as creek flats, river valleys and

Scientific Name	Common Name	Likelihood of Occurring on the Site
		lower slopes (NSW OEH 2014). It is considered that suitable habitat for this species does not occur on site.
Apus pacificus	Fork-tailed swift	**Possible: May forage above the site.** This is a primarily aerial species, usually occurring above dry or open habitats, but also occasionally above rainforest and wet sclerophyll forests. They are observed above settled areas such as farmlands, towns and cities (DoE, 2016).
Ardea alba	Great egret	**Possible: Some suitable habitat occurs on site.** This species inhabits a wide range of wetland habitats including swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands; reservoirs; sewage treatment ponds; drainage channels; salt pans and salt lakes; salt marshes; estuarine mudflats, tidal streams; mangrove swamps; coastal lagoons; and offshore reefs. This species usually frequents shallow waters (Dept. Environment 2012). The dam on site may provide suitable habitat for this species.
Ardea ibis	Cattle egret	**Possible**: Suitable habitat occurs on site. This species inhabits tropical and temperate grasslands, wooded lands and terrestrial wetlands. It uses predominately shallow, open and fresh wetlands including meadows and swamps with low emergent vegetation and abundant aquatic flora. This species often forages away from water on low lying grasslands, improved pastures and croplands. It is commonly found in cattle fields and other farm areas that contain livestock. This species roosts in trees or amongst ground vegetation in or near lakes and swamps (Dept. Environment 2012).
Botaurus poiciloptilus	Australian bittern	**Unlikely**: Suitable habitat not observed onsite. This species occurs in terrestrial freshwater wetlands and, rarely, estuarine habitats. It favours wetlands with tall, dense vegetation, where it forages in still, shallow water up to 0.3m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. The species favours permanent and seasonal freshwater habitats, particularly those dominated by

Scientific Name	Common Name	Likelihood of Occurring on the Site
		sedges, rushes and/or reeds (e.g. *Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus*) or cutting grass (*Gahnia*) growing over muddy or peaty substrate (Dept. Environment 2012).
Calyptorhynchus lathami lathami	Glossy black cockatoo	**Possible**: Some suitable habitat observed onsite. This species is associated with woodland or open sclerophyll forests with populations of *Allocasuarina*, which comprise its exclusive diet. They require large old trees with hollows for nesting (Glossy Black Conservancy, 2010). The site contains some foraging resources for this species.
Chalinolobus dwyeri	Large-eared pied bat	**Unlikely**: Suitable habitat not observed onsite. This species requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors which are used for foraging. Almost all records have been found within several kilometres of cliff lines or rocky terrain. Roosting has also been observed in disused mine shafts, caves, overhangs and disused Fairy Martin (*Hirundo ariel*) nests. It also possibly roosts in the hollows of trees. The structure of primary nursery roosts appears to be very specific, i.e. arch caves with dome roofs (that need to be deep enough to allow juvenile bats to learn to fly safely inside) and with indentations in the roof (presumably to allow the capture of heat). These physical characteristics are not very common in the landscape and therefore a limiting factor (DoE 2016).
Cuculus optatus	Oriental cuckoo	**Unlikely**: Suitable habitat not observed onsite. This species is found in monsoon forests, the edges of rainforests, treed paddocks, mangroves, roadsides and river flats (Pizzey & Knight, 1999).
Dasyornis brachypterus	Eastern bristlebird	**Unlikely**: Suitable habitat not observed onsite. This species inhabit moist, mountain ranges within about 100km of the coast. In Queensland most sightings have been within localised pockets of relatively open eucalypt forest in close proximity to denser vegetation along creek lines and rainforest. Soils are relatively fertile, derived from basalts of the Main Range Volcanics and Mt Warning Shield. The ground stratum of the eucalypt forests

Scientific Name	Common Name	Likelihood of Occurring on the Site
		favoured by the eastern bristlebird is a mosaic of dense clumped grasses interspersed with patches of shrubs, ferns, tangled vines and fallen logs. The more common grasses include wild sorghum (*Sarga leiocladum*), kangaroo grass (*Themeda triandra*) and tussock grass (*Poa labillardieri*). The presence of mature wild sorghum tussocks is thought to be a good indicator of high quality bristlebird habitat (DEHP 2013).
Dasyurus maculatus maculatus (SE mainland population)	Spotted-tail quoll	**Possible: Some suitable habitat occurs onsite.** This species is recorded from a wide range of habitats, including montane rainforests, open, closed and wet sclerophyll forests, coastal heathlands, sub-alpine woodlands, and riparian forests. It has a preference for mature wet forests that are unlogged, and require large areas of relatively intact forest for foraging. They require den sites such as hollow logs, caves or rocky outcrops for daytime shelter (DoE, 2016). Some foraging habitat may be present on site.
Delma torquata	Collared delma	**Unlikely**: Suitable habitat not observed onsite. Due to specific habitat requirements, this species distribution is highly fragmented and restricted to only a few locations. The Collared Delma is known from the western suburbs of Brisbane, QLD and the following sites: Bunya Mountains, Blackdown Tableland National Park (NP), Bullyard Conservation Park, D'Aguilar Range NP, Expedition NP, Naumgna and Lockyer Forest Reserves, Western Creek near Millmerran and the Toowoomba Range (Dept. Environment 2012). This species inhabits eucalypt dominated woodland and open forest where it is associated with suitable micro-habitats (exposed rocky outcrops). The ground cover is predominantly native grasses, such as Kangaroo Grass (*Themeda triandra*), Barbed-wire Grass (*Cymbopogon refractus*), Wiregrass (*Aristida* sp.) and Lomandra (*Lomandra* sp.) (Dept. Environment 2012). The presence of rocks, logs, bark and other coarse woody debris, and mats of leaf litter (typically 30-100mm thick) appears to be an essential characteristic of the collared delma microhabitat and is always present where the species occurs (Dept. Environment 2012). Whilst Collared delmas are often found associated with small rocks, the

Scientific Name	Common Name	Likelihood of Occurring on the Site
		presence of small rocks is not an essential habitat characteristic (Dept. Environment 2012).
Erythrotriorchis radiatus	Red goshawk	**Unlikely**: Suitable habitat not observed onsite. This species occupies open forests and woodlands along rivers and wetlands and rainforest fringes. In NSW favoured habitat includes *Melaleuca* forest along coastal rivers (Debus 1991, 1993).
Furina dunmalli	Dunmall's snake	**Unlikely**: Suitable habitat not observed onsite. Suitable habitat for this species includes forests and woodlands dominated by *Acacia harpophylla* on black alluvial cracking clays and Eucalypt-Bulloak associations on sandstone derived soils (DoE, 2016).
Gallinago hardwickii	Latham's snipe	**Unlikely**: Suitable habitat not observed onsite. This species generally occupies flooded meadows, seasonal or semi-permanent swamps, or open waters bogs, waterholes, billabongs, lagoons, lakes, creek or river margins, river pools and floodplains. Dense fringing vegetation is preferred by this species but it has been recorded in waterlogged paddocks (Dept. Environment 2012).
Geophaps scripta scripta	Squatter pidgeon	**Unlikely**: Suitable habitat not observed onsite. As this species nests in shallow ground depressions, it requires well drained soils, preferring those under an open tree canopy. Generally, open forest and woodland communities with patchy tussock-grassy understories support this species (DoE, 2016).
Grantiella picta	Painted honeyeater	**Unlikely**: Suitable habitat not observed onsite. This species is among the most specialized on honeyeaters, showing a strong preference for mistletoes for food and nest making. Hence, it is most commonly found on sites with a high density of mature trees, which host more mistletoes. It is usually found in wider patches of remnant vegetation, and less commonly in narrow strips (DoE, 2016).
Haliaeetus leucogaster	White-bellied sea-eagle	**Unlikely**: May forage on subject site.

Scientific Name	Common Name	Likelihood of Occurring on the Site
		This species has a large distribution range throughout SE QLD and is found in association with coasts, large rivers and estuaries and prefers to nest in large trees adjacent watercourses (DoE 2016).
Hirundapus caudacutus	White-throated needletail	**Possible**: May forage above subject site. This species occurs flying over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. It is recorded in all coastal regions of Queensland and NSW and almost always forage aerially (Dept. Environment 2012).
Lathamus discolor	Swift parrot	**Unlikely**: Suitable habitat not observed onsite. The Swift parrot migrates from its Tasmanian breeding grounds to overwinter in the box-ironbark forests and woodlands of Victoria, NSW and southern Queensland. In south-eastern Queensland, Narrow-leaved ironbark and Queensland blue gum forests are commonly utilized (Kennedy and Tzaros 2005, Swift Parrot Recovery Team 2001).
Maccullochella mariensis	Mary River cod	**Unlikely.** Suitable habitat not observed onsite. These fish are usually found in large, deep, shaded pools within relatively undisturbed tributaries of the Mary River. Translocated populations occur within other catchments within South-east Queensland (DoE, 2016). No waterways occur on the site.
Merops ornatus	Rainbow bee-eater	**Possible**: Some suitable habitat occurs onsite. This species occurs in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. Usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. Also occurs in inland and coastal sand dune systems, and in mangroves (DoE, 2016).
Monarcha melanopsis	Black-faced monarch	**Unlikely**: Suitable habitat not observed onsite.

Scientific Name	Common Name	Likelihood of Occurring on the Site
		This species occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest. During winter or migration, this species also occurs in marginal habitats such as 20-30 years old regrowth rainforest, nearby open eucalypt forest (mainly wet sclerophyll forests), especially in gullies with a dense, shrubby understorey as well as dry sclerophyll forests and woodlands, often with a patchy understorey. (DoE 2016).
Monarcha trivirgatus	Spectacled monarch	**Unlikely**: Suitable habitat not observed onsite. This species occupies the understorey of mountain/lowland rainforests, thickly wooded gullies, and waterside vegetation; mostly well below the canopy, and occasionally mangroves (Pizzey and Knight 1997).
Motacilla flava	Yellow wagtail	**Unlikely**: Suitable habitat not observed onsite. This species is usually found in open habitats such as playing fields, lawns, saltmarshes, sewage ponds and airfields (Pizzey & Knight, 1999).
Myiagra cyanoleuca	Satin flycatcher	**Unlikely**: Suitable habitat not observed onsite. This species occurs in heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occurs in coastal forests, woodlands, mangroves and drier woodland and open forests (DoE, 2016).
Pandion haliaetus	Osprey	**Unlikely**: Suitable habitat not observed onsite. This species is found in littoral and coastal habitats around the country, occasionally following large watercourses inland. It requires extensive open areas of water for foraging (Dept. Environment 2012).
Petauroides volans	Greater glider	**Unlikely**: Suitable habitat not observed onsite. This species is found in eucalypt forests and woodlands. It prefers forests with a good diversity of eucalypt species to provide consistent forage opportunities year round, and is found in the greatest abundance in tall, montane, moist old growth forests (Dept. Environment 2016).

Scientific Name	Common Name	Likelihood of Occurring on the Site
Petrogale penicillata	Brush-tailed rock wallaby	**Unlikely**: Suitable habitat not observed onsite. This species is found in rocky habitats, such as outcrops, slopes, gorges and rock piles/stacks. Within these areas, various vegetation types may provide habitat including rainforest, vine forests, and wet or dry sclerophyll forests (DoE 2016).
Phascolarctos cinereus	Koala	**Recorded**: Suitable habitat and evidence of activity recorded on site. This species inhabits a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities where suitable food trees are present. The Koala is a leaf-eating specialist that feeds primarily during dawn, dusk or night. Its diet is restricted mainly to foliage of *Eucalyptus* spp; however, it may also consume foliage of related genera, including *Corymbia* spp., *Angophora* spp. and *Lophostemon* spp. The Koala may, at times, supplement its diet with other species, including *Leptospermum* spp. and *Melaleuca* spp. (Dept. Environment 2012).
Poephila cincta cincta	Black-throated finch (southern)	**Unlikely**: Suitable habitat not observed onsite. The black-throated finch (southern) occurs at two general locations: in the Townsville region and at scattered sites in central-eastern Queensland (between Aramac and Great Basalt Wall National Park). This species occurs mainly in grassy, open woodlands and forests, typically dominated by *Eucalyptus*, *Corymbia* and *Melaleuca*, and occasionally in tussock grasslands or other habitats (for example freshwater wetlands), often along or near watercourses, or in the vicinity of water. The species is thought to require a mosaic of different habitats in which it can find seed during the wet season. Some of the more common species of eucalypts in woodlands and forests frequented by the subspecies include Narrow-leaved Ironbark (*E. crebra*), River Red Gum (*E. camaldulensis*), Silver-leaved Ironbark (*E. melanophloia*), Reid River Box (*E. brownii*), Yellow jacket (*E. similis*) and Forest Red Gum (*E. tereticornis*). The subspecies occasionally occurs in Melaleuca woodlands, or in grasslands comprised of genera such as *Astrebla*, *Dichanthium* or *Panicum* (Dept. Environment 2012).

Scientific Name	Common Name	Likelihood of Occurring on the Site
Potorous tridactylus tridactylus	Long-nosed potoroo	**Unlikely**: Suitable habitat not observed onsite. This species is sparsely distributed along the south-east Queensland coast and Great Dividing Range. They are found in a range of habitats including wet sclerophyll and coastal heaths, and appear to be most dependent on presence of dense vegetation for shelter, along with abundant food sources in the form of fundi (DoE, 2016).
Pteropus poliocephalus	Grey-headed flying-fox	**Possible**: Some suitable habitat occurs onsite. This species occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops (NSW OEH 2014). This species feeds on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia*, and fruits of rainforest trees and vines. It also feeds on commercial fruit crops and on introduced tree species in urban areas (NSW OEH 2014). The grey-headed flying-fox roosts in aggregations of various sizes on exposed branches. Roost sites are generally located within 20 km of a regular food source (NSW OEH 2014) and are typically located near water, such as lakes, rivers or the coast (Dept. Environment 2012). Roost vegetation includes rainforest patches, stands of *Melaleuca*, mangroves and riparian vegetation, but colonies also use highly modified vegetation in urban and suburban areas (Dept. Environment 2012). The species can maintain fidelity to roost sites for extended periods, although new sites have been 75olonized (NSW OEH 2014, Dept. Environment 2012).

Scientific Name	Common Name	Likelihood of Occurring on the Site
Rhipidura rufifrons	Rufous fantail	**Unlikely**: Suitable habitat not observed onsite. In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallowwood (*Eucalyptus microcorys*), Mountain Grey Gum (*E. cypellocarpa*), Narrow-leaved Peppermint (*E. radiata*), Mountain Ash (*E. regnans*), Alpine Ash (*E. delegatensis*), Blackbutt (*E. pilularis*) or Red Mahogany (*E. resinifera*); usually with a dense shrubby understorey often including ferns. They also occur in subtropical and temperate rainforests; for example near Bega in south-east NSW, where they are recorded in temperate Lilly Pilly (*Acmena smithi*) rainforest, with Grey Myrtle (*Backhousia myrtifolia*), Sassafras (*Doryphora sassafras*) and Sweet Pittosporum (*Pittosporum undulatum*) subdominants. They occasionally occur in secondary regrowth, following logging or disturbance in forests or rainforests. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, including Spotted Gum (*Eucalyptus maculata*), Yellow Box (*E. melliodora*), ironbarks or stringybarks, often with a shrubby or heath understorey. They are also recorded from parks and gardens when on passage. In north and north-east Australia, they often occur in tropical rainforest and monsoon rainforests, including semi-evergreen mesophyll vine forests, semi-deciduous vine thickets or thickets of Paperbarks (*Melaleuca* spp.) (Dept. Environment 2012).
Rostratula australis	Australian painted snipe	**Unlikely**: Suitable habitat not observed onsite. This species inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and clay pans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum *Muehlenbeckia* or canegrass or sometimes tea-tree (*Melaleuca*). The species sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber. Breeding habitat requirements may be quite specific: shallow wetlands with areas of bare wet

Scientific Name	Common Name	Likelihood of Occurring on the Site
		mud and both upper and canopy cover nearby. Nest records are all, or nearly all, from or near small islands in freshwater wetlands , provided that these islands are a combination of very shallow water, exposed mud, dense low cover and sometimes some tall dense cover (Dept. Environment 2012).
Rostratula benghalensis (sensu lato)	Painted snipe	**Unlikely**: Suitable habitat not observed onsite. This species inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and clay pans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire (Dept. Environment 2012).
Saiphos reticulatus	Three-toed snake-tooth skink	**Unlikely**: Suitable habitat not observed onsite. This species inhabits rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. This species feeds on earthworms and beetle grubs and is found in leaf litter, often immediately adjacent to fallen tree trunks (Dept. Environment 2012).
Tringa nebularia	Common greenshank	**Unlikely**: Suitable habitat not observed onsite. The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. The edges of the wetlands used are generally of mud or clay, occasionally of sand, and may be bare or with emergent or fringing vegetation, including short sedges and saltmarsh, mangroves, thickets of rushes, and dead or live trees (DoE 2016).

Scientific Name	Common Name	Likelihood of Occurring on the Site
Turnix melanogaster	Black-breasted button-quail	**Unlikely**: Suitable habitat not observed onsite. This species is restricted to rainforests and forests, mostly in areas with 770-1200 mm rainfall per annum. They prefer drier low closed forests, particularly semi-evergreen vine thicket, low microphyll vine forest, Araucarian microphyll vine forest and Araucarian notophyll vine forest. This species may also be found in low, dense acacia thickets and, in littoral area, in vegetation behind sand dunes. An extensive dense leaf-litter layer is required for foraging and possibly also roosting. Fallen logs and a dense, heterogeneously distributed shrub layers are also considered to be important habitat characteristics for shelter and breeding (Dept. Environment 2012).