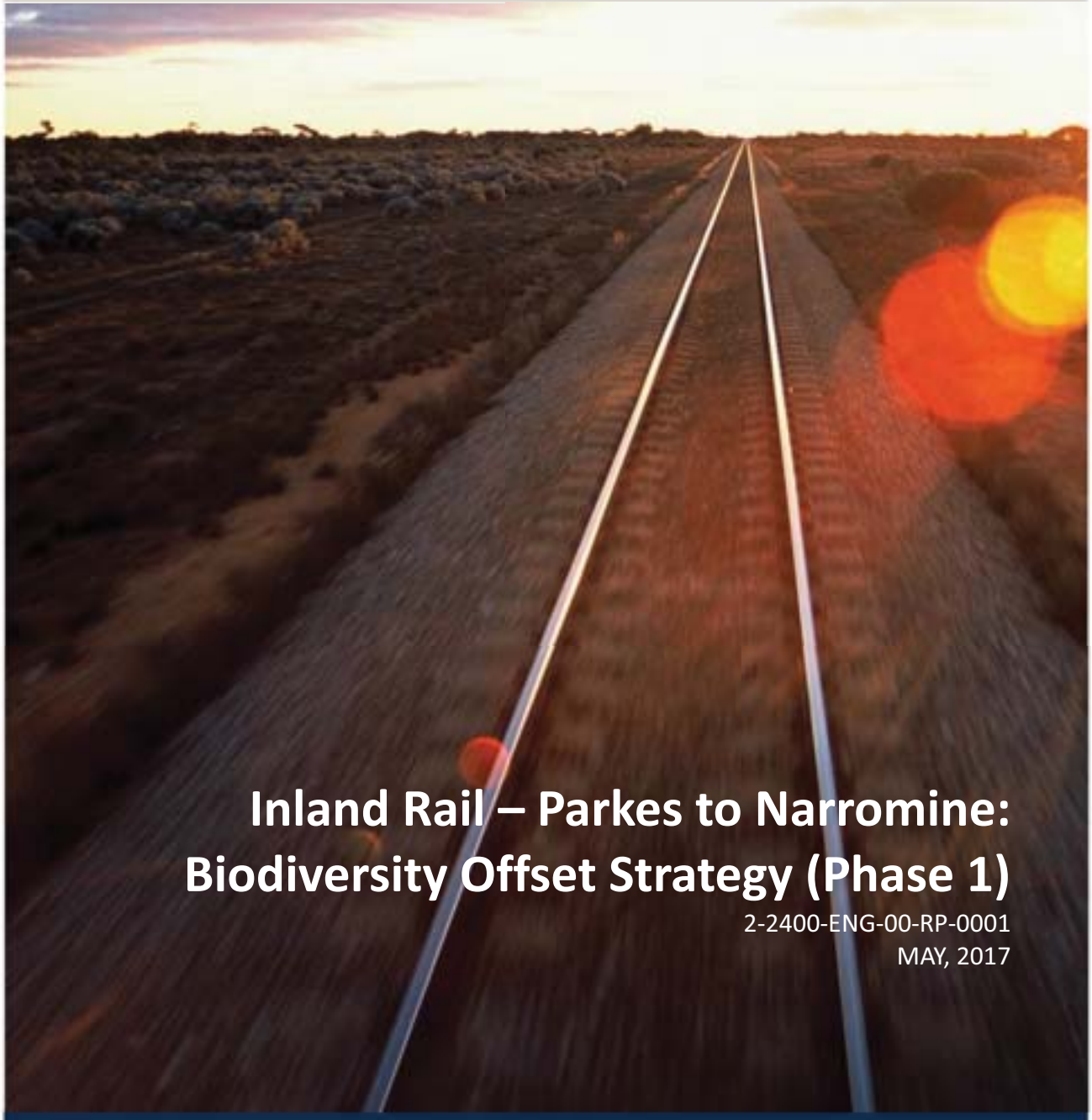
Appendix L – Inland Rail – Parkes to Narromine: Biodiversity Offset Strategy (Phase 1)

ARTC InlandRail

The Australian Government's priority freight rail project



Inland Rail – Parkes to Narromine: Biodiversity Offset Strategy (Phase 1)

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MAY, 2017

Document Control

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Project:	Inland Rail – Parkes to Narromine
Document title:	Inland Rail – Parkes to Narromine Biodiversity Offset Strategy (Phase 1)
Date issued:	10.05.2017
Prepared by:	Amec Foster Wheeler
Purpose:	To assess the biodiversity offset requirements for the Parkes to Narromine proposal under the *NSW Biodiversity Offsets Policy for Major Projects* and demonstrate that appropriate offsets are available and can be delivered.
Endorsed by:	Belinda Ezzy
Approved by:	Jeromy Claridge
Date approved:	
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EXECUTIVE SUMMARY

The Australian Government has committed to delivering a significant piece of national transport infrastructure by constructing a high performance and direct interstate freight rail corridor between Melbourne and Brisbane. The Inland Rail programme (Inland Rail) involves the design and construction of a new inland rail connection, about 1,700 kilometres long, between Melbourne and Brisbane.

Inland Rail has been divided into 13 projects, seven of which are located in NSW. One of these is the **Parkes to Narromine project** (proposal), consisting of approximately 106 kilometres of new and upgraded track and associated infrastructure and facilities.

Australian Rail Track Corporation Ltd (ARTC) ('the proponent') is seeking approval to construct and operate the proposal. The proposal requires approval from the NSW Minister for Planning under Part 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). ARTC are required to prepare an environmental impact statement (EIS) for the proposal that meets the Secretary's Environmental Assessment Requirements (SEARs). The EIS will be assessed by the NSW Department of Planning & Environment (DPE) under the Bilateral agreement made between the Commonwealth and NSW governments.

ARTC have completed the preparation of a Biodiversity Assessment Report (BAR) as part of the EIS, and this biodiversity offsets strategy has been prepared to support the BAR. The BAR describes the ecological values that occur within the proposal area including threatened flora and fauna species and ecological communities that have the potential to be impacted, assesses the potential for significant impacts, and calculates the offset requirements in accordance with the *NSW Biodiversity Offsets Policy for Major Projects* (Major Projects Offsets Policy). The BAR identifies nine Plant Community Types (PCTs) and one fauna species, being the koala (*Phascolarctos cinereus*), which require biodiversity offsets. A total of 2,561 ecosystem credits and 491 species credits need to be retired. Further details are provided in Table 4-2.

Based on the offset credits required a desktop assessment was undertaken to identify the potential for suitable land based offset sites to be located and secured. The principles established under the Framework for Biodiversity Assessment (FBA) which underpins the Major Projects Offsets Policy was used to guide which PCTs and areas could be used for the proposal. A range of sources were investigated including the NSW Office of Environment and Heritage (OEH) biodiversity credits register, expressions of interest (EOI) register and spatial analysis using available PCT mapping.

The assessment identified that there are no existing registered or EOI suitable ecosystem credits occurring in the impact subregions of Lower Slopes or Bogan-Macquarie, or adjacent subregions. For koala species credits there are three existing credit registered offset areas, and 13 EOI within NSW. The majority of these offset areas are located in eastern and coastal areas of NSW and there is adequate credits available to meet the proposal's requirements. Under the FBA proponents are permitted to offset for a threatened species within other subregions that are within the known geographic distribution of the threatened species impacted.

Desktop analysis found there is a high availability of potential offset areas for impact PCTs and alternative PCTs (that meet the FBA criteria) occurring in the impact and adjacent subregions. Extent of area available for each PCT is summarised in Table 5-7 and 5-8. Figures illustrating the distribution for each impact PCT are provided in Appendix A.

Due to a lack of suitable registered offsets for ecosystem credits ARTC will need to investigate sourcing their own offset sites and register BioBanking agreements with landowners. A preference will be for land-based offsets that are strategically located in the impact or adjacent subregions, a number of PCTs can be co-located, and 'like for like' conservation outcomes are achieved.

GLOSSARY OF TERMS AND ABBREVIATIONS

Abbreviation	Description
BAR	Biodiversity Assessment Report
BBAM	BioBanking Assessment Methodology
BOS	Biodiversity Offset Strategy
CEEC	Critically Endangered Ecological Community
CMA	Catchment Management Authority
DPE	NSW Department of Planning and Environment
DoEE	Commonwealth Department of the Environment and Energy
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FBA	Framework for Biodiversity Assessment
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
MNES	Matters of National Environmental Significance
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SEARS	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
SSI	State Significant Infrastructure
TEC	Threatened Ecological Community
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
VIS	Vegetation Information System

1. INTRODUCTION

1.1. Background

The Australian Government has committed to delivering a significant piece of national transport infrastructure by constructing a high performance and direct interstate freight rail corridor between Melbourne and Brisbane. The Inland Rail programme (Inland Rail) involves the design and construction of a new inland rail connection, about 1,700 kilometres long, between Melbourne and Brisbane. Inland Rail is a transformational rail infrastructure initiative that will enhance Australia's existing national rail network and serve the interstate freight market.

Inland Rail has been divided into 13 projects, seven of which are located in NSW. One of these is the **Parkes to Narromine project** (proposal), consisting of about 106 kilometres of new and upgraded track and associated infrastructure and facilities.

Australian Rail Track Corporation Ltd (ARTC) ('the proponent') has sought approval to construct and operate the proposal. The proposal requires approval from the NSW Minister for Planning under Part 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). On the 8th of October 2016 the proposal was determined a controlled action under sections 130(1) and 133 of the Commonwealth EPBC Act for listed species and communities.

ARTC is committed to delivering a biodiversity offset strategy that appropriately compensates for the unavoidable loss of ecological values as a result of the proposal under the *NSW Biodiversity Offsets Policy for Major Projects* (Major Projects Offsets Policy).

1.2. Purpose

The Parkes to Narromine Biodiversity Offset Strategy (Phase 1) (BOS) supports the Parkes to Narromine Biodiversity Assessment Report (BAR) and will form part of the Environmental Impact Statement (EIS). The purpose of this report is to:

- Summarise the proposal's biodiversity offset requirements (both State and Commonwealth) which have been determined through environmental impact assessments as part of finalising the BAR and EPBC Act referral
- Identify requirements for delivering a suitable offset under the Major Projects Offsets Policy and delivery options available for the proposal
- Assess the availability of suitable offset sites
- Outline a preferred offset delivery approach
- Identify future steps to secure the biodiversity offset requirements and associated timeframes.

This report forms the first of three phases of the BOS.

Phase two of this BOS will be prepared post detailed design and prior to the commencement of construction activities for the proposal. This phase two report will provide confirmation of offset values and credits required, identification of proposed offset site options, summary of preliminary field inspections, confirmation of initial landholder interest and assessment of existing condition, key threats and likely management actions on the offset site.

Phase three of the BOS will be prepared and submitted for approval within 12 months post commencement. Phase three report will provide in detail the final offset sites proposed, ground-truthed confirmation of PCTs and species credits generated at the offset site/s, completed biodiversity credit calculator output and report and a detailed offset site management plan. It is then proposed the endorsed offset site/s are legally secured within 2 years post commencement.

2. PARKES TO NARROMINE PROJECT DESCRIPTION

2.1.1. Location and Area

The proposal is generally located in the existing rail corridor between the towns of Parkes and Narromine in western NSW via Peak Hill, and will involve upgrading the existing line (approximately 106 kilometres) (Figure 2-1). A new north to west connection line to Broken Hill is also proposed near Parkes. The Parkes north-west connection provides a link between the existing Broken Hill line (the west line) and the existing Parkes to Narromine line. The proposal is located within the Parkes Local Government Area (LGA) and the Narromine LGA (Umwelt, 2016a).

The rail corridor is defined by fences located approximately 20 metres either side of the rail line, however in some sections where fences are not present the rail corridor may be wider, extending out to about 30 to 40 metres from the rail line or wider where site compounds are proposed. The proposal site varies along the length of the proposal depending on the construction activities that are to take place in any given area.

The proposal area includes the construction footprint, including provision for ancillary facilities, for the total 106 kilometres of the rail line; resulting in a total proposal area of approximately 923 hectares (Umwelt, 2016a).

2.1.2. Key Features

Key features of the proposal involve:

- Upgrading the track, track formation, and culverts within the existing rail corridor for a distance of 106 kilometres between Parkes and Narromine
- Realigning the track where required within the existing rail corridor to minimise tight curves
- Providing three new passing loops within the existing rail corridor, at Goonumbla, Peak Hill and Timjelly
- Providing a new 5.3 kilometre long rail connection to the Broken Hill line to the west of Parkes, including a new road bridge over the existing rail corridor at Brolgan Road.

The key features of the proposal are shown in Figure 2-1. Ancillary work would include works to level crossings, signalling and communications, signage and fencing, and services and utilities within the proposal site.

ARTC - 652520 - NSW Offset Advice

LEGEND

LOCATION DIAGRAM

Figure 2-1
Proposal Site

Proposal Site

WORK REQUEST NUMBER: 652520

DATA SOURCES:
Base Map - OEH NSW
World Base Map Copyright © 2015 DeLorme

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	MAP REV.	REVISION NOTE
16/01/2017	MG	BE	BE	0	Issued for Use
22/12/2016	AF	BE	BE	A	Issued for Review

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3. PARKES TO NARROMINE OFFSET LEGISLATIVE REQUIREMENTS

The proposal will be assessed and approved under both State and Commonwealth legislation including:

- Sections 130(1) and 133 of the Commonwealth EPBC Act
- Part 5.1 of NSW EP&A Act as State Significant Infrastructure (SSI) with assessment via an EIS.

Based on the approval and legislative requirements the following sections provide an overview of the State and Commonwealth biodiversity offset frameworks that will apply to the proposal, and requirements for the provision of biodiversity offsets.

3.1. Commonwealth

The proposal was declared a 'controlled action' under the EPBC Act on the 8th of October 2016 for the potential to have significant impacts on listed species and communities. ARTC is required to assess potential for the proposal to have significant impacts on matters of national environmental significance (MNES) in accordance with the issued SEARs. Where a significant impact has been identified, a biodiversity offset is required to compensate for this loss. An offset framework is established under the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012) that provides guidance on what constitutes an acceptable offset.

The EPBC Act Environmental Offsets Policy is not applicable to the proposal as the NSW Major Projects Offsets Policy is accredited under the NSW Bilateral Agreement. As the proposal has been declared a major project, offsets for impacts on MNES can be delivered in accordance with the NSW Major Projects Offsets Policy (as set out in Chapter 3.2 below).

An Assessment of Significance has been undertaken in accordance with the EPBC Act Policy Statement 1.1 – Significant Impact Guidelines – Matters of National Environmental Significance (DotE, 2013) for those MNES identified in the referral as known or likely to occur in the proposal area. Results of this assessment are outlined in the BAR (Umwelt, 2016a) and the Assessment of Commonwealth Matters Report (Umwelt, 2016b) which will be appended to the BAR. The MNES assessed and findings are summarised in Chapter 4.4.

3.2. New South Wales

3.2.1. New South Wales Biodiversity Offset Strategy for Major Projects

The NSW *Biodiversity Offsets Policy for Major Projects 2014* (OEH, 2014a) (Offsets Policy for Major Projects) establishes a set of offsetting principles for major projects, outlines an assessment methodology to quantify and describe the offsets required as well as detailing a range of options that can be used to provide offsets. The policy provides a standard method for assessing impacts and the quantum of biodiversity credits (species credits and ecosystem credits) required for projects declared as State Significant Development (SSD) or SSI under the EP&A Act. This includes impacts on:

- Species credit species – threatened species listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and/or EPBC Act that are identified by the OEH Threatened Species Profile Database as not being able to reliably be predicted to occur on a development site based on Plant Community Types (PCT), distribution and habitat criteria
- Ecosystem credit species – threatened species listed under the TSC Act and/or EPBC Act that are identified by the OEH Threatened Species Profile Database as being able to be predicted to occur on a development site based on the presence of habitat surrogates, including the confirmed presence of PCT

- Critically endangered ecological communities (CEECs) and endangered ecological communities (EECs) listed under the TSC Act
- Migratory species and Threatened Ecological Communities (TECs) listed under the EPBC Act.

Under the policy offset credit requirements can be satisfied through one or a combination of options which include:

- Land based offsets through the purchase and retirement of biodiversity credits from the biodiversity credit register
- Making payments into an offset fund (this option is not currently available)
- Supplementary measures (these are measures other than protection and management of land, and can include funding of actions identified in species recovery plans, threat abatement programs or research)
- A combination of the above.

Supplementary measures may only be considered if appropriate offset sites cannot be found. Proponents need to demonstrate reasonable steps have been undertaken to locate appropriate like-for-like offset sites before supplementary measures can be proposed. Reasonable steps are defined in Appendix A of the Major Projects Offsets Policy.

Where there are insufficient credits available from the register to acquit a project's offset requirements, proponents can seek to identify and establish a biobank site by entering into a BioBanking agreement with an interested landholder.

Proponents are generally required to secure offsets before development commences. If they wish to secure the offset after development commences, they must enter into a voluntary planning agreement prior to the granting of project approval, requiring the offset requirement to be carried out.

3.2.2. Framework for Biodiversity Assessment

As a requirement under the EP&A Act the proposal has been provided with SEARs that require ARTC to prepare a Biodiversity Assessment Report (BAR) and apply the Framework for Biodiversity Assessment (FBA) to assess impacts on biodiversity. The FBA underpins the Major Projects Offsets Policy.

The FBA sets out the process for assessing impacts on threatened species, CEECs, EECs and TECs and determining the biodiversity offset requirements for those impacts. It provides a method for calculating an offset quantum in the form of biodiversity credits (species credits and ecosystem credits) based on landscape analysis and detailed field assessments including ground truthing of mapped vegetation communities and threatened species surveys.

The results of the application of the FBA are documented by accredited assessors in a BAR. ARTC have completed the preparation of a BAR for the proposal which identifies the potential impacts to species and ecological communities and biodiversity offset credits required (Umwelt, 2016). The findings of the BAR in terms of offset credit requirements are summarised in Chapter 4.1 – 4.3.

3.2.3. BioBanking

BioBanking was established by the former NSW Department of Environment, Climate Change and Water (DECCW) (now the OEH) as a method to address the loss of biodiversity and threatened species. The scheme attempts to create a market framework for the conservation of biodiversity values and the offsetting of development impacts.

BioBanking is established under Part 7A of the TSC Act. The *Threatened Species Conservation (Biodiversity Banking) Regulation 2008* provides additional rules for specific aspects of the scheme that are important for its operation. The BioBanking Assessment Methodology 2014 (BBAM) sets out how biodiversity values will be assessed, establishes rules for calculating the number and class of biodiversity credits, and determines the trading rules that will apply (OEH, 2014a).

To support proponents and offset providers OEH have established the BioBanking Public Registers. They consist of:

- BioBanking agreements register – identifies locations of approved biobank sites, number and type of credits generated and a copy of BioBanking agreement
- BioBanking statements register – provides the location of where BioBanking statements apply, the number and type of credits required, a copy of the BioBanking statement and credits retired to satisfy conditions of statement requirements
- Biodiversity credits register – provides ownership information in relation to each credit, including its status. The credit register can be used to find buyers and sellers
- Biodiversity credit transactions and sales register – information on credit transactions including the price and date of transactions
- Expressions of Interest (EOI) register – landowners who are interested in establishing biobank sites, but have not entered into a formal agreement
- Credits wanted register – proponents who are seeking biodiversity credits.

A search of the above public registers has been undertaken to identify offset credit availability in this report.

4. PARKES TO NARROMINE OFFSET REQUIREMENTS

The BAR (Umwelt, 2016a) has assessed the biodiversity values that are known and likely to occur in the proposal area. An assessment has been undertaken as to what the residual impacts are likely to be, and requiring an offset applying the FBA. The number of biodiversity offset credits have also been estimated and further supporting information is provided in the BAR (Umwelt, 2016a).

4.1. Threatened Species Requiring Offset

The BAR identified that a single species-credit species (being the koala (*Phascolarctos cinereus*)) will be impacted by the proposal and require offsets. Details are summarised in Table 4-1.

4.2. Biodiversity Offset Credit Summary

There are nine PCTs and one fauna species requiring biodiversity offsets. A summary of ecosystem and species credits that require offsetting under the FBA is provided in Table 4-1 below. A total of 2,561 ecosystem credits and 491 species credits are required to offset the direct impacts of the proposal. Maps of these PCTs within the proposal site and the full Credit Calculator reports are provided as Appendices to the BAR.

Table 4-1 Ecosystem and species credits generated by the proposal

Name	Credits Required
Ecosystem Credits	
PCT26 (CW205, LA212) Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	146
PCT36 (CW183, LA193) River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion	54
PCT55 (CW104, LA105) Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions	342
PCT70 (CW220, LA223) White Cypress Pine woodland on sandy loams in central NSW wheatbelt	38
PCT76 (CW145, LA154) Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	1,029
PCT244 (CW172, LA178) Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt)	114
PCT201 (CW138, LA145) Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	70
PCT267 (CW213, LA218) White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion	185

Name	Credits Required
PCT276 (CW226, LA226) Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	583
Total Ecosystem Credits	**2,561**
Species Credits	
Koala (*Phascolarctos cinereus*)	491
Total Species Credits	**491**

4.3. Matters of National Environmental Significance

ARTC have completed assessments of significance for MNES applying the *Significant Impact Guidelines 1.1* (DotE, 2013). Assessments of significance concluded the proposal was unlikely to result in a significant impact on any MNES applying the guideline (Umwelt, 2016b). Further detail on the MNES assessed are summarised below and provided in the BAR.

4.3.1. Threatened Ecological Communities

The BAR identified the proposal was likely to impact the following MNES TECs listed under the EPBC Act:

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (also a CEEC under the TSC Act)
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (also a EEC under the TSC Act)
- Weeping Myall Woodlands (also an EEC under the TSC Act).

Each of the above MNES TECs is equivalent to a NSW PCT which will be impacted by the proposal and require offsetting as detailed in Table 4-2 below. As such, offsets for the ecosystem credits calculated from project impacts to these PCTs will also offset impacts to the MNES TECs under the NSW Bilateral Agreement. Table 4-2 also identifies the extent of clearing for each MNES TEC and the corresponding PCT.

Table 4-2 NSW Plant Community Types impacted by the proposal and equivalent Commonwealth Threatened Ecological Communities impacted

NSW PCT	Equivalent TEC	PCT area to be Impacted (ha)	TEC area to be impacted (ha)
PCT26 (CW205, LA212) Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion *Moderate to Good*	Weeping Myall Woodlands	3.16	0.99 meets the Weeping Myall Woodlands TEC listing advice
PCT76 (CW145, LA154) Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions *Moderate to Good*	Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	8.58	7.89 meets the criteria of the EPBC Act TEC
PCT76 (CW145, LA154) Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions *Moderate to Good-Derived Natural Grassland*	Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	23.64	23.64
PCT267 (CW213, LA218) White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion *Moderate to Good*	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	3.12	3.12
PCT267 (CW213, LA218) White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion *Moderate to Good -Derived Natural Grassland*	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	9.35	9.35
PCT276 (CW226, LA226) Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	3.40	3.40

NSW PCT	Equivalent TEC	PCT area to be Impacted (ha)	TEC area to be impacted (ha)
Moderate to Good			
PCT276 (CW226, LA226) Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion *Moderate to Good_ Derived Natural Grassland*	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	10.32	10.32
	Total clearing (ha)	**61.57**	**58.71**

4.3.2. Threatened Species

Assessments of Significance following Significant Impact Criteria in the Significant Impact Guidelines (DotE, 2013) for EPBC Act threatened fauna species have been undertaken as part of the BAR. These species are:

- Painted honeyeater (*Grantiella picta*) - Vulnerable
- Superb parrot (*Polytelis swainsonii*) - Vulnerable
- Koala (*Phascolarctos cinereus*) (combined population of QLD, NSW and the ACT) - Vulnerable
- South-eastern long-eared bat (*Nyctophilus corbeni*) – Vulnerable.

Assessments of Significance concluded that all four of these species are unlikely to be significantly impacted by the proposed action. At the State level the BAR has identified a single species-credit species (being the koala (*Phascolarctos cinereus*)) is required to be offset. As such, offsets being provided for the koala will also deliver conservation outcomes for the MNES species under the NSW Bilateral Agreement.

5. OFFSET INVESTIGATIONS

5.1. Requirements under the Major Projects Offsets Policy and Framework for Biodiversity Assessment

As identified in Chapter 3.2 the FBA provides guidance and criteria to assist proponents in determining offset sites that will satisfy the Major Projects Offsets Policy requirements. The objective is to ensure that the biodiversity values, such as PCTs and threatened species, being lost at an impact site are offset by improvements on land with the same or similar biodiversity values (i.e. like for like offsets). A summary of the FBA offset criteria that have supported the assessment of offset availability for the proposal are summarised in Table 5-1.

Table 5-1 Criteria used to identify potential like for like offsets

Offset Attribute	Offset Criteria (OEH, 2014b)
PCT	PCTs that meet the following criteria may be used for offsetting: 1. The same PCT for which the ecosystem credit is required (i.e. the impact PCT). 2. Any PCT of the same vegetation class as the impact PCT that has: • A percent cleared value that is equal to, or greater than the percent cleared of the impact PCT OR • A percent cleared value up to 10% lower than the impact PCT if the percent cleared of the impact PCT is less than or equal to 70%.
IBRA Subregions	IBRA subregions that meet the following criteria can be used for offsetting purposes. 1. The IBRA subregion in which the impact will occur (i.e. the impact subregion) 2. The adjoining IBRA subregions within the same IBRA bioregion as the impact PCT 3. Any other IBRA subregions that immediately adjoin the impact subregion 4. Any other IBRA subregions that have the same geographic distribution of the threatened species assessed for ecosystem credits or species credits.
Species Credits	A required species credit must be offset with a species credit created for the same species, determined in accordance with the BBAM.

The offset criteria outlined in Table 5-1 have been used to assess offset availability for the proposal, and results are outlined in Chapter 5.3.

An analysis of the IBRA subregions that satisfy the FBA (being the impact IBRA subregions and adjacent subregions) has been undertaken and results are presented in Table 5-2. The proposal occurs within two IBRA subregions, namely Lower Slopes and Bogan-Macquarie. These will be given priority for locating potential offset sites. There are a total of nine adjoining IBRA subregions that can also be considered when assessing potential offset availability (Table 5-2). The location of the proposal in relation to the location of impact and adjacent subregions is illustrated in Figure 5-1.

Table 5-2 IBRA subregions that satisfy the FBA offset rules

IBRA Bioregion	Impact IBRA Subregion/s	Adjoining IBRA Subregion/s
NSW South Western Slopes	Lower Slopes	Inland Slopes
Darling Riverine Plains	Bogan-Macquarie	Castlereagh - Barwon
Cobar Peneplain	N/A	Boorindal Plains Canbelego Downs Lachlan Plains Nymagee
Riverina	N/A	Murrumbidgee Murray Fans
Brigalow Belt South	N/A	Pilliga

A range of alternative PCTs to the impact PCTs that may also be considered for offsets are presented in Table 5-3. These PCTs meet the FBA offset rules presented in Table 5-1 in that:

- They are of the same vegetation class as the impact PCT
- They occur in the impact subregions or adjoining subregions identified in Table 5-2
- They have a percent clearing value that is equal to, or greater than the percent clearing for the impact PCT in the major catchment area (consistent with criteria outlined in Appendix A of the NSW Biodiversity Offsets Policy for Major Projects for achieving 'like for like' offset outcomes).

Boorindal Plains

Canbelego Downs

Castlereagh-Barwon

Bogan-Macquarie

Pilliga

Nymagee

Lachlan Plains

Lower Slopes

Inland Slopes

Murrumbidgee

Murray Fans

NEW SOUTH WALES

VICTORIA

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Figure 5-1
IBRA Subregions for Offset Purposes

WORK REQUEST NUMBER: 652520

DATA SOURCES:
IBRA Sub-Regions v7.0: Australian Government
State Vegetation Type Map - OEH NSW
World Base Map Copyright © 2015 DeLorme

LEGEND

- Proposal Site
- Impacted Sub-Regions
- Neighbouring Sub-Regions

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LOCATION DIAGRAM

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	MAP REV.	REVISION NOTE
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Table 5-3 Impact and Alternative PCTs that may be considered for offsets

Vegetation Formation	Vegetation Class	Impact PCT	Alternative PCT Option
Semi-arid woodland (Grassy subformation)	Riverine Plains Woodlands	PCT26 (CW205, LA212) Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	PCT27 (BR233, CW204, NA219, WE97) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion
Forested wetlands	Inland Riverine Forests	PCT36 (CW183, LA193) River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion	PCT9 (LA263, MR612, MU584) River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion
			PCT249 (CW181, LA191, MR611, MU583) River Red Gum swampy woodland wetland on cowals (lakes) and associated flood channels in central NSW.
			PCT356 (CW240, LA232) Blakely's Red Gum x Dirty Gum - White Cypress Pine tall riparian woodland, NSW South Western Slopes Bioregion
Semi-arid woodland (Grassy subformation)	North-west floodplain woodlands	PCT55 (CW104, LA105) Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions	PCT39 (BR130, CW125, NA129, WE74) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion
			PCT40 (BR131, CW126, NA130, WE76) Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains
Grassy woodlands	Floodplain transition woodlands	PCT70 (CW220, LA223) White Cypress Pine woodland on sandy loams in central NSW wheatbelt	PCT56 (BR186, CW167, LA175, NA182, WE136) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW

Vegetation Formation	Vegetation Class	Impact PCT	Alternative PCT Option
			PCT74 (LA195, MR616, MU589) Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion
			PCT80 (LA153, MR565, MU554) Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
			PCT237 (LA194, MR615, MU588) Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone
			PCT248 (CW152, LA162) Mixed box eucalypt woodland on low sandy-loam rises on alluvial plains in central western NSW
			PCT251 (LA163) Mixed Eucalypt woodlands of floodplains in the southern-eastern Cobar Peneplain Bioregion
		PCT76 (CW145, LA154) Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	PCT237 (LA194, MR615, MU588) Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone
		PCT244 (CW172, LA178) Poplar Box grassy woodland on alluvial clay-loam soils mainly in	PCT56 (BR186, CW167, LA175, NA182, WE136) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW

Vegetation Formation	Vegetation Class	Impact PCT	Alternative PCT Option
		the temperate (hot summer) climate zone of central NSW (wheatbelt)	PCT74 (LA195, MR616, MU589) Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion
			PCT80 (LA153, MR565, MU554) Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
			PCT237 (LA194, MR615, MU588) Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone
			PCT248 (CW152, LA162) Mixed box eucalypt woodland on low sandy-loam rises on alluvial plains in central western NSW
			PCT251 (LA163) Mixed Eucalypt woodlands of floodplains in the southern-eastern Cobar Peneplain Bioregion
Grassy woodlands	Western slopes grassy woodlands	PCT201 (CW138, LA145) Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion PCT267 (CW213, LA218) White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion PCT276 (CW226, LA226) Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	PCT266 (CW216, LA219, MR561, MU551) White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

5.2. Methodology Used to Identify Suitable Offset Sites

In accordance with the Major Projects Offsets Policy, the options presently available for the proposal to fulfil its offset requirements are:

- Retiring biodiversity credits – like for like offsets are secured and credits retired
- Contributing to supplementary measures
- Combination of the above.

Biodiversity credits are generated when a landholder agrees to enter a BioBanking agreement. BioBanking agreements provide security and certainty for offsets, as adequate funding for offset site management forms part of the agreements as well as stringent monitoring and reporting requirements to OEH.

The following steps were undertaken in order to find biodiversity credits for the PCTs and species requiring offsets for the proposal (refer Chapter 4).

Table 5-4 Process used to identify offset credits and like for like offsets for the proposal

Step	Actions
1. Check for available credits	The OEH biodiversity credits register was checked on 15 December 2016 to determine if ecosystem credits matching the proposal offset requirements have been issued and are available.
2. Check for expressions of interest	The OEH Biobank site expression of interest (EOI) register was checked on 16 December 2016 to determine if a landholder may have credits matching the proposal offset requirements, but have not yet issued those credits.
3. Identify potential like for like offset sites	A desktop analysis has been completed using the offset rules specified in Table 5-1 to identify potential like for like offset sites. Desktop analysis occurred during December 2016.
4. Put a request on the credits wanted list	A 'credits wanted' request will be prepared and submitted on the OEH credits wanted register for the approximate number and type of credits required for the proposal once these are confirmed with assessing agencies. Estimated to occur early 2017.
5. Test landholder interest	Post approval of the proposal contact will be made with shortlisted landholders to determine interest in entering into a BioBanking agreement and selling credits to ARTC.
6. Validate offset credits	Based on landholder interest ground-truth the potential offset site to validate the presence of ecosystem and/or species credit requirements and assess overall suitability as an offset. Shortlist preferred offset properties that will then be taken to the next level of assessment.

7. Investigate options for supplementary measures and estimate costs	The indicative cost of supplementary measures is estimated with similar credits already sold as part of the BioBanking scheme acting as a guide to pricing. Estimated offset delivery costs for the proposal are summarised in Chapter 5.3.4.

5.3. Biodiversity Offset Availability

The availability of ecosystem credits and potential like for like offset sites as identified by undertaking the actions described in Table 5-2 is discussed in the following sections.

5.3.1. Offset Register Availability

The BioBanking public register is established under section 127ZZ of the TSC Act. The public register covers:

- BioBanking agreements register
- Biobank site expressions of interest (EOI) register
- BioBanking statements register
- Biodiversity credits register
- Biodiversity credit transactions and sales register.

The biodiversity credits register was searched on 15 December 2016 for credits available for purchase that satisfy the proposal offset requirements. At present, there are no suitable ecosystem credits in the impact subregions or adjoining subregions (Table 5-2) available on the BioBanking credit register (Table 5-5). There is one registered site for koala credits that could meet the proposal's species credit requirements. The offset has 965 credits approved, and is located in the Macleay Hastings - Northern Rivers subregion of Kempsey Shire Council LGA as the offset is within the known distribution for the species.

Table 5-5 Results of Biobank credit register searches

Impact PCT Biodiversity credit required	BioBanking Plant Community Codes	Availability in impact subregions	Availability in adjoining subregions
Ecosystem Credits – Priority PCTs			
PCT 26	CW205, LA212	No available credits in impact subregions.	No available credits statewide.
PCT 36	CW183, LA193	No available credits in impact subregions.	No available credits statewide.
PCT 55	CW104, LA105	No available credits in impact subregions.	No available credits statewide.
PCT 70	CW220, LA223	No available credits in impact subregions.	No available credits statewide.

Impact PCT Biodiversity credit required	BioBanking Plant Community Codes	Availability in impact subregions	Availability in adjoining subregions
PCT 76	CW145, LA154	No available credits in impact subregions.	No available credits statewide.
PCT 201	CW138, LA145	No available credits in impact subregions.	No available credits statewide.
PCT 244	CW172, LA178	No available credits in impact subregions.	No available credits statewide.
PCT267	CW213, LA218	No available credits in impact subregions.	No available credits statewide.
PCT 276	CW226, LA226	No available credits in impact subregions.	No available credits statewide.
Ecosystem credits – Alternative PCTs [Corresponding Impact PCT]			
PCT27 [PCT26]	BR233, CW204, NA219, WE97	No available credits in impact subregions.	No available credits statewide.
PCT9 [PCT36]	LA263, MR612, MU584	No available credits in impact subregions.	No available credits statewide.
PCT249 [PCT36]	CW181, LA191, MR611, MU583	No available credits in impact subregions.	No available credits statewide.
PCT356 [PCT36]	CW240, LA232	No available credits in impact subregions.	No available credits statewide.
PCT39 [PCT55]	BR130, CW125, NA129, WE74	No available credits in impact subregions.	No available credits statewide.
PCT40 [PCT55]	BR131, CW126, NA130, WE76	No available credits in impact subregions.	No available credits statewide.
PCT56 [PCT70, PCT244]	BR186, CW167, LA175, NA182, WE136	No available credits in impact subregions.	No available credits statewide.
PCT74 [PCT70, PCT244]	LA195, MR616, MU589	No available credits in impact subregions.	No available credits statewide.
PCT80 [PCT70, PCT244]	LA153, MR565, MU554	No available credits in impact subregions.	No available credits statewide.

Impact PCT Biodiversity credit required	BioBanking Plant Community Codes	Availability in impact subregions	Availability in adjoining subregions
PCT237 [PCT70, PCT244]	LA194, MR615, MU588	No available credits in impact subregions.	No available credits statewide.
PCT248 [PCT70, PCT244]	CW152, LA162	No available credits in impact subregions.	No available credits statewide.
PCT251 [PCT70, PCT244]	LA163	No available credits in impact subregions.	No available credits statewide.
PCT237 [PCT76]	LA194, MR615, MU588	No available credits in impact subregions.	No available credits statewide.
PCT266 [PCT201, PCT267, PCT276]	CW216, LA219, MR561, MU551	No available credits in impact subregions.	No available credits statewide.
Species Credits			
Koala	N/A	There are no species credits for the koala available in either the Lower Slopes or Bogan – Macquarie subregions.	There are no species credits for the koala available in any adjoining subregions. There are three credit registered areas for koalas within the whole of NSW available for use. Two are classified with a credit status of “Issued” and have a combined credit number of 1,074. One is located within the Macleay Hastings - Northern Rivers subregion of Kempsey Shire Council LGA with over 900 credits available for use. There are sufficient credits available on this property to meet the proposal requirements. The second is located in Karuah Manning subregion of Great Lakes Council LGA but only has 109 credits available. The third credit registered area for the koala has a

Impact PCT Biodiversity credit required	BioBanking Plant Community Codes	Availability in impact subregions	Availability in adjoining subregions
			credit status of "Pending" with 317 potential credits.

5.3.2. Expressions of Interest

The Biobank EOI register provides details of potential Biobank sites that could generate biodiversity credits in the future. The EOI register was searched on 16 December 2016 for potential sites with ecosystem credits that would satisfy the proposal offset requirements (Table 5-6). Only one EOI has the potential to be located in an adjacent subregion which may contain areas of PCT201.

Table 5-6 Results of Biobank Credit Expressions of Interest Searches

Ecosystem credit required	BioBanking Plant Community Codes	EOIs in impact subregions	EOIs in adjoining subregions
Ecosystem credits – impact/priority PCTs			
PCT 26	CW205, LA212	There are currently no EOIs for the impact subregions.	There are currently no EOIs statewide.
PCT 36	CW183, LA193	There are currently no EOIs for the impact subregions.	There are currently no EOIs statewide.
PCT 55	CW104, LA105	There are currently no EOIs for the impact subregions.	There are currently no EOIs statewide.
PCT 70	CW220, LA223	There are currently no EOIs for the impact subregions.	There are currently no EOIs statewide.
PCT 76	CW145, LA154	There are currently no EOIs for the impact subregions.	There are currently no EOIs statewide.
PCT 201	CW138, LA145	There are currently no EOIs for the impact subregions.	There is one EOI with potential to be located in the Inland Slopes subregion. The EOI includes CW138 and is located within the Dubbo City Council LGA (now part of Western Plains Regional Council) which comprises 800 ha of potential ecosystem credits. Further information on the EOI site will need to be sought.

Ecosystem credit required	BioBanking Plant Community Codes	EOIs in impact subregions	EOIs in adjoining subregions
PCT 244	CW172, LA178	There are currently no EOIs for the impact subregions.	There are currently no EOIs statewide.
PCT267	CW213, LA218	There are currently no EOIs for the impact subregions.	There are currently no EOIs statewide.
PCT 276	CW226, LA226	There are currently no EOIs for the impact subregions.	There are currently no EOIs statewide.
Ecosystem credits – Alternative PCTs [Corresponding Impact PCT]			
PCT27 [PCT26]	BR233, CW204, NA219, WE97	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions.
PCT9 [PCT36]	LA263, MR612, MU584	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions.
PCT249 [PCT36]	CW181, LA191, MR611, MU583	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions.
PCT356 [PCT36]	CW240, LA232	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions.
PCT39 [PCT55]	BR130, CW125, NA129, WE74	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions.
PCT40 [PCT55]	BR131, CW126, NA130, WE76	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions.
PCT56 [PCT70, PCT244]	BR186, CW167, LA175, NA182, WE136	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions.
PCT74 [PCT70, PCT244]	LA195, MR616, MU589	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions.

Ecosystem credit required	BioBanking Plant Community Codes	EOIs in impact subregions	EOIs in adjoining subregions
PCT80 [PCT70, PCT244]	LA153, MR565, MU554	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions.
PCT237 [PCT70, PCT244]	LA194, MR615, MU588	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions.
PCT248 [PCT70, PCT244]	CW152, LA162	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions.
PCT251 [PCT70, PCT244]	LA163	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions.
PCT237 [PCT76]	LA194, MR615, MU588	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions.
PCT266 [PCT201, PCT267, PCT276]	CW216, LA219, MR561, MU551	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions. There are two EOIs that will potentially provide 1,232ha of ecosystem credits for CW216. These EOIs are located within the Hill End – Central West subregion of the Bathurst Regional Council LGA (1,000ha) and the Upper Slopes – Central West subregion of the Mid-Western Regional Council LGA (232ha) respectively.
Species credits			
Koala	N/A	There are currently no EOIs for the impact subregions.	There are currently no EOIs for the adjoining subregions. However, under FBA an offset site can be used in a different subregion if it occurs in the species known distribution.

Ecosystem credit required	BioBanking Plant Community Codes	EOIs in impact subregions	EOIs in adjoining subregions
			There are currently 13 EOIs for the koala statewide located within the Sydney Basin subregion, NSW North Coast subregion, Nandewar subregion and the South Eastern Queensland subregion that potentially provide a total of 3,862.6ha of ecosystem credits.

5.3.3. Desktop Analysis

To assess availability of potential offset sites (other than those registered through OEH databases) a spatial analysis of OEH's Vegetation Information System (VIS) database and mapping was undertaken. Based on the latest PCT mapping available for the impact and adjacent subregions, spatial analysis identified the extent of each impact PCT or suitable alternative PCT. It should be noted there are some limitations with the spatial analysis including that PCT mapping was unavailable for a proportion of the adjacent subregions in the north-west. Parts of Canbelego Downs subregion were not mapped and all of Boorindal Plains did not have PCT mapping available. There may also be a level of inaccuracy in the PCT mapping therefore future steps will include field validation and an evaluation of landholder interest.

The spatial extent of each impact PCT and alternative PCTs is presented in Appendix A.

The results of the spatial analysis indicate that there are mapped areas of each impact PCT within at least one of the impact subregions (Table 5-7; Appendix A). Further, each impact PCT has been identified and mapped within at least two of the adjoining subregions that can also be considered for offsetting purposes. Based on the data presented in Table 5-7, there is opportunity to identify potential offsets for impact PCTs within either an impact subregion or adjoining subregion. The greater constraints to securing offsets will be associated with land tenure, ownership and landholder interest.

Similarly, all of the alternative PCTs have been mapped within at least one of the impact subregions and one of the adjoining subregions (Table5-8; Appendix A).

As a priority offsets should be located within the impact subregions as far as practical. Should this not be possible, the adjoining subregions with the greatest mapped areas and ability to co-locate PCTs should be considered as a priority, given their proximity to the proposal site and associated impacts.

Table 5-7 Area (ha) of Impact PCTs in each impact subregion and adjoining subregion.

Impact PCT	Area (ha) – Impact Subregions		Area (ha) – Adjoining Subregions							
	Bogan-Macquarie	Lower Slopes	Canbelego Downs	Castlereagh - Barwon	Inland Slopes	Lachlan Plains	Murray Fans	Murrumbidgee	Nymagee	Pilliga
PCT26	25	26,718	10,577	-	31,758	34,307	85	6,095	45,839	-
PCT36	6,445	2,305	30,625	7,855	-	-	-	-	6,794	394
PCT55	44	3,474	4,479	44,552	2,604	52	-	7,122	914	7,672
PCT70	72	7,655	3,168	77,632	13,883	19,610	13,554	29,848	55	14,102
PCT76	136	22,795	-	734	3,295	1,334	116	2,490	3,613	24,241
PCT201	-	989	-	-	1,655	2,635	-	-	-	1,153
PCT244	197	262	24,248	11,138	-	-	-	-	2,744	146,249
PCT267	349	2092	-	-	16,575	-	-	449	-	26
PCT276		4181	-	-	827	3,671	-	-	-	-

Table 5-8 Area (ha) of Alternative PCTs in each impact subregion and adjoining subregion

Alternative PCT [Associated Impact PCT]	Area (ha) – Impact Subregions		Area (ha) – Adjoining Subregions							
	Bogan-Macquarie	Lower Slopes	Canbelego Downs	Castlereagh-Barwon	Inland Slopes	Lachlan Plains	Murray Fans	Murrumbidgee	Nymagee	Pilliga
PCT27 [PCT26]	29,848	20	-	9,563	1,153	-	-	19	-	8,750
PCT9 [PCT36]	-	12,635	-	-	56	5,262	761	5,874	-	-
PCT249 [PCT36]	29,723	2,529	-	-	3,708	2	5,533	3,655	-	24,871
PCT356 [PCT36]	-	1,185	-	68	19	2	-	-	64,895	13,198
PCT39 [PCT55]	67	-	-	903	-	-	-	-	-	-
PCT40 [PCT55]	243	3,938	-	77,757	-	-	-	-	-	-
PCT56 [PCT70]	1,463	3,308	37,338	3,704	-	2,450	-	-	15,563	3,022
PCT74 [PCT70]	52	1,424	-	-	28,521	64	53	2,471	-	67
PCT80 [PCT70]	65,672	25,693	-	-	11,411	77,632	8,301	5,582	-	18,878

Alternative PCT [Associated Impact PCT]	Area (ha) – Impact Subregions		Area (ha) – Adjoining Subregions							
	Bogan-Macquarie	Lower Slopes	Canbelego Downs	Castlereagh-Barwon	Inland Slopes	Lachlan Plains	Murray Fans	Murrumbidgee	Nymagee	Pilliga
PCT237 [PCT70]	-	2,305	-	-	5,371	-	1,677	115,563	-	-
PCT248 [PCT70]	548	2,751	37,904	17,253	50,972	38,433	-	-	64,723	136,920
PCT251 [PCT70]	-	3,511	-	-	-	31,248	-	-	9,730	
PCT56 [PCT244]	2986	4972	14,405	29,218	-	368	-	-	572	1,613
PCT74 [PCT244]	413	29,123	-	-	4,812	1,780	902	2,550	-	1,079
PCT80 [PCT244]	6,095	33,450	-	-	11,078	34,307	85	6,095	-	202
PCT237 [PCT244]	-	6,728	-	-	87,002		3,179	13,929	-	-
PCT248 [PCT244]	2,022	88,619	-	27,535	2,351	23,053	1,836	12,843	-	3,432
PCT251 [PCT244]	-	3,179	-	-	-	36,991	-	-	3	-
PCT628	-	-	-	1,884	-	-	-	-	-	-

Alternative PCT [Associated Impact PCT]	Area (ha) – Impact Subregions		Area (ha) – Adjoining Subregions							
	Bogan-Macquarie	Lower Slopes	Canbelego Downs	Castlereagh-Barwon	Inland Slopes	Lachlan Plains	Murray Fans	Murrumbidgee	Nymagee	Pilliga
[PCT244]										
PCT266 [PCT201]	-	33,809	-	-	23,338	-	-	-	-	-
PCT266 [PCT267]	-	40,059	-	-	147,335	-	-	-	-	-
PCT266 [PCT276]	-	5,484	-	-	975	-	-	-	-	-

Table 5-9 Koala Habitat impact PCT area (ha) in each impact subregion and adjoining subregion.

Koala Habitat (Associated PCT)	Area (ha) – Impact Subregions		Area (ha) – Adjoining Subregions							
	Bogan-Macquarie	Lower Slopes	Canbelego Downs	Castlereagh-Barwon	Inland Slopes	Lachlan Plains	Murray Fans	Murrumbidgee	Nymagee	Pilliga
PCT36	6,445	2,305	30,625	7,855	-	-	-	-	6,794	394
PCT201	-	989	-	-	1,655	2,635	-	-	-	1,153
PCT267	349	2092	-	-	16,575	-	-	449	-	26
PCT276		4181	-	-	827	3,671	-	-	-	-
TOTAL	6,794	9,567	30,625	7,855	19,057	6,306		449	6,794	1,563
Grand Total										**89,010**

5.3.4. Supplementary Measures

Under the Major Projects Offsets Policy, a proponent may use supplementary measures which are defined as: *another measure undertaken as part of the BOS that is likely to lead to improvements in biodiversity or other environmental values that are not on an offset site*. The policy states that proponents can provide funds for supplementary measures when offsets are not available and requires that supplementary measures be of an equivalent cost to the provision of offsets.

A search of the OEH biodiversity credits register for the impacted PCTs (performed in December 2016) indicated there were no suitable credits available for purchase. Subsequently, an evaluation of all available offset transactions listed in the OEH biodiversity credits register for 2015 and 2016 has been completed to support determination of the cost to provide ecosystem and species credits.

The estimated cost has been calculated using the average range of price per credit of all available transactions per year and averaged between years to determine the current market for estimated costs of providing offsets for unavoidable impacts.

Ecosystem supplementary measures

There was a total of 102 available transactions for analysis. The average cost for years 2015-2016 was calculated as $10,554 per ecosystem credit with an average range of $1,451 - $24,482 per credit. Costs include landholder payments and ongoing management payments. The transactions were from a variety of subregions predominantly in urban areas such as Cumberland-Sydney Metro, coastal regions such as Jervis and Bateman or resource focused areas such as Upper Hunter. Due to the location of these transactions the calculated costs are likely to be inflated compared to the proposals impact and adjacent subregions. Results of the cost analysis for each impact PCT and required ecosystem credits are shown in Table 5-10.

Table 5-10 Estimated offset delivery costs for ecosystem credits

Impact PCT	Proposal Credits Required	Minimum Cost Range	Maximum Cost Range	Average Total Cost
PCT26	146	$211,930.68	$3,574,492.45	$1,540,965.03
PCT36	54	$78,385.32	$1,322,072.55	$569,945.97
PCT55	342	$496,440.36	$8,373,126.15	$3,609,657.81
PCT70	38	$55,160.04	$930,347.35	$401,073.09
PCT76	1029	$1,493,675.82	$25,192,826.95	$10,860,637.09
PCT201	70	$101,610.60	$1,713,797.75	$738,818.85
PCT244	114	$165,480.12	$2,791,042.05	$1,203,219.27
PCT267	185	$268542.30	$4,529,322.62	$1,952,592.67
PCT276	583	$846,271.14	$14,273,486.97	$6,153,305.56

Species supplementary measures

There was a total of nine available transactions for analysis. The average cost for years 2015-2016 was calculated as $2,410.70 per species credit with an average range of $5.50 - $7,750.00 per credit. Due to the location of these transactions being in coastal regions of NSW the calculated costs are likely to be inflated compared to the proposals impact and adjacent subregions. The current estimated cost (avg.) of providing 491 species credits for the proposal is approximately $1,183,651.15 as shown in **Table 5-11** Estimated offset deliver costs for species credits below.

Table 5-11 Estimated offset deliver costs for species credits

Impact Species	Credits Required	Minimum Range Cost	Maximum Range Cost	Average Total Cost
Koala	491	$2,700.50	$3,805,250.00	$1,183,656.15

6. CONCLUSION

This report has assessed the availability of offset requirements for the proposal in accordance with the NSW Major Projects Offset Policy and FBA.

The BAR has identified nine PCTs (PCT26, PCT36, PCT55, PCT70, PCT76, PCT244, PCT201, PCT267, PCT276) and one fauna species (koala) as requiring biodiversity offsets as a result of the proposal. Under the *Significant Impact Guidelines 1.1* (DotE, 2013) there were no MNES (including TECs and species) identified as being significantly impacted. While residual significant impacts on threatened species and ecological communities listed under the EPBC Act are not predicted, the proposal will include the retirement of offset credits calculated in accordance with the NSW FBA (OEH, 2014a). Offsets will incorporate vegetation communities that conform to MNES TECs including *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC* and *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia EEC* and *Weeping Myall Woodlands EEC.* The retirement of credits associated with these native vegetation communities occurring in the proposal area also ensures that the habitat for threatened bird species (regent honeyeater, swift parrot and superb parrot) and the potentially occurring *Tylophora linearis* are all offset as part of the proposal.

In total 2,561 ecosystem credits (across nine PCTs) and 491 species credits (for koalas) need to be retired for the proposal. A search of the OEH biodiversity credits register and EOI register in December 2016 identified there were no suitable ecosystem credits available for purchase (apart from one EOI potentially occurring in an adjacent subregion) that satisfy the FBA criteria for the proposal. For koalas there are three offset sites on the OEH credit register for the whole of NSW available for use. Two are classified with a credit status of "Issued" and have a combined credit number of 1,074 which would meet the proposal's requirements.

In order to assess offset availability more broadly, a spatial analysis of OEH's VIS database and mapping was undertaken. Results of the spatial analysis indicate there are mapped areas of each impact PCT within at least one of the impact subregions (Table 5-7; Appendix A). Further, each impact PCT has been identified and mapped within at least two of the adjoining subregions that can also be considered for offsetting purposes. Mapping showing the distribution of impact PCTs is illustrated in Appendix A.

The analysis suggests there is ample opportunity to identify potential offsets for impact PCTs within either an impact subregion or adjoining subregion as summarised in Table 6-1.

Table 6-1 Summary of area (ha) of impact PCTs in each impact subregion and adjoining subregion

Offset Value	Development Impact Area (ha)	Offset Avail. Impact Subregions (ha)	Offset Avail. Adjoining Subregions (ha)	Comments
Impact PCTs				
PCT 26 (CW205, LA212)	3.16	29,868	128,661	Scattered patches of the impact PCT26 are available in the impact Lower Slopes subregion. To the south-west of this subregion are larger mapped patches of PCT26. There is also high availability of alternative PCT27 in the northern impact subregion of Bogan-Macquarie.
PCT 36 (CW183, LA193)	1.49	8,750	45,668	Substantial offset areas of impacted PCT36 are available within the impact subregion of Bogan-

Offset Value	Development Impact Area (ha)	Offset Avail. Impact Subregions (ha)	Offset Avail. Adjoining Subregions (ha)	Comments
				Macquarie to the north-west of the proposal. The mapped PCT36 areas occur alongside major watercourses. There are also alternative PCT areas mapped south of the proposal in the Lower Slopes subregion.
PCT 55 (CW104, LA105)	7.06	3,518	67,395	There are some clustered areas available of PCT55 in the central area of Lower Slopes subregion. Substantial offset areas of alternative PCTs are mapped in the Bogan-Macquarie subregion and adjacent subregions to the north-east.
PCT 70 (CW220, LA223)	1.54	7,727	171,852	Viable offset areas of impacted PCT70 are located within scattered areas surrounding the proposed development area in Lower Slopes and Bogan-Macquarie subregions. There are also substantial offset areas of alternative PCTs within the impacted subregions.
PCT 76 (CW145, LA154)	32.06	22,931	35,823	Substantial offset areas of impacted PCT76 are available within the impacted Lower Slopes subregion. Very small areas of the alternative PCT are mapped in adjacent subregions to the south-west.
PCT 201 (CW138, LA145)	1.5	989	5,443	Only small scattered patches of PCT201 are available in the Lower Slopes subregion. Much larger areas are available of alternative PCTs to the east of the proposal in the Inland Slopes subregion.
PCT 244 (CW172, LA178)	2.61	459	184,379	Substantial offset areas of impacted PCT244 are available predominantly within the Bogan-Macquarie impacted subregion. Large areas of alternative PCTs are available in the Lower Slopes impacted subregion.
PCT267 (CW213, LA218)	3.58	2,441	17,050	Smaller scattered patches of PCT267 are available along the eastern boundary of the Lower Slopes subregion. There are significant offset areas of PCT267 also available directly east of the proposal within the adjacent Inland Slopes subregion.
PCT 276 (CW226, LA226)	13.72	4,181	4,498	Scattered areas of impacted PCT276 are located within the Lower Slopes subregion, south of the

Offset Value	Development Impact Area (ha)	Offset Avail. Impact Subregions (ha)	Offset Avail. Adjoining Subregions (ha)	Comments
				proposal site. There are significant areas of alternative PCTs available to the east in the Inland Slopes subregion.

The next steps will be to:

- Confirm the ecosystem credits and species credits required to be offset with relevant agencies through finalisation of the approval process and detailed design.
- A 'credits wanted' request will be prepared and submitted on the OEH credits wanted register for the approximate number and type of credits required for the proposal.
- Develop a shortlist of preferred offset properties based on desktop analysis. Preference would be properties that contain a number of the required PCTs and koala habitat, are located in the impact or adjacent subregions and are strategically located.
- Undertake landholder engagement and field surveys to validate the presence of the biodiversity offset values, management actions required and overall suitability of the site.
- Based on the results of preliminary field surveys and landholder discussions, final offset sites would be selected. These sites would then be assessed by an accredited BioBanker and the number and type of biodiversity credits that can be generated would be finalised.
- Within 12 months of commencement of construction, ARTC would prepare a Biodiversity Offset Strategy (BOS) Phase 3 for approval. This report would include:
    i. Details of the proposed strategic offset sites
    ii. Ecosystem credits and species credits created at an offset site
    iii. Credit profiles for ecosystem credits and species credits at the offset site
    iv. Identification of any ecosystem and species credits that are proposed to be converted to a supplementary measure
    v. A summary of biodiversity offset measures and how these match to credit requirements created by the development site
    vi. A management plan detailing management actions and the vegetation zones to which they will apply in accordance with BBAM Section 12.9.

7. REFERENCES

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