Australian Government

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ARTC InlandRail

Inland Rail Programme

Narrabri to North Star Project

Environmental Impact Statement

Technical Report 3: **Aquatic Ecology Assessment**

Technical Report 4: **Commonwealth Matters Assessment**

Image: Newell Highway north of Narrabri, NSW

Technical Report 4:
Commonwealth Matters Assessment

Image: Railway near Edgeroi, NSW

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ARTC

AUSTRALIAN RAIL TRACK CORPORATION
INLAND RAIL – NARRABRI TO NORTH STAR EIS

Commonwealth Matters Assessment
IR Document Number: 02-2600-PE-P11-DE-0100

FINAL

October 2017

AUSTRALIAN RAIL TRACK CORPORATION
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FINAL

Prepared by
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Report No. 3607/R09/Final
Date: October 2017

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This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Glossary

Additional assessment area	Additional area assessed outside the proposal site. It includes an approximate 60 metre buffer around culverts/underbridges and overbridges, an approximate 120 metre buffer around level crossings and some other areas to provide design flexibility for future planning
ARTC	Australian Rail Track Corporation
BAR	Biodiversity Assessment Report
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CMA Subregion	Catchment Management Authority Subregion
DoEE	Commonwealth Department of the Environment and Energy
DPE	Department of the Planning and Environment (NSW)
DPI	Department of Primary Industries (NSW)
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
Existing rail corridor	The corridor within which existing rail infrastructure, subject to works as part of Inland Rail, are located. The existing rail corridor is defined by ARTC to mean everywhere within 15 metres of the outermost rails; or within the boundary fence where boundary fences are provided and are closer than 15 metres; or if the property boundary is less than 15 metres, the property boundary; or a permanent structure such as a fence, wall or level crossing separating the operating rail corridor from eased or non-operational land
FBA	Framework for Biodiversity Assessment
FM Act	*Fisheries Management Act 1994* (NSW)
IBRA	Interim Biogeographic Regionalisation for Australia (Version 7)
KP	Kilometre point (rail line kilometrage)
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	Office of Environment and Heritage (NSW)
PCT	Plant Community Type
PMST	Protected Matters Search Tool
Proposal	Construction and operation of the Narrabri to North Star section of the Melbourne to Brisbane Inland Rail.
proposal site	The area that would be directly affected by construction works. The proposal site is considered to have a width of 30 metres, providing for a 15 metre buffer on each side of the alignment centreline. It includes the location of proposal infrastructure, the area that would be directly disturbed by the movement of construction plant and machinery, and the location of the storage areas/compounds sites etc, that would be used to construct that infrastructure

SEARs	Environmental Assessment Requirements of the Secretary of the Department of Planning and Environment
SPRAT	Species Profile and Threats database (Commonwealth)
Strahler stream order	Classification system that gives a waterway an 'order' according to the number of tributaries associated with it
SSI	State Significant Infrastructure
TEC	Threatened Ecological Community
TSC Act	*Threatened Species Conservation Act 1995* (NSW)

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1.0 Introduction

1.1 Overview

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.

Australian Rail Track Corporation Ltd (ARTC) is seeking approval to construct and operate the Narrabri to North Star section of Inland Rail ('the proposal'), which consists of 188 kilometres of upgraded rail track and associated facilities (refer to **Figure 1.1**).

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). The proposal is also a controlled action under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act), and requires approval from the Australian Minister for the Environment and Energy.

This report has been prepared by Umwelt (Australia) Pty Limited (Umwelt) as part of the environmental impact statement (EIS) for the proposal. The EIS has been prepared to accompany the application for approval of the proposal, and addresses the environmental assessment requirements of the Secretary of the Department of Planning and Environment (the SEARs), issued on 8 November 2016.

1.1 Designated Proponent

Australian Rail Track Corporation Ltd (ARTC) ('the proponent') is seeking approval to construct and operate the Narrabri to North Star section of Inland Rail ('the proposal').

1.2 Current Status of Proposal

Attachment A to the SEARs refers to the 'action', however, for consistency with remainder of the EIS, this document uses the term 'proposal'.

The proposal was deemed to be a controlled action on 26 September 2016 as result of the likely impacts to Matters of National Environmental Significance (MNES) protected under the EPBC Act namely threatened species and communities (sections 18 & 18A). The proposal is to be assessed in accordance with the NSW Assessment Bilateral Agreement (2015) and guidelines for preparing assessment documentation provided in the SEARs.

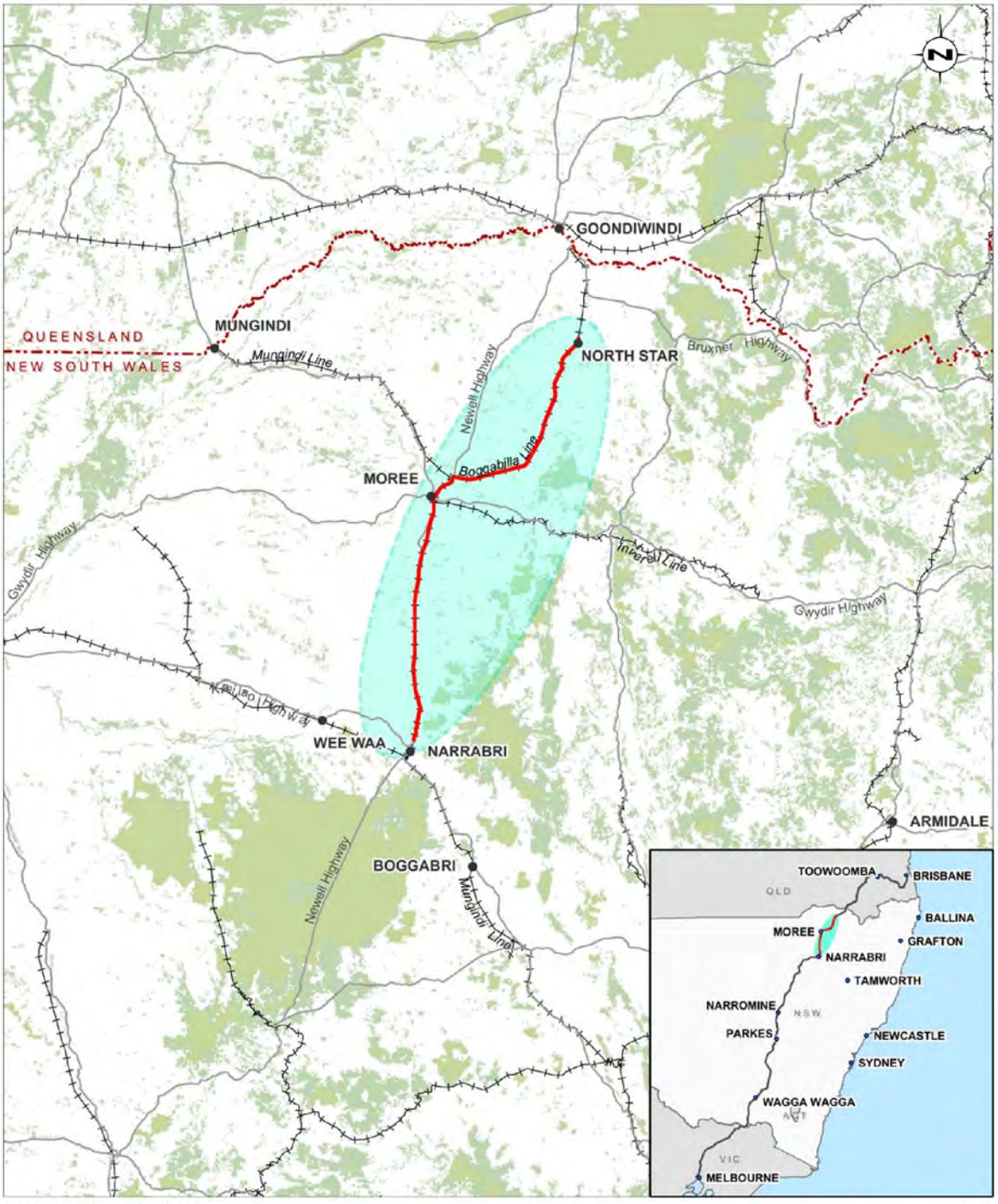

Image Source: GHD (2017)

LEGEND

- Proposal site
- Proposal location
- Main road
- Railway
- State border

FIGURE 1.1

Location of the Proposal

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1.3 Location of the Proposal

For the purposes of this Assessment of Commonwealth Matters report the location of the proposal is the proposal site shown on **Figure 1.2**. The proposal site comprises the portion of the proposal that will be subject to impact. The proposal site varies along the length of the proposal depending on the construction activities that are proposed in any given area. The additional assessment area, as also shown on **Figure 1.3**, relates to additional areas outside the proposal site and includes an approximate 60 metre buffer around culverts/underbridges and overbridges, an approximate 120 metre buffer around level crossings and some other areas that were surveyed to provide design flexibility for future planning.

1.3.1 Location

The proposal is generally located in the existing rail corridor between the towns of Narrabri and North Star. The location of the proposal is shown in **Figure 1.3** and described in **Table 1.1**.

Table 1.1 Location in the Landscape

Narrabri to North Star Proposal site	
IBRA Bioregions	Brigalow Belt South Darling Riverine Plains
IBRA Subregions	Northern Basalts Northern Outwash Castlereagh-Barwon
Major Catchment Areas	Border Rivers Gwydir Namoi
Mitchell Landscapes	Belata Sands Croppa Clay Plains Croppa Creek Channels and Floodplains Gwydir Alluvial Plains Gwydir Channels and Floodplains Kaputar Slopes Liverpool Alluvial Plains Namoi Channels and Floodplains Yallaroi Basalts
LGAs	Gwydir Moree Plains Narrabri

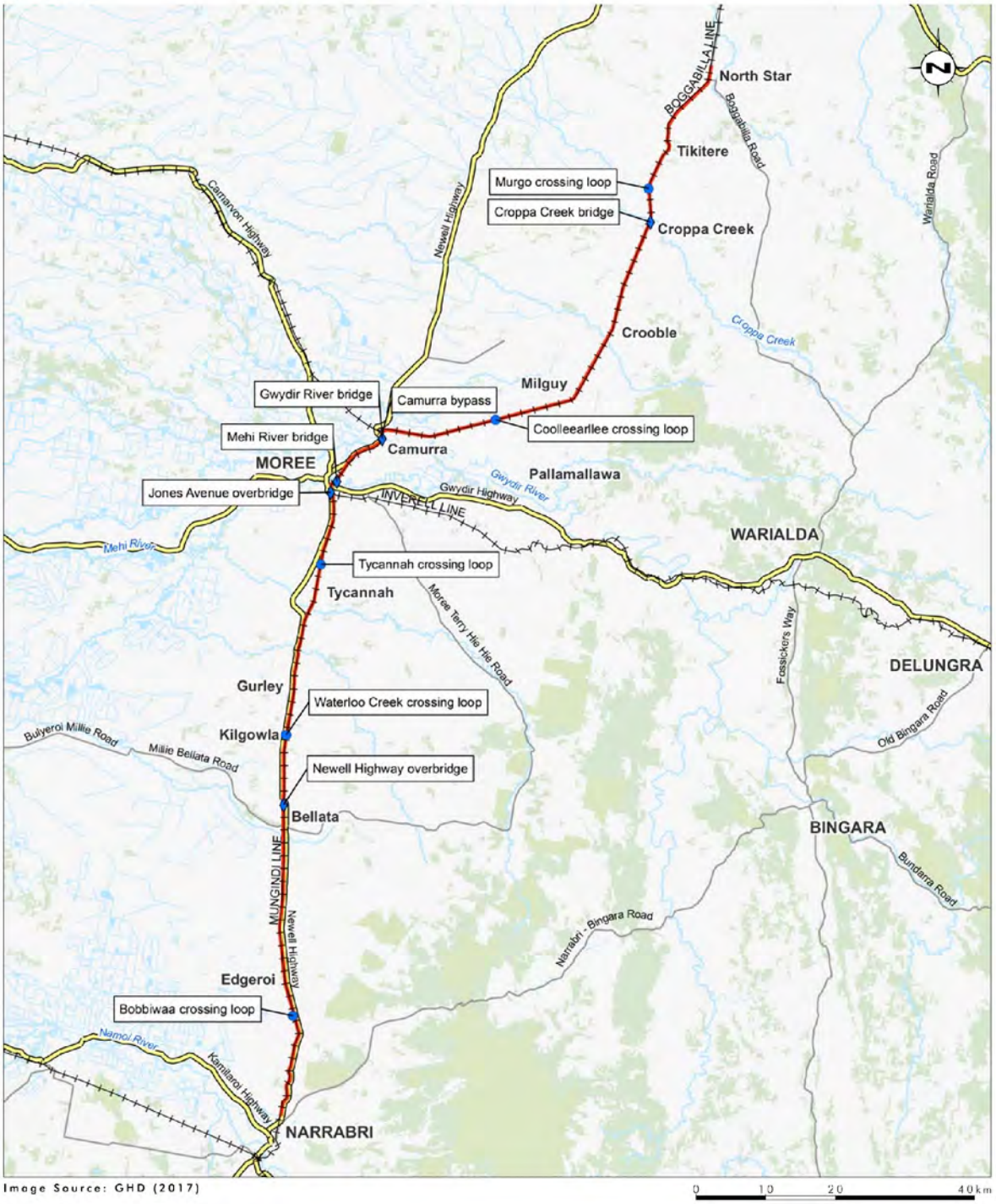

Image Source: GHD (2017)

LEGEND

- New bridge
- Crossing loop
- The proposal
- Railway
- Highway
- Road

FIGURE 1.2

Key Features of the Proposal

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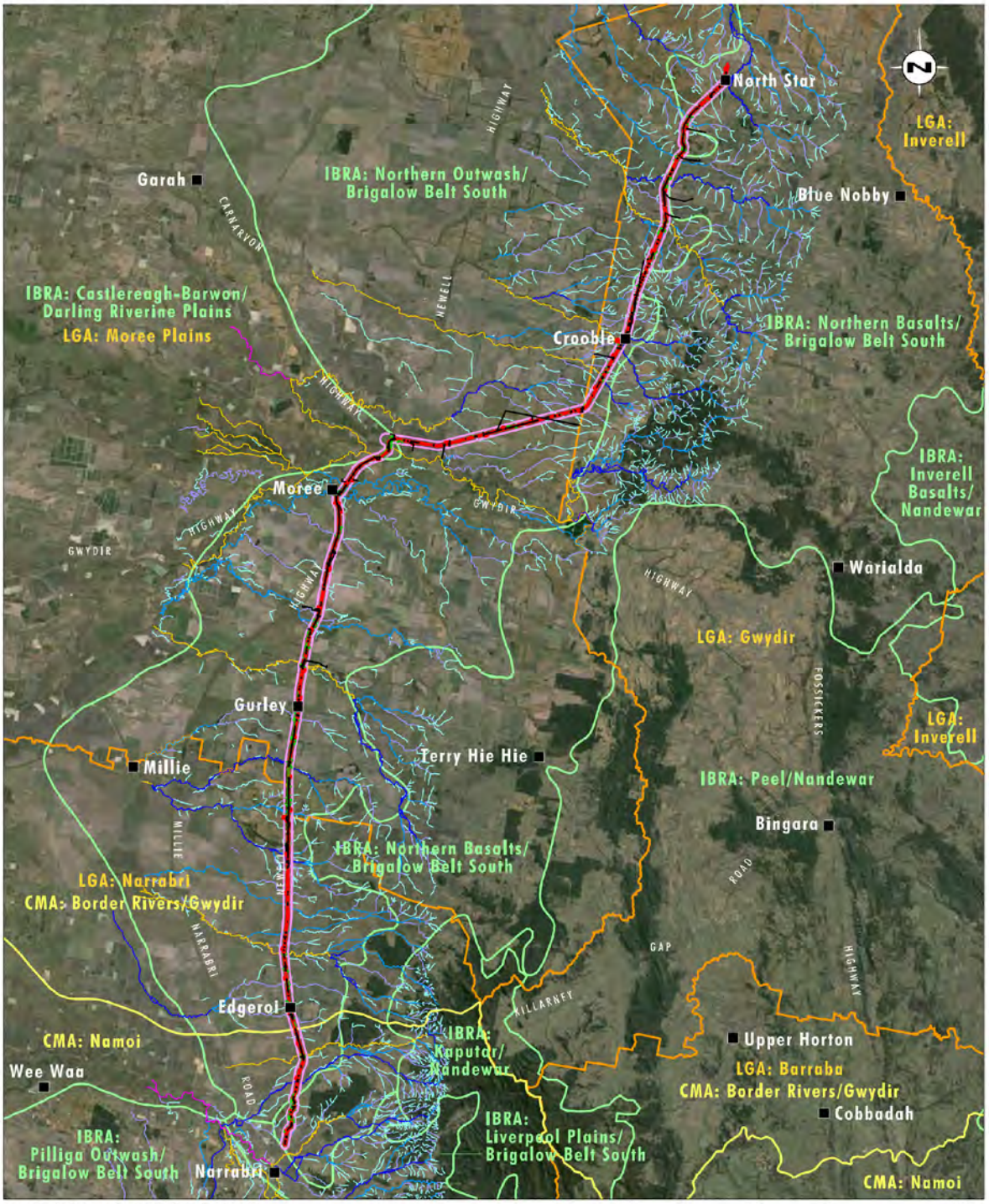

Image Source: Google Earth (2013)
Data Source: Geoscience Australia (2009), GHD (2017), Umwelt (2016)

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Legend

- Proposal Site
- Additional Assessment Area
- 550m Buffer Area
- IBRA Regions and Subregion Areas
- Local Government Area
- Catchment Management Authority
- Native Vegetation Area
- Town Location

Stream Order:
- 1st Order
- 2nd Order
- 3rd Order
- 4th Order
- 5th Order
- 6th Order

FIGURE 1.3

Narrabri to North Star Proposal Site

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The coordinates of the turning points of the rail line from south to north are as identified in **Table 1.2**.

Table 1.2 Coordinates of the proposal

Longitude (I)	Latitude (I)	Longitude (I)	Latitude (I)
149°47'17.8"" E	30°2'55.9"" S	149°51'9.7"" E	29°30'59.7"" S
149°47'18.6"" E	29°48'58.2"" S	149°51'11.1"" E	29°29'59.7"" S
149°47'31.9"" E	30°0'10.1"" S	149°51'18.3"" E	29°27'57.0"" S
149°47'46.6"" E	30°17'26.3"" S	149°52'33.2"" E	29°26'11.0"" S
149°47'56.7"" E	30°7'9.2"" S	149°53'39.8"" E	29°25'28.4"" S
149°47'58.9"" E	30°16'21.7"" S	149°54'32.4"" E	29°25'11.9"" S
149°48'0.3"" E	29°44'35.3"" S	149°55'15.9"" E	29°24'42.6"" S
149°48'3.9"" E	29°42'57.6"" S	149°55'17.4"" E	29°24'6.8"" S
149°48'14.0"" E	30°15'5.1"" S	149°55'24.2"" E	29°23'56.5"" S
149°48'18.3"" E	29°41'7.5"" S	149°55'35.7"" E	29°23'49.9"" S
149°48'19.8"" E	30°15'55.1"" S	149°59'43.0"" E	29°24'14.1"" S
149°48'19.8"" E	29°41'29.5"" S	150°11'54.2"" E	29°21'9.2"" S
149°48'24.1"" E	30°13'54.5"" S	150°12'17.2"" E	29°20'56.4"" S
149°48'28.8"" E	30°14'41.2"" S	150°15'34.2"" E	29°15'25.7"" S
149°48'29.8"" E	29°40'33.3"" S	150°16'24.6"" E	29°12'9.3"" S
149°48'32.0"" E	30°14'20.0"" S	150°18'25.5"" E	29°4'18.6"" S
149°48'34.9"" E	30°13'29.4"" S	150°18'39.6"" E	29°6'48.6"" S
149°48'49.6"" E	29°38'50.6"" S	150°19'33.6"" E	29°1'56.1"" S
149°48'54.0"" E	30°11'48.5"" S	150°19'55.5"" E	29°0'44.8"" S
149°49'13.4"" E	30°10'57.0"" S	150°20'4.1"" E	28°59'26.9"" S
149°49'37.2"" E	29°37'14.3"" S	150°20'4.5"" E	29°1'23.1"" S
149°50'20.0"" E	29°33'23.7"" S	150°20'7.0"" E	29°1'4.8"" S
149°50'53.5"" E	29°28'38.1"" S	150°20'42.0"" E	28°58'30.8"" S
149°50'53.8"" E	29°28'11.8"" S	150°23'20.0"" E	28°56'9.1"" S
149°51'6.1"" E	29°29'8.5"" S	150°23'38.4"" E	28°54'45.3"" S
150°23'37.8"" E	28°54'45.0"" S	150°23'38.9"" E	28°54'45.1"" S

1.3.2 Size

The proposal site covers approximately 896 hectares.

1.4 Relationship to Other Actions

The proposal forms one of 13 sections of the Inland Rail. Currently the Parkes to Narromine section of Inland Rail is the only other section to be referred to the Department of Environment and Energy (DoEE). Similar to the Narrabri to North Star proposal, the Parkes to Narromine section of Inland Rail was determined to be a controlled action and is being assessed under the NSW Assessment Bilateral Agreement.

The relative location of the Narrabri to North Star section, Parkes to Narromine and other sections of the Inland Rail proposal are shown on **Figure 1.4**.

1.5 Purpose and Scope of this Report

The purpose of this report is to assess potential biodiversity issues from the operation and construction of the proposal, and where required, identify feasible and reasonable mitigation measures. Based on the information provided in the referral, and additional information provided on 19 August 2016, the DoEE consider the proposal is likely to have a significant impact on matters of national environmental significance (MNES), including but not limit to:

- the removal of 268 ha of the critically endangered Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern New South Wales and Southern Queensland reducing an already greatly reduced ecological community and increasing the fragmentation of an important population.

- the removal of 159 ha of foraging habitat for the vulnerable Koala (*Phascolarctos cinereus*) combined populations of Old, NSW and the ACT.

As outlined in **Section 1.1**, this Assessment of Commonwealth Matters report has been prepared to address the SEARs for the proposal. **Table 1.3** outlines the requirements relevant to this assessment.

Legend

- Existing Track
- New Track
- Upgrade Track

FIGURE 1.4

Inland Rail Project

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Table 1.3 SEARs Related to Commonwealth Matters of National Environmental Significance and where they are addressed in the report

SEARs Attachment A	Where Addressed
General Requirements – Project Description	
4. The title of the action, background to the development and current status.	Section 1.0
5. The precise location and description of all works to be undertaken (including associated offsite work and infrastructure), structures to be built or elements of the action that may have impacts on matters of national environmental significance (MNES)	Section 2.0 Figures 1.1 and 1.2
6. How the action relates to any other actions that have been, or are being taken, in the region affected by the action.	Section 1.4
7. How the works are to be undertaken and design parameters of those aspects of the structures or elements of the action that may have relevant impacts on MNES.	Section 2.0
Impacts	
8. The EIS must include an assessment of the relevant impacts of the action on threatened species and communities; including	
• a description and detailed assessment of the nature and extent of the likely direct, indirect and consequential impacts, including short term and long term relevant impacts;	Section 4.1
• a statement whether any relevant impacts are likely to be known, unpredictable or irreversible;	Section 4.1.3
• analysis of the significance of relevant impacts;	Section 4.2
• any technical data and other information used or needed to make a detailed assessment of the relevant impacts; and	Section 4.4.2
• a comparative description of the impacts of alternatives, if any, on the threatened species and communities.	Section 5.1.2
Avoidance, mitigation and offsetting	
9. For each of the relevant matters protected that are likely to be impacted by the development, the EIS must provide information on proposed avoidance and mitigation measures to deal with the relevant impacts of the action, including:	
• a description and an assessment of the expected or predicted effectiveness of the mitigation measures;	Section 5.5
• any statutory policy basis for the mitigation measures;	Section 5.2
• the cost of mitigation measures;	

SEARs Attachment A	Where Addressed
• a description of the outcomes that the avoidance and mitigation measures will achieve; • and outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action; • a description of the offsets proposed to address the residual adverse significant impacts and how these offsets will be established.	Section 5.2 Table 5.2 Section 5.6
10. Where a significant residual adverse impact to a relevant protected matter is considered likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit associated with the proposed offset strategy.	Section 5.6
Key Issues – Biodiversity	
11. The EIS must address the following issues in relation to biodiversity including separate: • Identification of <u>each EPBC</u> Act listed threatened species and community likely to be impacted by the development. • Any likely impacts must be described for each matter and, if there are impacts, how these impacts are avoided, mitigated and if required offset. Note that only significant residual adverse impacts are required to be offset.	Appendix A and Section 4.2 Section 4.6
12. For <u>each</u> of the relevant EPBC Act listed threatened species and communities likely to be impacted by the developments the EIS must provide a separate: • description of the habitat and habits (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans, threat abatement plans and wildlife conservation plans; and • details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements. • description of the impacts of the action having regard to the full national extent of the species or community's range. (Note: the relevant guidelines and policy statements for each species and community are available from the Department of the Environment Species Profiles and Threats Database)	Appendix A and Table 2.4 Section 3.1 Section 4.2 and Appendix B

SEARs Attachment A	Where Addressed
13. For each of the relevant EPBC Act listed threatened species and communities likely to be impacted by the development the EIS must provide a separate: • identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account • detailed of how the current published NSW Framework for Biodiversity Assessment (FBA) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts; • details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the development in accordance with the FBA and/or mapping and descriptions of the extent and condition of the relevant habit and/or threatened communities occurring on proposed offset sites. (Note: for the purposes of approval under the EPBC Act, it is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposal i.e. 'like for like'. In applying the FBA, residual impacts on EPBC Act listed threatened ecological communities must be offset with plant community type (s) (PCT) that are ascribed to the specific EPBC listed ecological community. PCTs from a different vegetation class will not generally be acceptable as offsets for EPBC listed communities.)	Section 5.0 Section 5.6 Section 5.6
14. Any significant residual impacts not addressed by the FBA may need to be addressed in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* Environmental Offset Policy. (Note: if the EPBC Act Environmental Offset Policy is used to calculate proposed offsets for a threatened species or community you may wish to seek further advice from the Department of Planning and Environment.)	Section 5.6
15. For each threatened species and community likely to be impacted by the development, the EIS must provide reference to, and consideration of, relevant approved conservation advice or recovery plan for the species or community. (Note: the relevant guidelines and policy statements for each species and community are available from the Department of the Environment Species Profiles and Threats Database)	Appendix B and Section 3.3
Environmental Record of person proposing to take action	
16. Information in relation to the environmental record of a person proposing to take action must include details as prescribed in Schedule 4 Clause 6 of the EPBC Regulations 2000.	Section 7.0
Information sources	
For information given in the EIS, the EIS must state the source of the information, how recent the information is, how the reliability of the information was tested; and what uncertainties (if any) are in the information.	Section 4.2.2

2.0 Description of the Proposal

2.1 The Proposal

2.1.1 Location

The proposal is generally located in the existing rail corridor between the town of Narrabri and the village of North Star, via Moree. The location of the proposal is shown in **Figure 1.1**.

2.1.2 Key Features

The key features of the proposal involve:

- upgrading the track, track formation, and culverts within the existing rail corridor for a distance of 188 kilometres between Narrabri and North Star
- realigning the track where required within the existing rail corridor to conform with required platform clearances for Inland Rail trains to minimise the radius of tight curves
- providing five new crossing loops within the existing rail corridor, at Bobbiwaa, Waterloo Creek, Tycannah Creek, Coolleearllee, and Murgo
- providing a new section of rail line at Camurra, about 1.6 kilometres long, to bypass the existing hairpin curve (the Camurra bypass)
- removing the existing bridges and providing new rail bridges over the Mehi and Gwydir rivers and Croppa Creek
- realigning about 1.5 kilometres of the Newell Highway near Bellata, and providing a new road bridge over the existing rail corridor (the Newell Highway overbridge)
- providing a new road bridge over the existing rail corridor at Jones Avenue in Moree (the Jones Avenue overbridge).

The key features of the proposal are shown in **Figure 1.2**.

Ancillary work would include works to level crossings, signalling and communications, signage and fencing, and services and utilities.

Further information on the proposal is provided in the EIS.

2.1.3 Timing

Subject to approval of the proposal, construction is planned to start in early to mid 2018, and is expected to take about 24 months. Existing train operations along the Narrabri to North Star line would continue prior to, during, and following construction. Inland Rail as a whole is expected to be operational in 2025.

2.1.4 Operation

Prior to the opening of Inland Rail as a whole, the proposal would be used by existing rail traffic, which includes trains passengers and grain at an average rate of about four trains per day. It is estimated that the operation of Inland Rail would involve an annual average of about 10 trains per day travelling north of Moree (between North Star and Moree) and 12 trains per day travelling south of Moree (between Moree and Narrabri) in 2025. This would increase to about 19 trains per day north of Moree (between North Star and Moree) and 21 trains per day south of Moree (between Moree and Narrabri) in 2040. The trains would be a mix of grain, intermodal (freight), and other general transport trains.

Once operational in 2020, the proposal would enable increased train running speeds in many areas that are currently the subject of restrictions due to local track conditions. Daily average train volumes are not expected to significantly change until Inland Rail through connection in 2025.

3.0 Methods

A detailed description of the flora and fauna surveys undertaken within the proposal site can be found in Section 2.0 of the *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* (Umwelt 2017a) and in the *ARTC Inland Rail – Narrabri to North Star Aquatic Ecology Assessment* (Umwelt 2017b) of the EIS. A summary of the survey methodology is provided below.

During all biodiversity surveys, consideration was given to relevant Commonwealth threatened species survey guidelines, conservation listing advice, recovery plans and policy statements so that appropriate survey techniques were employed, including seasonal considerations.

The threatened species and ecological communities known or likely to occur within the proposal site were identified through database searches, review of previous studies and detailed field surveys. The database searches included:

- EPBC Protected Matters Search Tool conducted on 20/12/16 and 30 March 2017 (refer to **Appendix A**)
- OEH Atlas of NSW Wildlife (April 2016 and March 2017)
- NSW DPI - Fishing and Aquaculture – Threatened and protected species record viewer (May 2016).

Following the identification of species and communities to be targeted in the surveys, the native vegetation assessment commenced with desktop reviews prior to completing comprehensive field surveys over several seasons to identify the communities and threatened flora species present within the proposal site. The following activities were undertaken:

- literature and database review (see Section 2.3.1 of *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a and Section 2.1 of the *ARTC Inland Rail – Narrabri to North Star Aquatic Ecology Assessment* – Umwelt 2017b)
- digital aerial photograph interpretation (see Section 2.3.2 of *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a)
- systematic plot/transect surveys (see Section 2.3.3 of *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a)
- semi-quantitative rapid sampling (see Section 2.3.4 of *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a)
- meandering transects (see Section 2.3.5 of *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a)
- vegetation mapping (see Section 2.3.7 of *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a), and
- targeted surveys for threatened flora species predicted to occur in the proposal site (see **Table 3.1**).

A total of 54 systematic plots/transect surveys and 287 rapid vegetation assessments were conducted across the proposal site during the surveys undertaken for this assessment (refer to Figures A1-A56 in Appendix A of the BAR). These surveys were undertaken over 20 days and three survey periods, being:

- 25 – 29 September 2014
- 3 – 12 February 2016, and
- 20 – 24 April 2016.

Targeted threatened fauna surveys were undertaken over 16 days and three survey periods in July 2015, December 2015 and April 2016 with consideration of the survey guidelines for Australia's threatened mammals (DSEWPC 2011a), bats (DSEWPC 2010a), birds (DSEWPC 2010b), fish (DSEWPC 2011b), reptiles (DSEWPC 2011c) and frogs (DSEWPC 2010c).

In order to identify the range of threatened fauna species occurring in the proposal site the following survey methods were utilised:

- habitat assessment
- diurnal bird area searches
- diurnal reptile/amphibian area searches
- nocturnal spotlighting
- nocturnal amphibian surveys in appropriate freshwater wetland habitat
- nocturnal call playback surveys
- nocturnal Anabat surveys targeting micro-bat species
- targeted fauna species inspections of cavities and expansion joints of timber, steel and concrete bridges
- targeted surveys for threatened species (see **Table 3.1**).

The locations of survey sites are shown on Figures A1-A56 in Appendix A of the *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* (Umwelt 2017a).

Table 3.1 Summary of Targeted Surveys Completed for EPBC Act-listed Threatened Species listed Predicted to Occur in the Proposal site*

Species	Status EPBC Act	Required Survey Period**	Survey Technique, Timing and Location
Flora			
Androcalva procumbens	V	August - May	Targeted threatened flora searches in suitable habitat undertaken in September 2014 and February 2016 throughout the proposal site. Opportunistic observations undertaken throughout all Umwelt survey periods.
austral toadflax *Thesium australe*	V	September-February	Targeted threatened flora searches in suitable habitat undertaken in September 2014 and February 2016 throughout the proposal site. Opportunistic observations undertaken throughout all Umwelt survey periods.
Belson's panic *Homopholis belsonii*	E	December - April	Targeted threatened flora searches in suitable habitat undertaken in September 2014, February and April 2016 throughout the proposal site. Opportunistic observations undertaken throughout all Umwelt survey periods.
bluegrass *Dichanthium setosum*	V	December - May	Targeted threatened flora searches in suitable habitat undertaken in September 2014, February and April 2016 throughout the proposal site. Opportunistic observations undertaken throughout all Umwelt survey periods.
slender darling pea *Swainsona murrayana*	V	September - February	Targeted threatened flora searches in suitable habitat undertaken in September 2014, February and April 2016 throughout the proposal site. Opportunistic observations undertaken throughout all Umwelt survey periods.
spiny peppercress *Lepidium aschersonii*	V	September - May	Targeted threatened flora searches in suitable habitat undertaken in September 2014, February and April 2016 throughout the proposal site. Opportunistic observations undertaken throughout all Umwelt survey periods.
ooline *Cadallia pentastylis*	V	All year	Targeted threatened flora searches in suitable habitat undertaken in September 2014, February and April 2016 throughout the proposal site. Opportunistic observations undertaken throughout all Umwelt survey periods.
Tylophora linearis	E	September - May	Targeted threatened flora searches in suitable habitat undertaken in September 2014, February and April 2016 throughout the proposal site. Opportunistic observations undertaken throughout all Umwelt survey periods.
Reptiles			
five-clawed worm-skink *Anomalopus mackayi*	V	All year	Diurnal reptile searches undertaken in December 2015 at all sites except Site 8. Opportunistic observations undertaken throughout all Umwelt survey periods.

Species	Status EPBC Act	Required Survey Period**	Survey Technique, Timing and Location
Dunmall's snake *Furina dunmalli*	V	October – April	Spotlighting surveys in suitable habitat undertaken in December 2015 at all sites except for Site 8. Opportunistic observations undertaken throughout all Umwelt survey periods.
Border Thick-tailed Gecko *Uvidicolus sphyrurus*	V	All year	Spotlighting surveys in suitable habitat undertaken in December 2015 at all sites except for Site 8. Opportunistic observations undertaken throughout all Umwelt survey periods.
Birds			
regent honeyeater *Anthochaera phrygia*	CE	All year	Targeted diurnal bird surveys undertaken in December 2015 at all sites within the proposal site. Targeted winter surveys were not undertaken as there are no records of this species within 10 kilometres of the proposal site (OEH 2016d). Key foraging habitat in accordance with the National Recovery Plan (DoE 2016b) was not identified within the proposal site.
squatter pigeon *Geophaps scripta scripta*	V	All year	Diurnal bird surveys undertaken in December 2015 at all sites within the proposal site. Opportunistic observations undertaken throughout all Umwelt survey periods.
painted honeyeater *Grantiella picta*	V	Not specified in TSPD, however assumed to be all year.	Diurnal bird surveys undertaken in December 2015 at all sites within the proposal site. Opportunistic observations undertaken throughout all Umwelt survey periods.
swift parrot *Lathamus discolor*	CE	Not specified in TSPD, however assumed to be May to October.	Targeted winter surveys were not undertaken as there are no records of this species within 10 kilometres of the proposal site (OEH 2016d). Key foraging habitat in accordance with the National Recovery Plan (Saunders and Tzaros 2011) was not identified within the proposal site.
superb parrot *Polytelis swainsonii*	V	September - December	Diurnal bird surveys undertaken in December 2015 at all sites within the proposal site. Targeted hollow habitat searches throughout the proposal site. Opportunistic observations undertaken throughout all Umwelt survey periods.
Mammals			
koala *Phascolarctos cinereus*	V	All year	Spotlighting surveys in suitable habitat undertaken in December 2015 at all sites within the proposal site except Site 8. Spot Assessment Technique (SAT) surveys in suitable habitat undertaken in December 2015 at all sites within the proposal site except Site 8. Opportunistic observations undertaken throughout all Umwelt survey periods.

Species	Status EPBC Act	Required Survey Period**	Survey Technique, Timing and Location
grey-headed flying-fox *Pteropus poliocephalus*	V	September - May	Spotlighting surveys in suitable habitat undertaken in December 2015 at all sites except Site 8. Opportunistic observations undertaken throughout all Umwelt survey periods.
large-eared pied bat *Chalinolobus dwyeri*	V	September - April	Echolocation surveys using SD1 Anabat Recorders undertaken in December 2015 at all sites except Sites 8, 9, 12, 13 and 14. Targeted inspections of timber, steel and concrete bridges for roosting bats in September 2014.
Pilliga mouse *Pseudomys pilligaensis*	V	Not specified in TSPD	Targeted surveys were not undertaken for this species. Habitat assessments were used to identify potential habitat for this species.
Fish			
Murray cod *Maccullochella peelii*	V	Not applicable – TSPD does not cover aquatic species	No targeted surveys were undertaken for this species, however database, literature reviews and detailed aquatic habitat assessments were completed.

*Refer to the *Australian Rail Track Corporation Inland Rail – Narrabri to North Star Biodiversity Assessment Report* (Umwelt 2017a) and *Australian rail Track Corporation Inland Rail – Narrabri to North Star Aquatic Assessment Ecology* (Umwelt 2017b) for detailed discussions regarding surveys undertaken within the proposal site

**As specified in the NSW Threatened Species Profile Database which identifies required survey periods for threatened species.

Source: Table 2.3 and Table 2.4 of the *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* (Umwelt 2017a).)

Aquatic habitat assessments included stream order mapping of watercourses in keeping with the Strahler order system (see Section 2.2 of the *ARTC Inland Rail – Narrabri to North Star Aquatic Ecology Assessment* – Umwelt 2017b), preliminary mapping of the broad scale aquatic habitats within the proposal site was undertaken using recent aerial photography in conjunction with topographic maps prior to field surveys. Topographic maps were used to gain a broad understanding of catchment characteristics including adjacent land use, elevation, access routes, distance from source and location of barriers to fish passage, such as dams and weirs.

An assessment of the aquatic habitat characteristics within each of the sampling sites was undertaken, and indicators of stream condition were also noted. The aquatic habitat characteristics were recorded using standard recording sheets (adapted from those developed for the AUSRIVAS sampling protocol for low gradient streams available as a web resource (AUSRIVAS 2007)).

This data together with vegetation mapping assisted with key fish habitat classification and habitat sensitivity analysis for major watercourses along the proposal site. Full details are provided in Section 2 and Section 3 of the *ARTC Inland Rail – Narrabri to North Star Aquatic Ecology Assessment* – Umwelt 2017b.

4.0 Impact Assessment

The controlled action notification identified the following MNES as likely to be significantly impacted by the proposal:

- critically endangered Natural Grassland on Basalt and Fine-texture Alluvial Plains of Northern New South Wales and Southern Queensland
- koala (*Phascolarctos cinereus*) combined populations of Qld, NSW and the ACT.

The controlled action notification identified the following MNES as at risk of potential impact by the proposal:

- White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC
- regent honeyeater - *Anthochaera phrygia*
- squatter pigeon - *Geophaps scripta scripta* (southern)
- painted honeyeater – *Grantiella picta*
- swift parrot – *Lathamus discolor*
- superb parrot – *Polytelis swainsonii*
- Murray cod – *Maccullochella peelii*
- Pilliga mouse – *Pseudomys pilligaensis*
- *Androcalva procumbens*
- ooline- *Cadellia pentastylis*
- bluegrass – *Dichanthium setosum*
- *Tylophora linearis*
- five-clawed worm-skink – *Anomalopus mackayi*
- pink-tailed worm-lizard – *Aprasia parapulchella*
- border thick-tailed gecko – *Uvidicolus sphyrurus.*

In addition to the above species, investigations completed in the *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* (Umwelt 2017a) have identified a number of other EBPC Act listed threatened species that require further assessment. These include:

- Belson's panic - *Homopholis belsonii*,
- south-eastern long eared bat - *Nyctophilus corbeni*, and
- grey-headed flying-fox -*Pteropus poliocephalus.*

Attachment A of the SEARs requires an assessment of the relevant impacts of the proposal on threatened species and communities. This assessment is provided for the relevant species and communities in the following sections.

4.1 Nature and Extent of the Likely Short Term and Long Term Relevant Impacts

The construction and operation of the proposal will result in a range of direct impacts on MNES within the proposal site. Direct impacts include the loss of native vegetation and fauna habitats as a result of direct and permanent clearance works and track upgrades. The location and extent of direct (permanent) impacts corresponds to the area shown on **Figures 4.1, 4.1A** to **4.1I** as the proposal site.

For the purpose of this assessment, impacts of the proposal on MNES were assessed within the proposal site.

Construction of the proposal would include ancillary activities such as the establishment of construction compounds, the upgrade of existing access tracks, the construction of new access tracks and works to alter existing powerlines. For the purposes of the current assessment, ground surface impacts associated with ancillary activities were considered to potentially occur within the proposal site.

Two types of construction compound areas are proposed; minor compound/storage areas and larger compound sites. Minor compounds/storage areas are areas that would be used temporarily for the assembly of adjacent infrastructure such as culverts and turnouts. These compounds would be located within the rail corridor. Larger compound sites would be established for general construction activities associated with each stage of work, located within the proposal site.

The relevant impacts of the proposal are considered to be well known and predictable based on the extensive knowledge of the ecological values of the proposal site and a sound understanding of the impacts. The direct impacts of the proposal, as they relate to the clearing of threatened species habitat and ecological communities are predicted to be permanent.

Further information regarding the proposal is contained in the main text of the EIS, with summaries in the *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* (Umwelt 2017a) and in the *ARTC Inland Rail – Narrabri to North Star Aquatic Ecology Assessment* (Umwelt 2017b).

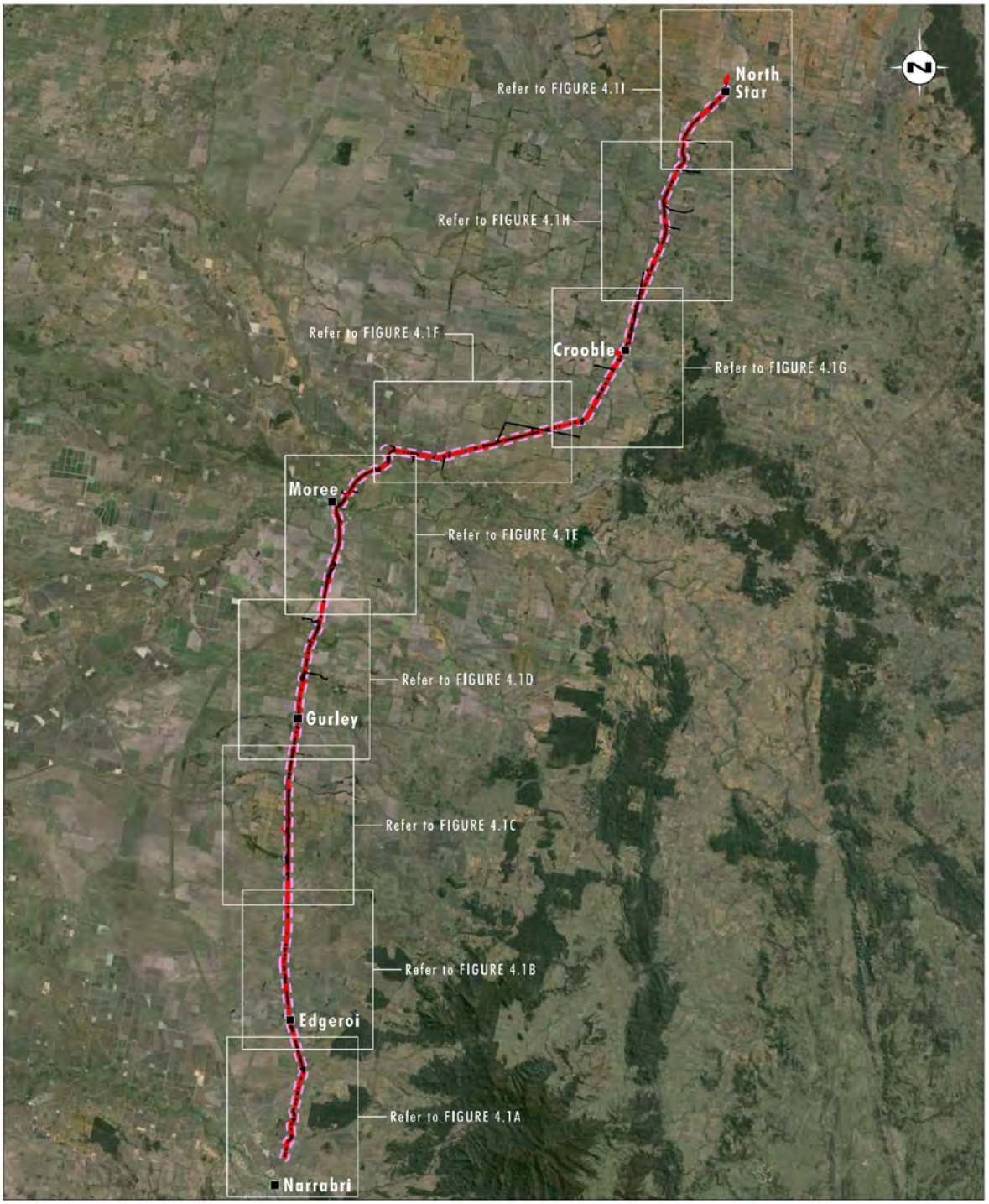

FIGURE 4.1

Proposal Site and Additional Assessment Area
Narrabri to North Star

File Name (A4): R09/3607_215.dgn
20170329 11.20

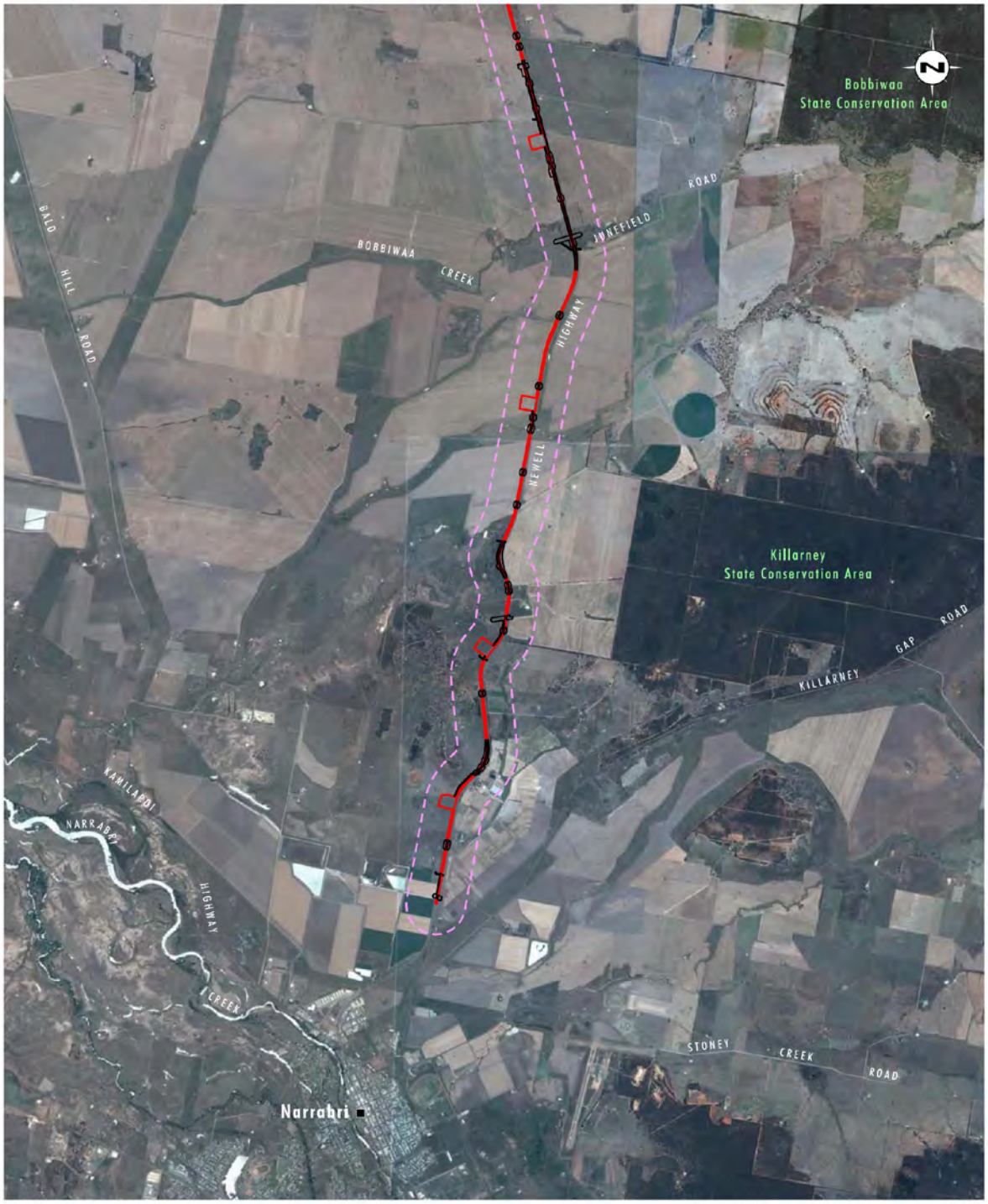

Image Source: Google Earth/DigitalGlobe (Nov 2015)
Data Source: Geoscience Australia (2009), GHD (2017)

0 1.0 2.5 5.0km
1:100 000

Legend

- Proposal Site
- Additional Assessment Area
- 550m Buffer Area
- Town

FIGURE 4.1A

Proposal Site and Additional Assessment Area
Narrabri to North Star

File Name (A4): R09/3607_216.dgn
20170329 11.23

Image Source: Google Earth/DigitalGlobe (Nov 2015)
Data Source: Geoscience Australia (2009), GHD (2017)

0 1.0 2.5 5.0km
1:100 000

Legend

- Proposal Site
- Additional Assessment Area
- 550m Buffer Area
- Town

FIGURE 4.1B

Proposal Site and Additional Assessment Area
Narrabri to North Star

File Name (A4): R09/3607_217.dgn
20170329 11.25

Image Source: Google Earth/DigitalGlobe (Nov 2015)
Data Source: Geoscience Australia (2009), GHD (2017)

0 1.0 2.5 5.0km
1:100 000

Legend

- Proposal Site
- Additional Assessment Area
- 550m Buffer Area
- Town

FIGURE 4.1C

Proposal Site and Additional Assessment Area
Narrabri to North Star

File Name (A4): R09/3607_218.dgn
20170329 11.25

Image Source: Google Earth/DigitalGlobe (Nov 2015)
Data Source: Geoscience Australia (2009), GHD (2017)

0 1.0 2.5 5.0km
1:100 000

Legend

- Proposal Site
- Additional Assessment Area
- 550m Buffer Area
- Town

FIGURE 4.1D

Proposal Site and Additional Assessment Area
Narrabri to North Star

Image Source: Google Earth/DigitalGlobe (Nov 2015)
Data Source: Geoscience Australia (2009), GHD (2017)

0 1.0 2.5 5.0km
1:100 000

Legend

- Proposal Site
- Additional Assessment Area
- 550m Buffer Area
- Town

FIGURE 4.1E

Proposal Site and Additional Assessment Area
Narrabri to North Star

Image Source: Google Earth/DigitalGlobe (Jan 2016)
Data Source: Geoscience Australia (2009), GHD (2017)

0 1.0 2.5 5.0km
1:100 000

Legend
- Proposal Site
- Additional Assessment Area
- 550m Buffer Area

FIGURE 4.1F

Proposal Site and Additional Assessment Area
Narrabri to North Star

File Name (A4): R09/3607_221.dgn
20170329 11.27

Image Source: Google Earth/DigitalGlobe (Nov 2015)
Data Source: Geoscience Australia (2009), GHD (2017)

0 1.0 2.5 5.0km
1:100 000

Legend

- Proposal Site
- Additional Assessment Area
- 550m Buffer Area
- Town

FIGURE 4.1G

Proposal Site and Additional Assessment Area
Narrabri to North Star

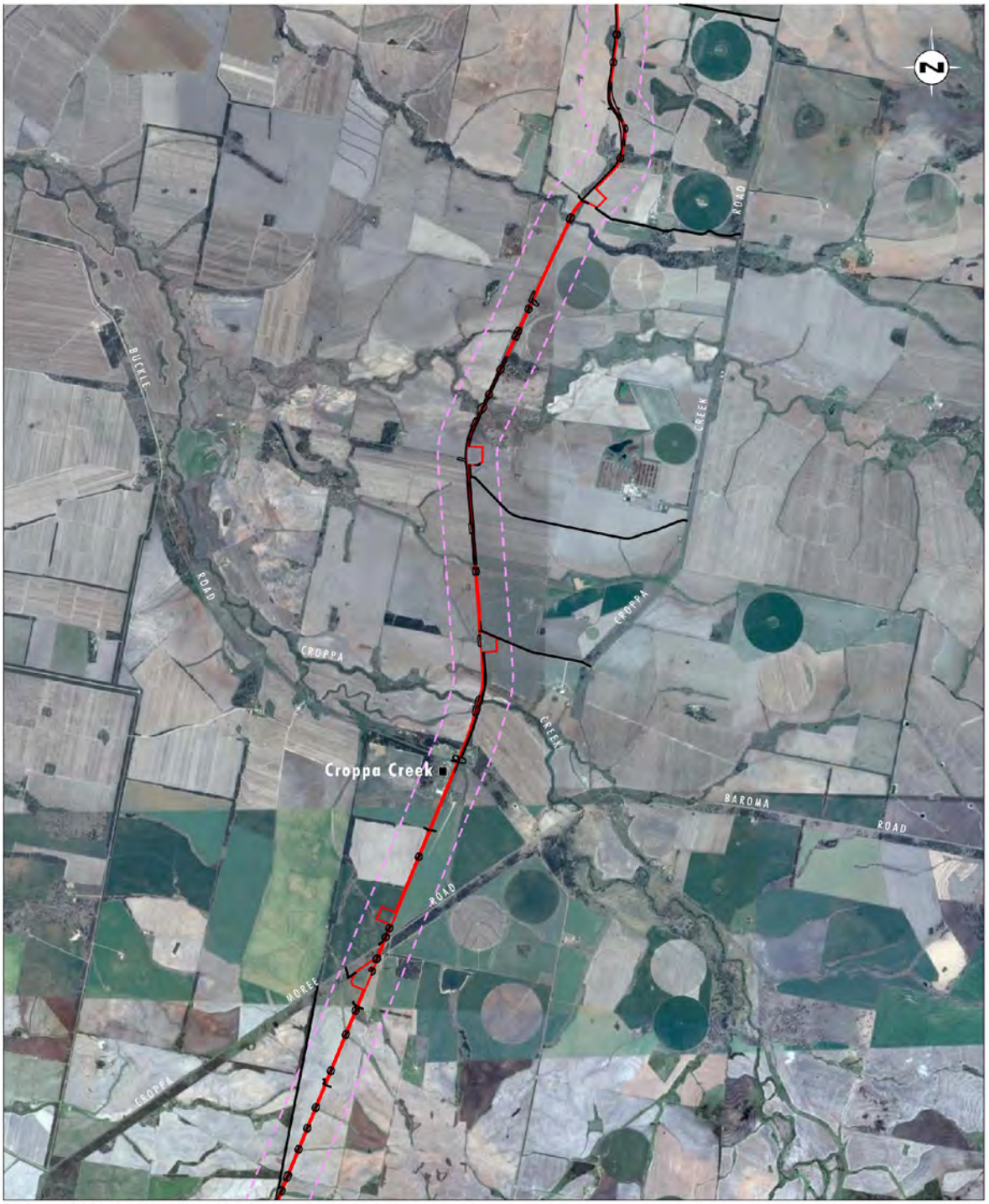

Image Source: Google Earth/DigitalGlobe (Nov 2015)
Data Source: Geoscience Australia (2009), GHD (2017)

0 1.0 2.5 5.0km
1:100 000

Legend

- Proposal Site
- Additional Assessment Area
- 550m Buffer Area
- Town

FIGURE 4.1H

Proposal Site and Additional Assessment Area
Narrabri to North Star

Image Source: Google Earth/DigitalGlobe (Nov 2015)
Data Source: Geoscience Australia (2009), GHD (2017)

0 1.0 2.5 5.0km
1:100 000

Legend

- Proposal Site
- Additional Assessment Area
- 550m Buffer Area
- Town

FIGURE 4.1I

Proposal Site and Additional Assessment Area
Narrabri to North Star

File Name (A4): R09/3607_224.dgn
20170329 11.30

4.1.1 Direct and Permanent Impacts to Ecological Communities and Habitats

Table 4.1 outlines the impact of the proposal on ecological communities and habitats. A total of 225.5 hectares of vegetation will be directly impacted by the proposal, which includes species and communities listed under the EPBC Act. 671 hectares of cleared/non-native vegetation is also subject to direct impacts within the proposal site.

Table 4.1 Direct and Permanent Impacts of the Proposal on Ecological Communities and Values

EPBC Act Listed MNES	Corresponding Plant Community Type in the Proposal Site	Area Impacted in the Proposal Site (ha)
Weeping Myall Woodlands EEC	PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion *Moderate to Good*	1.38 ha (0.43 ha = EPBC Act EEC)
Brigalow (Acacia harpophylla dominant and co-dominant) EEC	PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion *Moderate to Good*	0.62 ha
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions EEC	PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion *Moderate to Good*	0.09 ha
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland CEEC	PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion *Moderate to Good_Natural Grassland*	146.72 ha
Poplar Box Grassy Woodland on Alluvial Plains Proposed EEC	PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW *Moderate to Good*	16.22 ha
*Poplar Box Grassy Woodland on Alluvial Plains Proposed EEC**	PCT56 (BR186; NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW *Moderate to Good_DNG*	56.39 ha

EPBC Act Listed MNES	Corresponding Plant Community Type in the Proposal Site	Area Impacted in the Proposal Site (ha)
Not listed under EPBC Act	PCT71 (BR127, NA126) Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and aeolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion *Moderate to Good*	0.04 ha
Not listed under EPBC Act	PCT78 (BR196, NA193) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion *Moderate to Good*	2.09 ha
Not listed under EPBC Act	PCT135 (BR284, NA271) Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion *Moderate to Good*	1.80 ha
Not listed under EPBC Act	PCT413 (BR346, NA348) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion *Moderate to Good*	0.11 ha
Total		**225.46**
Belson's panic (*Homopholis belsonii*) – vulnerable	PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion Moderate to Good	29 individuals recorded in 1.38 ha of this PCT
	PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion Moderate to Good	0.62 ha of potential habitat
Total Belson's panic (*Homopholis belsonii*) Habitat		**2 ha**

EPBC Act Listed MNES	Corresponding Plant Community Type in the Proposal Site	Area Impacted in the Proposal Site (ha)
koala (*Phascolarctos cinereus*) – vulnerable Vegetation containing koala feed trees and vegetation types (as per the TSPD)	PCT-39/BVT-BR130, NA129/Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion/Moderate - Good	0.09
	PCT-78/BVT-BR196, NA193/River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion/Moderate – Good	2.09
	PCT-56/BVT-BR186, NA182/Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW/Moderate – Good	13.44
Total Koala habitat		**15.62**
grey-headed flying-fox *Pteropus poliocephalus*	PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion *Moderate to Good*	0.62 ha
	PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion *Moderate to Good*	0.09 ha
	PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW *Moderate to Good*	16.22 ha
	PCT71 (BR127, NA126) Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and aeolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion *Moderate to Good*	0.04 ha

EPBC Act Listed MNES	Corresponding Plant Community Type in the Proposal Site	Area Impacted in the Proposal Site (ha)
	PCT78 (BR196, NA193) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion *Moderate to Good*	2.09 ha
	PCT413 (BR346, NA348) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion *Moderate to Good*	0.11 ha
Total grey-headed flying-fox habitat		**19.13**

*DNG form of the PCT56 (BR186; NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW may conform in part to the proposed Draft Conservation Advice for the Poplar Box Grassy Woodland on Alluvial Plains EEC. Patches lacking the canopy cover and tree regrowth are not considered part of this ecological community, except where these represent a gap in, or the edge of a larger patch, or where the tree layer is sparse between two patches across a short distance (up to 50 metres).

Poplar Box Grassy Woodland on Alluvial Plains was nominated for listing as a threatened ecological community in 2013 and is currently being assessed by the Commonwealth Threatened Species Scientific Committee for listing as endangered under the EPBC Act (DoEE undated). The ecological community is a type of temperate to semi-arid grassy eucalypt woodland that is sparsely scattered inland of the Great Dividing Range from around Cowra in NSW to near Collinsville in Queensland. This eucalypt woodland is mainly associated with alluvial plains including back plains, higher terraces and levees along rivers, ephemeral watercourses and depressions. The Bimbil Box Woodlands mapped within the proposal site are considered likely to conform to the description of this ecological community. Invitation to comment on the draft conservation advice for this ecological community ended on 10 March 2017 and it is anticipated that a decision on the status of this ecological community will be made by the Commonwealth Threatened Species Scientific Committee in late 2017.

As the proposal was deemed a controlled action prior to the listing of the community on the schedules of the EPBC Act, further assessment of the impact of the proposal on the community is not required. Section 158A of the EPBC Act provides that approval process decisions will not be affected by listing events that happen after a section 75 decision (a decision on whether or not an action is a controlled action) is made, and therefore, further assessment is not provided in this report.

Direct impacts of the proposal on aquatic ecology habitats include:

- removal of riparian vegetation on the banks of the watercourse within the proposal site may be required for some of the watercourse structures
- removal of in-stream vegetation – predominantly non-native grasses and weed species, though some small beds of sedges/reeds were noted in watercourses
- modified surface flow volume, rate or paths during construction

- water quality impacts including potential for increased sediment load, and risk of spills and pollution associated with construction equipment working in the watercourse.

4.1.2 Indirect and Potential Impacts

The construction of the proposal will result in temporary impacts relating to construction of facilities such as compounds and temporary access tracks. Native vegetation occurring in these areas is not expected to be fully impacted (i.e. will not be cleared) but will be subject to some disturbance and is expected to recover. While the vegetation and habitats in these areas will be impacted in the short term, it is considered that these areas will regenerate following the completion of the construction phase of the proposal. To facilitate the regeneration of temporary impact locations, a rehabilitation strategy will be prepared as part of the Construction Environmental Management Plan (CEMP).

Indirect and temporary impacts on aquatic habitat and species relates to the following activities:

- temporary obstruction of fish passage when constructing access tracks
- temporary obstruction of fish passage during removal of existing structures and construction of new structure
- modified surface flow volume, rate or paths during construction
- water quality impacts including potential for increased sediment load, and risk of spills and pollution associated with construction equipment working in the watercourse.

Some of the watercourses that intersect the proposal site comprise important aquatic ecosystems, in particular NSW DPI identified the Mehi River as having good fish community value; while Bobbiwaa and Spring Creek in the Namoi catchment and Ten Mile Creek, Bulldog Creek, Gurly Creek, Tycannah Creek and Gwydir River in the Gwydir catchment are identified as having moderate fish community value. Gehan Creek, Waterloo Creek and Gil Gil Creek were identified as having moderate fish community value but with a high alien presence. Small areas of these sensitive aquatic ecosystems will potentially be impacted by construction works where bridge demolition and replacement works will occur. Construction works in the vicinity of sensitive aquatic environments would be required to be undertaken in accordance with control measures to minimise and mitigate the potential for adverse water quality and fish habitat (including fish passage) impacts. The temporary construction impacts will occur in discrete areas where the rail corridor cross the watercourses and only a very small proportion of the aquatic habitat associated with the watercourses will be impacted. No long-term impacts are predicted.

4.1.3 Are any Relevant Impacts Likely to be Unknown, Unpredictable or Irreversible?

The relevant impacts of the proposal are considered to be well known and predictable based on the extensive knowledge of the ecological values of the proposal site and a sound understanding of the impacts of the proposal (e.g. clearing of vegetation, earthworks and water management). The direct impacts of the proposal, as they relate to the clearing of threatened species habitat and ecological communities listed under the EPBC Act are predicted to be permanent; however, a biodiversity offset strategy will be developed as part of the proposal in order to compensate for the residual impacts of habitat loss that cannot be adequately avoided or minimised.

4.2 Analysis of the Significance of Relevant Impacts

Following the completion of the database searches discussed in **Section 3.0**, an analysis of the EPBC Act listed threatened species and communities that could occur in the proposal site was undertaken. **Table 4.2** details the results of the EPBC Act protected matters database search which identified seven communities and 28 threatened species as known or predicted to occur in suitable habitat within 10km of the proposal site. The controlled action notification provided by DoEE identified a likely significant impact on the critically endangered Natural Grassland on Basalt and Fine-texture Alluvial Plains of Northern New South Wales and Southern Queensland and the koala, and the potential for impact on an additional ecological community and 13 threatened species. A further three species were recorded during field surveys within the proposal site and are therefore included in the preliminary impact assessment in **Table 4.2**.

Table 4.2 provides a description of the ecology of each threatened species and ecological community along with an assessment of the likelihood of occurrence including description of the outcomes of targeted surveys. For those threatened species and communities that were considered to be potentially significantly impacted by the proposal, an Assessment of Significance was undertaken in accordance with the EPBC Act Policy Statement 1.1 – Significant Impact Guidelines – Matters of National Environmental Significance (DoE 2013) (see **Appendix B**).

The EPBC Act Significant Impact Guidelines 1.1 states the following:

When deciding whether or not a proposal is likely to have a significant impact on a matter of national environmental significance, the precautionary principle is relevant. Accordingly, where there is a risk of serious or irreversible damage, a lack of scientific certainty about the potential impacts of an action will not itself justify a decision that the action is not likely to have a significant impact on a matter of national environmental significance.

In light of the above, where there was lack of scientific certainty, the maximum potential impact was assumed. The development of mitigation and offset strategies will be based on the outcomes of the impact assessment and the precautionary principle will also be applied in the development of the mitigation and offset strategies to ensure that uncertainties are compensated for with more robust mitigation or more substantial offset outcomes.

The assessments of significance were undertaken following an initial screening process to identify species that may be potentially significantly affected by the proposal (refer to **Table 4.2**), with a consequential full assessment of the likely significance of impacts being completed for these species (refer to **Appendix B**).

The assessments of significance do not take into account the range of impact mitigation strategies and biodiversity offsets proposed for the proposal, rather they consider the impacts of the proposal without any mitigation or offsetting, consistent with the requirements of both State and Commonwealth significant impact assessment guidelines (Department of the Environment 2013). The Assessment of Significance was completed for the threatened species and threatened ecological communities (TECs) identified in **Table 4.2**, either due to their recorded presence or the presence of potential habitat in the proposal site, and the potential for the species or TECs to be affected.

A summary of the impacts of the proposal on each of the species and communities identified in the controlled action notification is provided in the following sections.

Table 4.2 identifies the threatened species and TECs listed under the EPBC Act recorded or having the potential to occur within the proposal site based on the results of the searches of the OEH Atlas of NSW Wildlife Database (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a), DoEE Protected Matters Database (March 2017) and the Primary Industries Fishing and

Aquaculture Records Viewer (DPI 2016 in refer to *ARTC Inland Rail – Narrabri to North Star Aquatic Ecology Assessment* – Umwelt 2017b) and the controlled action notification provided by DoEE.

Any threatened species or threatened ecological communities considered to have the potential to be significantly impacted are further assessed in **Appendix B** with the outcomes of the assessments described below.

The following abbreviations or symbols are used in **Table 4.2**

V Vulnerable

E Endangered

CE Critically Endangered

EEC Endangered Ecological Community

CEEC Critically Endangered Ecological Community

PMST Protected Matters Search Tool

BAR *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* (Umwelt 2017a)

Table 4.2 Preliminary Assessment of the Proposal on MNES Recorded or with Potential to Occur within the Proposal Site

Species/Community Habitat Requirements and Ecological Information	Status	Preliminary Impact Assessment	Detailed Assessment Required?
Threatened Ecological Communities			
Brigalow (*Acacia harpophylla* dominant and co-dominant) Brigalow (*Acacia harpophylla* dominant and co-dominant) is listed as an endangered ecological community under the EPBC Act. This ecological community occurs within Queensland (Qld) and New South Wales (NSW) usually on heavy clay soils. In NSW this community is also listed under the TSC Act as Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains bioregions. The Brigalow ecological community is characterised by the presence of *Acacia harpophylla* as one of the most abundant tree species. *A. harpophylla* is either, dominant in the tree layer, or co-dominant with other species – notably *Casuarina cristata* (belah), other species of *Acacia*, or species of *Eucalyptus*. Occasionally these other species may be more common than *A. harpophylla* within the broad matrix of brigalow woodlands vegetation (TSSC 2013a). The estimated total current national extent of Brigalow (*Acacia harpophylla* dominant and co-dominant) is 804,264 hectares (TSSC 2001).	EEC	Predicted to occur in PMST search. Identified by DoEE as a community requiring further consideration. 0.62 ha of moderate to good condition Brigalow - Belah open forest/ woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion (PCT 35) occurs in the proposal site and will be subject to direct impacts.	Yes – refer to **Appendix B**.
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions Coolibah – Black Box Woodland of the Darling Riverine Plains and the Brigalow Belt South Bioregion is limited to the Darling Riverine Plains and Brigalow Belt South bioregions in northern NSW and southern Queensland. It is broadly characterised by a canopy dominated by coolibah (*Eucalyptus coolabah* subsp. *coolabah*) and black box (*Eucalyptus largiflorens*) with a grassy understorey (TSSC 2011).	EEC	Predicted to occur in PMST search. 0.09 ha of moderate to good condition Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion (PCT 39) on the floodplain near Gurley and on the levee of Tycannah Creek occurs in the proposal site and will be subject to direct impacts.	Yes– refer to **Appendix B**.

Species/Community Habitat Requirements and Ecological Information	Status	Preliminary Impact Assessment	Detailed Assessment Required?
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* is characterised by a canopy dominated by inland grey box (*Eucalyptus microcarpa*). Several other canopy species are also commonly associated with the EEC including, but not limited to bulloak (*Allocasuarina luehmannii*), kurrajong (*Brachychiton populneus*) and white cypress pine (*Callitris glaucophylla*).	EEC	Predicted to occur in PMST search however this community was not identified in proposal site during field investigations. Detailed vegetation survey and mapping did not identify any grey box or other associations characteristic of this community. *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* was not recorded in the proposal site and this community will therefore not be adversely impacted as a result of the proposal. Further detailed assessment is not required.	No
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD occurs from the Darling Downs in Queensland to Dubbo in New South Wales. Within this broad geographical area it is confined to where climate, soils and landform are conducive to the development of tussock grasslands. The community is typically dominated by tussock grasses in the genera *Austrostipa*, *Bothriochloa*, *Chloris*, *Enteropogon*, *Rytidosperma* or *Themeda* (TSSC 2008g, DSEWPaC 2012b).	CEEC	Predicted to occur in PMST search. Assessed by DoEE as likely to be significantly impacted by the proposal. 146.7 ha of moderate to good condition Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion/Native Grassland (PCT 52) will be directly impacted in the proposal site.	Yes – refer to **Appendix B**.
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions) Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions occurs within Queensland, New South Wales, the Northern Territory and Western Australia. This EEC comprises semi-evergreen vine thickets characterised by the prominence of trees with microphyll sized leaves (i.e. leaves usually 2.5–7.6 cm long), the presence of emergent bottle trees/kurrajongs (*Brachychiton* spp.), and the thickets occurring in areas with a subtropical, seasonally dry climate on soils of high to medium fertility. In NSW they are part of the *Notelaea microcarpa-Ehretia membranifolia – Geijera parviflora* vine thicket sub-alliance (#32) (McDonald 2010).	EEC	Predicted to occur in PMST search however this community was not identified in proposal site during field investigations. *Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions* was not recorded in the proposal site and this community will therefore not be adversely impacted as a result of the proposal. Further detailed assessment is not required.	No

Species/Community Habitat Requirements and Ecological Information	Status	Preliminary Impact Assessment	Detailed Assessment Required?
Weeping Myall Woodlands Weeping Myall Woodlands ecological community occur on the inland alluvial plains west of the Great Dividing Range in NSW and Queensland. It occurs in the Riverina, NSW South Western Slopes, Darling Riverine Plains, Brigalow Belt South, Brigalow Belt North, Murray-Darling Depression, Nandewar and Cobar Peneplain Interim Biogeographic Regionalisation for Australia (IBRA) Bioregions. The ecological community currently occurs in small pockets throughout this range (TSSC 2008a). The Weeping Myall Woodlands is characterised by open woodlands and woodlands, generally 4-12 m high, dominated by Weeping Myall (*Acacia pendula*) trees. Weeping Myall trees often occur in monotypic stands, however other vegetation may also occur in the ecological community, though not as dominant species, including western rosewood (*Alectryon oleifolius* subsp. *elongatus*), poplar box (*Eucalyptus populnea*) or black box (*Eucalyptus largiflorens*) (TSSC 2008a).	EEC	Not predicted to occur in PMST search. Identified by DoEE as a community requiring further consideration. 1.38 ha of moderate to good condition Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion (PCT 27) has been mapped in the proposal site. The community was widespread across the proposal site however it occurs as small remnants or regenerating relatively isolated patches. Only 0.43 ha of PCT 27 across the proposal site was assessed as consistent with the EPBC Act listing for Weeping Myall Woodlands EEC (Appendix D of *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). The remaining 0.95 ha of PCT 27 did not meet the threshold criteria for the EPBC Act listing as remnants were less than 0.5 ha.	Yes – refer to **Appendix B**.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is listed as a critically endangered ecological community under the EPBC Act. This community occurs along the western slopes and tablelands of the Great Dividing Range from Southern Queensland through NSW to central Victoria. It is characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of white box, yellow box or Blakely's red gum trees.	CEEC	Predicted to occur in the proposal site in PMST search. DoEE considers there is some risk that there may be impacts to this community. This community was not identified in the proposal site during detailed field investigations (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a) and detailed vegetation survey and mapping did not identify any white box, grey box and/or Blakely's red gum or other species associations characteristic of this community. Accordingly, the proposal is unlikely to adversely impact this community and no further consideration is required.	No

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
Threatened Flora Species				
Androcalva procumbens	*Androcalva procumbens* is a prostrate shrub with slender trailing stems to 30 cm long. It is also known as *Rulingia procumbens* or *Commersonia procumbens*. Endemic to NSW it is mainly confined to the Dubbo-Mendooran - Gilgandra region, but also occurs in the Pilliga and Nymagee areas. Recent collections made from the Upper Hunter region, and additional populations found in Goonoo SCA in response to the 2007 fires (OEH, 2015). The species occurs in sandy soils, often in disturbed habitats such as road verges, quarry boundaries, gravel stockpiles, and power line easements (DoEE 2008). *Androcalva procumbens* is often found in communities of *Eucalyptus dealbata–E. sideroxylon* woodland, *Melaleuca uncinata* shrubland, and mallee eucalypt with *Calytrix tetragona* understorey (DoEE 2008). Associated species include *Acacia triptera, Callitris endlicheri, Eucalyptus melliodora, Allocasuarina diminuta, Philotheca salsolifolia, Xanthorrhoea spp., Exocarpos cupressiformis, Leptospermum parvifolium,* and *Kunzea parvifolia* (DECC NSW, 2005a).	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search. DoEE considers there is some risk that there may be impacts on this species. Not identified as occurring through either record database searches or during targeted investigations in the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). The vegetation communities and flora species identified in the Approved Conservation Advice (DoEE 2008) as being associated with *Androcalva procumbens* were not recorded during detailed surveys within the proposal area and the species is considered to be unlikely to occur. Therefore, the proposal site is not expected to contain an important population of *Androcalva procumbens* and further assessment of this species is not required.	No

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
Bertya opponens	*Bertya opponens* is slender shrub or small tree to 4 m high, found in shallow soils on ridges with mallee. Recorded from the Cobar – Coolabah area (Harden, 2002). In NSW, the species has been recorded at the following sites: north-east of Cobar; in the Jacks Creek State Forest area of the Pilliga Scrub; Gibraltar Range National Park east of Glen Innes; and Kangaroo River State Forest north-west of Coffs Harbour (TSSC 2016d)). *Bertya opponens* has been recorded in a variety of vegetation communities including mixed shrubland, lancewood woodland, mallee woodland, eucalypt/acacia open forest with shrubby understorey, eucalypt/callitris open woodland and semi-evergreen vine-thicket (TSSC 2016d).	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search. Was not identified as occurring through either record database searches or during targeted investigations in the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). Assessed as unlikely to occur in the proposal site due to a lack of suitable habitat (refer *to ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). The proposal site is not likely to contain an important population of *Bertya opponens* and further assessment of the species is not required.	No
ooline *Cadellia pentastylis*	Ooline is a very slow growing medium-sized tree that generally grows to 10 m high, occasionally reaching 25 m. In NSW, ooline occurs in an area bounded by Gunnedah, Tenterfield and the Queensland border (ALA 2014). Ooline grows in semi-evergreen vine thickets and sclerophyll vegetation on undulating terrain of various geology, including sandstone, conglomerate and claystone (Harden 1991). Soils generally have low to medium nutrient content and are normally associated with upper and mid-slopes in the landscape.	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species at some risk of impacts. Database records in locality are over 30 years old (OEH 2016d) with the closest recent record near Mount Kaputar National Park. Not recorded within the proposal site despite thorough vegetation surveys undertaken in accordance with the seasonal requirements for this species. Habitats within the proposal site are generally highly disturbed and in low condition and the semi-evergreen vine thicket habitat required to support this species was not identified within the proposal site. An *important population* of Ooline is not expected to occur in the proposal site and further assessment is not required.	No

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
bluegrass *Dichanthium setosum*	Bluegrass is an erect perennial which grows to 1 m in height associated with heavy basaltic black soils and stony red-brown hard-setting loam with clay subsoils (Ayers et al 1996). This species occurs chiefly on the New England Tablelands with large populations in the Saumarez area (near Armidale), west of Armidale, east of Guyra and Somerton Road Travelling Stock Route. It is more rarely found on the north-western slopes, central western slopes and north western plains, extending west to Narrabri (TSSC 2008b).	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species at some risk of impacts. Bluegrass was not recorded within the proposal site despite targeted searches undertaken in accordance with seasonal requirements of the species. There are a low number of records within 10km of the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). The habitats within the proposal site are generally highly disturbed and while the species is considered unlikely to occur in the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a) further assessment is provided in **Appendix B**.	Yes – refer to **Appendix B**.
Belson's panic *Homopholis belsonii*	Belson's panic is a rhizomatous and stoloniferous perennial grass growing to 0.5 m high. Belson's panic spreads mainly by the stolons and can form colonies in a matter of months (Menkins 1998). It is known to occur in three broad habitat types: • rocky, basaltic hills supporting *Eucalyptus albens* (White Box)/*Geijera parviflora* (Wilga) woodland with assorted shrubs and a number of grass species. • flat to gently undulating alluvial areas supporting *Casuarina cristata* (Belah) forest and sometimes *Acacia harpophylla* (Brigalow) or *Grevillea parviflora* (Wilga). • drainage lines supporting *C. cristata* and sandy country dominated by Cypress Pine-Bloodwood-Ironbark-She-Oak Forest.	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species requiring further consideration. Recorded on alluvial clay soils primarily within the understorey of remnant patches of PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion (Moderate to Good condition) within the proposal site. A total of 29 individuals were recorded in the proposal site on 23 February 2016 south of North Star, between Crooble and Croppa Creek (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a).	Yes – refer to **Appendix B**.

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
spiny peppercress *Lepidium aschersonii*	Spiny peppercress is a short lived perennial herb that grows to about 30 cm tall. It is distinguished from other *Lepidium* species in having inflorescences that terminate in a spine (Carter 2010). It occurs in periodically wet sites such as gilgai depressions and the margins of marshes/shallow lakes on heavy clay soils (Carter 2010). It is known from the Brigalow Belt South, Darling Riverine Plains, Cobar Peneplain and Riverina bioregions with most northern known population being near Moree and largest populations (of many thousand plants) known from Brigalow Park Nature Reserve and a proposed reserve near Narrabri (Carter 2010).	V	Not predicted to occur in the proposal site in PMST search. Assessed by DoEE as a species requiring further consideration. Closest recent record approximately 10 km to the east of the proposal site in Bobbiwaa State Forest (OEH 2016d). A population is also known from Brigalow SCA and Brigalow Park Nature Reserve 15 km southwest of Narrabri (OEH 2016d). Spiny peppercress was not recorded within the proposal site despite thorough vegetation surveys undertaken in accordance with the seasonal requirements for this species. This species is not likely to occur in the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a).	No
slender darling pea *Swainsona murrayana*	Slender darling pea is an ascending to erect perennial forb to 25 cm tall (TSSC 2008). In NSW the species occurs in the central western slopes, Western Division and the Riverina Area in grassland, herbland and Black-box woodland (TSSC 2008c). The species occupies heavy grey or brown clays, loams or red cracking clays (TSSC 2008c).	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species requiring further consideration. Has been recorded within 10 kilometres of the proposal site including one old record (1968) at approximately KP 638 near Gurley. Targeted searches in September 2014 did not relocate this record. (Note that this record has a very low accuracy (within 10 kilometres)). The closest recent record occurs near the rail corridor 10 km south of Moree (OEH 2016d). Not recorded within the proposal site despite thorough vegetation surveys undertaken in accordance with the seasonal requirements for this species. Habitats within the proposal site are generally highly disturbed and in low condition (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). Assessed as not likely to occur in the proposal site.	No

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
Tylophora linearis	*Tylophora linearis* is an herbaceous climber with clear latex growing to approximately 2 m in length (TSSC 2008d). In NSW the species is rarely collected and is known from less than 10 localities in the Dubbo area and Mt Crow near Barraba (TSSC 2008d). It grows in dry scrub, open forest and woodlands. It is also known to overlap in distribution with Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community and White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community (TSSC 2008d).	E	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species at some risk of impacts. Populations are known to occur in the Pilliga conservation reserves approximately 30km south of the proposal site (OEH 2016d). Was not recorded within the proposal site despite thorough vegetation surveys undertaken in accordance with the seasonal requirements for this species. While this species is known from Brigalow (*Acacia harpophylla* dominant and co-dominant) EEC, this EEC in the proposal site occurs to the north of known records of this species. While this species has a low likelihood of occurrence in the proposal site, further assessment is provided in **Appendix B**.	Yes – refer to **Appendix B**.
austral toadflax *Thesium australe*	Austral toadflax is a hairless, yellowish-green perennial herb with slender, wiry stems to 40 cm high and tiny, white flowers (Harden 1992). In New South Wales, Austral toadflax occurs on the coast, tablelands and western slopes. It is semi-parasitic on roots of a range of grass species notably kangaroo grass (*Themeda australis*).	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search. Targeted searches were conducted for this species (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). Habitat was generally highly disturbed and in low condition. This species is not likely to occur in the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a).	No

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
Threatened Frogs				
booroolong frog *Litoria booroolongensis*	The booroolong frog is a medium sized tree frog that occurs along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses (Anstis 2002; Robinson 1993). Adults occur on or near cobble banks and other rock structures within stream margins, or near slow-flowing connected or isolated pools that contain suitable rock habitats. Range extends from Tamworth in northern NSW to the Southern Highlands in Victoria (TSSC 2007).	E	Predicted to occur or habitat likely to occur in the proposal site in PMST search. The proposal site is to the north and west of the known range of the booroolong frog and this species is not likely to occur. Further assessment is not required.	No
Threatened Aquatic Species				
silver perch *Bidyanus bidyanus*	*Bidyanus bidyanus* prefers fast-flowing waters, especially where there are rapids. This species migrates to spawn. Historical records show that the species was widespread and abundant in most of the Murray-Darling drainage, excluding the cool, high, upper reaches of streams on the western side of the Great Diving Range. Only one natural population is known, which occurs downstream of Torrumbarry Weir in the Murray River (DPI 2005).	CE	Analysis of the DPI Threatened and protected species – records viewer (accessed May 2016) lists records of the silver perch in the: • Mehi River downstream of Moree near Bullarah in 2004 • Gwydir River upstream of Bingara in 1995 and 1999 • Barwon River in 2002 • Namoi River upstream of Boggabri in 1999 and downstream of Wee Waa in 2001 (refer to *ARTC Inland Rail – Narrabri to North Star Aquatic Ecology Assessment* – Umwelt 2017b). Key sites include the Namoi River between Gunnedah and Wee Waa, the Horton River and Gwydir River upstream of Bingara (DPI 2015). All of these records are remote from the proposal site. Given habitat preferences, the silver perch is not expected to occur in the proposal site, no further assessment is required.	No

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
Murray cod *Maccullochella peelii*	Murray cod occurs naturally in the waterways of the Murray-Darling basin in a wide range of warm water habitats ranging from clear, rocky streams to slow flowing turbid rivers and billabongs. It is a long lived, highly territorial species that is highly dependent on in-stream woody structures or large rocks for habitat (National Murray Cod Recovery Team 2010).	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species at some risk of impacts. Analysis of the DPI Threatened and protected species – records viewer (accessed May 2016) lists records in the: • Mehi River, upstream of Moree in 2009 and downstream of Moree in 2007 • Gwydir River downstream of Moree in 2001 and 2001 • Gwydir River tributaries upstream of Gravesend in 2008 • MacIntyre and Barwon Rivers in 1999, 2005 and 2007 • Namoi River upstream and downstream of Narrabri in 2001, 2005 and 2009. NSW key sites or 'important populations' include the Horton and Gwydir River and the Gwydir River population downstream of Copeton Dam (including the proposal site) (DPI 2015). The Murray cod is reportedly more commonly recorded in the Mehi River and may occur in the class 1 key fish habitats in the Mehi River and Gwydir River (refer to *ARTC Inland Rail – Narrabri to North Star Aquatic Ecology Assessment* – Umwelt 2017b). Further assessment is provided in **Appendix B**.	Yes – refer to **Appendix B**.

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
Threatened Reptiles				
five-clawed worm-skink *Anomalopus mackayi*	The five-clawed worm-skink is a medium sized species of the Scincidae family. It is a burrowing skink known to occur in both remnant and non-remnant woodlands and grasslands including grassy White Box woodland, open woodland and River Red Gum–Coolibah-Bimble Box woodland. The species lives in permanent deep tunnel-like burrows and deep soil cracks, using fallen logs and timber as sheltering sites on the surface (TSSC 2008e). In areas modified by agriculture and other human activities, the species has been found sheltering under artificial materials lying flat on the ground, such as discarded railway sleepers, sheet metal and hay bales. Five-clawed worm-skink is predicted to occur between Narrabri and the Queensland border east to Bingara and west to Walgett (DSEWPC 2011d) and is known or likely to occur between Narrabri and Moree (DSEWPC 2011d).	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species at some risk of impacts. Five-clawed worm-skink was not recorded within the proposal site despite targeted fauna surveys undertaken in accordance with the seasonal requirements for this species (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). The habitats within the proposal site are highly disturbed and generally in low condition due to surrounding agricultural practices and disturbance from the rail corridor. The closest record of the species occurs around Bellata less than 1km to the west of the proposal site and also south of Narrabri (OEH 2016d). While no known populations of five-clawed worm-skink were recorded within the proposal site, potential habitat was identified and further assessment of potential impacts is provided in **Appendix B**.	Yes – refer to **Appendix B**.

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
pink-tailed worm-lizard *Aprasia parapulchella*	The pink-tailed worm-lizard is a small, legless and slender lizard growing to 25 cm in length that lives underground (TSSC 2015a). The species occupies both primary and secondary grasslands, grassy woodlands and woodlands, usually inhabiting sloping sites that contain native grasses (particularly kangaroo grass), rocky outcrops or scattered, partially buried rocks (TSSC 2015a). In NSW the species only occurs from Central and Southern Tablelands and the South Western Slopes between Bendigo in Victoria and Gunnedah in NSW (TSSC 2015a).	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species at some risk of impacts. The habitats within the proposal site are generally highly disturbed and in low condition due to surrounding agricultural practices and disturbance from the rail corridor. The pink-tailed worm-lizard was not recorded despite thorough fauna surveys undertaken throughout the proposal site. There are no known records of this species within 10 kilometres of the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). While no known populations of pink-tailed worm-lizard were recorded within the proposal site, potential habitat was identified and further assessment of potential impacts is provided in **Appendix B**.	Yes – refer to **Appendix B**.
Dunmall's Snake *Furina dunmalli*	Dunmall's Snake is a small to medium sized, terrestrial, nocturnal snake found in open forest particularly brigalow *Acacia harpophylla* forest and woodland on floodplains of deep-cracking black clay and clay loam soils (TSSC 2014). In NSW it is known or likely to occur between Boggabilla and Ashford near the Queensland border and predicted to occur near Mungindi (DSEWPC 2011d).	V	Dunmall's snake was not recorded within the proposal site despite targeted fauna surveys undertaken in accordance with the seasonal requirements for this species (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). The closest record of the species occurs 50 km to the northeast of North Star (OEH 2016d). No known populations occur within the proposal site and it is considered that the species is unlikely to be impacted as a result of the proposal.	No

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
border thick-tailed gecko *Uvidicolus sphyrurus*	The border thick-tailed gecko is a pale fawn to brown reptile growing to 7 cm (Cogger 2000). It is a nocturnal species that shelters by day under exfoliating rocks and is most commonly found in undisturbed habitat remnants on rocky outcrops (mainly granite) and stony hills within eucalypt and cypress-pine open forest or woodland in rugged terrain between 500 – 1100 m elevations (NSW SC 2010). It is known to occur on the northern slopes and tablelands in the New England Tableland, Nandewar and Brigalow Belt South Bioregions.	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species at some risk of impacts. The border thick-tailed gecko is known from records concentrated in granite belt between Tamworth and Stanthorpe-Warwick (NSW SC 2010). There is one outlying record from Moree area in 1990 with the nearest records to the proposal site being Mount Kaputar National Park east of Narrabri. Given the absence of preferred habitat, microhabitats and also the lower elevations (less than 500 m) along the proposal site this species is unlikely to occur in the proposal site however further assessment is provided in **Appendix B**.	Yes – refer to **Appendix B**.

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
Threatened Birds				
regent honeyeater *Anthochaera phrygia*	The regent honeyeater is a highly mobile, migratory species capable of travelling large distances and occurs only irregularly at most sites in varying numbers. Its primary habitat is box-ironbark eucalypt woodland associated with more creek flats/broad river valleys and dry sclerophyll forest, however it does utilise riparian vegetation and wet lowland coastal forest dominated by swamp mahogany. It is known to undertake a complex series of movements, which are thought to be governed mainly by the flowering of a select number of *Eucalyptus* species. It is likely the species use different areas within its range in different years depending on food resources (DoE 2016). Habitat critical to the survival of the regent honeyeater includes any breeding or foraging areas where the species is likely to occur and any newly discovered breeding or foraging locations.	CE	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species at some risk of impacts. The regent honeyeater was not recorded within the proposal site despite thorough targeted diurnal bird surveys undertaken in December 2015. The proposal site does not occur within the four known regularly used foraging and breeding areas, namely Bundarra-Barraba area of NSW, the Capertee Valley in NSW, Hunter Valley in NSW and the Chiltern area of north-east Victoria (DoE 2016). However, the Pilliga, to the south of the proposal site, is identified as a subsidiary breeding area to Bundarra-Barraba (DoE 2016). Unlikely to occur as it was not recorded in the proposal site, there is a lack of records within 10 km of the proposal site and the proposal site does not support key foraging habitat in accordance with the National Recovery Plan (DoE 2016b), however further assessment is provided in **Appendix B**.	Yes – refer to **Appendix B**.
curlew sandpiper *Calidris ferruginea*	The curlew sandpiper is a small and slim sandpiper that in NSW are widespread east of the Great Divide especially in coastal regions, Riverina and south-west NSW, but occasionally recorded in the Tablelands (TSSC 2015b). The species does not breed in Australia. Its general habitat is on intertidal mudflats in sheltered coastal areas, while inland it occupies ephemeral and permanent lakes, dams, waterholes and bore drains that have bare edges of mud or sand (TSSC 2015b). Feeding habitat includes mudflats and nearby shallow water.	CE	Predicted to occur or habitat likely to occur in the proposal site in PMST search. The curlew sandpiper was not recorded within the proposal site despite extensive fauna survey undertaken throughout the proposal site across multiple seasons. There are no known records of curlew sandpiper within 10km of the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). This species is unlikely to occur in the proposal site based on the lack of ephemeral foraging habitat and will not be impacted by the proposal. Further assessment is not required.	No

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
red goshawk *Erythrotriorchis radiatus*	The red goshawk is a large, swift and powerful rufous-brown hawk, known from coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia (Marchant & Higgins 1993) where there are large populations of prey birds. Riverine forests are also used frequently. They nest in large trees typically within one kilometre of permanent water. In northern New South Wales and southern and northern Queensland, red goshawks are mainly found in rugged terrain, as the more suitable lowland forest has been cleared or modified.	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search. The red goshawk was not recorded within the proposal site despite extensive fauna survey undertaken throughout the proposal site across multiple seasons. There are no known records of within 10km of the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). Based on the species range, this species is unlikely to occur in the proposal site and will not be impacted by the proposal.	No
squatter pigeon *Geophaps scripta scripta*	The squatter pigeon (southern) is a medium-sized, ground-dwelling pigeon, inhabiting grassy understorey of open eucalypt woodland, nearly always found near permanent water. Sandy areas dissected by gravel ridges, with open and short grass cover are preferred and they are less commonly found on heavier soils with dense grass (TSSC 2015c). In NSW, the distribution of the squatter pigeon has disappeared from the southern half of its range on the western slopes of the range (south to West Wyalong area). There have been no confirmed records of this species in NSW in the last 10 years with only a few records near the Queensland border in the last 50 years (NSW SC 2016). The squatter pigeon is now listed as CE in NSW.	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species at some risk of impacts. The TSPD lists three of the vegetation communities recorded in the proposal site as providing suitable habitat for the squatter pigeon however, the species was not recorded in the proposal site despite extensive fauna surveys undertaken throughout the proposal site across multiple seasons (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). There are no known records within 10km of the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a) and this species is unlikely to occur in the proposal site. Based on the species range and presence of suitable habitat, this species has been assessed further in **Appendix B**.	Yes – refer to **Appendix B**.

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
painted honeyeater *Grantiella picta*	The painted honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations and almost all breeding, occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Important habitat is mistletoes in eucalypt forests/woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, acacia-dominated woodlands, paperbarks, casuarinas, callitris, and trees on farmland or gardens (TSSC 2015d). The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes.	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species at some risk of impacts. The painted honeyeater was not recorded in the proposal site despite extensive fauna surveys undertaken throughout the proposal site across multiple seasons (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a) however, potential habitat was recorded. Within the proposal site potential woodland habitat is restricted to small linear patches and scattered trees, mostly fragmented by agricultural lands but sometimes with adjoining woodland areas. There are 15 records within 10km of the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). Further assessment of this species is provided in **Appendix B**.	Yes – refer to **Appendix B**.

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
swift parrot *Lathamus discolor*	The swift parrot is a slim, medium sized parrot that breeds in Tasmania during summer migrating to mainland Australia in winter (TSSC 2016a). In NSW the species disperses widely in small flocks to forage in forests and woodlands throughout the coastal and western slopes on flowers and *psyllid* lerps in *Eucalyptus* species (TSSC 2016a). White Box – Yellow Box – Blakely's Red Gum Grassy Woodland are an important habitat in NSW as is coastal swamp mahogany (*Eucalyptus robusta*) and spotted gum (*Corymbia maculata*) (TSSC 2016a).	CE	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species at some risk of impacts. Unlikely to occur as: • Not recorded despite extensive fauna surveys undertaken throughout the proposal site across multiple seasons (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). • There are no known records within 10km of the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a), and, • important habitat (White Box – Yellow Box – Blakely's Red Gum Grassy Woodland) does not occur in the proposal site. Further assessment of the species is provided in **Appendix B.**	Yes – refer to **Appendix B**.
malleefowl *Leipoa ocellata*	The malleefowl is a mound building bird inhabiting semi-arid and arid habitats (Benshemesh, 2007). The species occupies shrublands and low woodlands dominated by mallee and associated semi-arid and arid habitats.	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search. The malleefowl was not recorded despite thorough fauna surveys undertaken throughout the proposal site. The proposal site is not considered to support suitable habitat critical for this species (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a) based on review of the OEH TSPD. There are no known records of within 10km of the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). This species is unlikely to occur in the proposal site and will not be impacted by the proposal.	No

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
superb parrot *Polytelis swainsonii*	The superb parrot occurs through the inland slopes and plains of NSW (including the Australian Capital Territory) to northern Victoria. The breeding range of the superb parrot is mostly in the NSW South Western Slopes and Riverina bioregions. The three main breeding areas are: (1) bounded by Molong, Rye Park, Yass, Coolac, Cootamundra and Young (NSW); (2) along the Murrumbidgee River, between Wagga Wagga and Toganmain Station (near Bringagee), and farther north at Goolgowi (NSW); and (3) along the Murray and Edward Rivers, from east of Barmah and Millewa State Forest to south of Taylors Bridge (Baker-Gabb 2011). The proposal site is considered unlikely to provide breeding habitat for the species. Breeding habitat for this species includes hollows more than 60 mm in diameter located more than 4 metres above ground (OEH 2016b). The national recovery plan for the species (Baker-Gabb 2011) identifies Blakely's red gum (*Eucalyptus blakelyi*) as the most important tree species for breeding for this species in the south western slopes bioregion, with most breeding events confined to this tree species.	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species at some risk of impacts. Unlikely to occur as: • Not recorded despite extensive fauna surveys undertaken throughout the proposal site across multiple seasons including targeted surveys of some potential nesting sites (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). • There are a low number of known records within 10km of the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a), • Blakely's red gum was not recorded in the proposal site and therefore breeding habitat is not considered likely to occur. • Proposal site does not occur within an area defined as 'Likely to Occur' or 'Breeding Habitat' in the species distribution map (Baker-Gabb 2011). The proposal site is not likely to provide habitat for an 'important population' of the superb parrot and further assessment is not required.	No

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
Australian painted snipe *Rostratula australis*	The Australian painted snipe is a stocky wading bird between 24 and 30 cm in length (TSSC 2013a). This species occupies shallow freshwater and occasionally brackish wetlands that are both ephemeral and permanent with a good cover of grass, rush, reeds, low scrub and open timber (TSSC 2013a).	E	Predicted to occur or habitat likely to occur in the proposal site in PMST search. The Australian painted snipe was not recorded despite thorough fauna surveys undertaken throughout the proposal site. There is one record of Australian painted snipe within 10km of the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). The proposal site is not considered to contain suitable habitat to support this species (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). This species is unlikely to occur in the proposal site and will not be impacted by the proposal.	No
Threatened Mammals				
large-eared pied-bat *Chalinolobus dwyeri*	The large-eared pied bat is a medium-sized insectivorous bat roosting in caves in sandstone cliffs/escarpments adjacent to higher fertility sites particularly box gum woodlands or river/rainforest corridors; and moist eucalypt habitats at higher elevations on other geologies. The species' current distribution is also poorly known. Much of the known distribution is within NSW. Available records suggest that the largest concentrations of populations appear to be in the sandstone escarpments of the Sydney basin and the north-west slopes (Coolah Tops, Mt Kaputar, Warrumbungle National Parks and Pilliga Nature Reserve).	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species requiring further consideration. Large-eared pied bat was not recorded within the proposal site despite thorough fauna surveys undertaken in accordance with the seasonal requirements for this species. The closest record of the species occurs approximately 30 km to the east of the proposal near Narrabri within Mount Kaputar National Park (OEH 2016d) and the sandstone escarpment habitat required by the species for breeding was not recorded in the proposal site. The proposal site is not likely to provide habitat for an 'important population' of the large-eared pied bat, however further assessment is provided in **Appendix B**.	Yes – refer to **Appendix B**.

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
south-eastern long-eared bat *Nyctophilus corbeni*	The south-eastern long-eared bat is found in southern central Queensland, central western NSW, north-western Victoria and eastern South Australia, where it is patchily distributed, with most of its range in the Murray Darling Basin (TSSC 2015e). The south-eastern long-eared bat is found in a wide range of inland woodland vegetation types. These include box / ironbark / cypress pine woodlands, Buloke woodlands, Brigalow woodland, Belah woodland, smooth-barked apple woodland, river red gum forest, black box woodland, and various types of tree mallee (TSSC 2015e). The species mainly roosts solitarily in dead trees or dead spouts with maternity colonised in dead trees including ironbarks, cypress and buloke (TSSC 2015e).	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search. There is one record of this species within 10 km of the proposal site. The south-eastern long-eared bat was not recorded, despite thorough fauna surveys undertaken throughout the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a) however potential habitat was identified. Potential foraging and roosting habitat occurs throughout the proposal site associated with the woodland vegetation. Further assessment of the species is provided in **Appendix B.**	Yes – refer to **Appendix B**.
greater glider *Petauroides volans*	The greater glider is a large gliding marsupial that feeds exclusively on eucalypt leaves and buds. Inhabits a variety of eucalypt forests and woodlands (TSSC 2016c). Greater gliders shelter during the day in large tree hollows and at night movements are primarily restricted to gliding between tree canopies. The distribution of the greater glider includes the ranges and coastal plain of eastern Australia from north Queensland to central Victoria (TSSC 2016c).	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search. Not recorded in locality of the proposal site. As records in NSW are largely associated with the ranges and coastal plains this species is not expected to occur in fragmented habitats along the proposal site. This species is unlikely to occur in the proposal site and will not be impacted by the proposal.	No

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
koala *Phascolarctos cinereus*	The koala is a (mainly) arboreal, medium-sized marsupial. In NSW, koalas occur along the coast, extending west to the Darling Riverine Plains and north to the Mulga Lands bioregions; to the Cobar Peneplain bioregion in the centre of the state; and to the Riverina and eastern most parts of the Murray-Darling Depression bioregions in the south.	V	Predicted to occur in PMST search. Assessed by DoEE as likely to be significantly impacted by the proposal. Koalas were recorded directly and indirectly at eight locations across the proposal site during targeted surveys. 72 records exist on the OEH Atlas of NSW Wildlife within the 10 km buffer area. The majority of these records occur within the northern portion of the search area in larger woodland remnants including Bullala State Forest 40 km north east of Moree. Three known koala feed tree species occur in the proposal site including two primary food trees (river red gum (*Eucalyptus camaldulensis*) and coolibah (*E. coolabah*)) and one secondary food tree (bimble box (*E. populnea*)). Further assessment of the species is provided in **Appendix B.**	Yes – refer to **Appendix B**.
Pilliga mouse *Pseudomys pilligaensis*	The Pilliga mouse is a small rodent known only from the type locality in Pilliga, NSW, and three other nearby sites all in the immediate surrounding area including the Pilliga Nature Reserve and the adjacent Pilliga State Forest (TSSC 2009). There is no specific habitat type with records in mixed *Eucalyptus*, *Acacia* and *Callitris* open forest. Found in greatest abundance post fire and rainfall, peaking approximately 20 months following the disturbance event. During non-peak population periods its distribution is patchy (TSSC 2009).	V	Predicted to occur or habitat likely to occur in the proposal site in PMST search and assessed by DoEE as a species at some risk of impacts. Potential habitat was identified in one vegetation community occurring within the proposal site (NA348 Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion). Records in NSW are all concentrated in the Pilliga scrub area to the south of Narrabri, south of the proposal site. This species may occur in the southern section of the proposal site and may be impacted by the proposal, with further assessment provided in **Appendix B**.	Yes – refer to **Appendix B**.

Species/Community Habitat Requirements and Ecological Information		Status	Preliminary Impact Assessment	Detailed Assessment Required?
grey-headed flying-fox *Pteropus poliocephalus*	The grey-headed flying-fox occurs in the coastal belt from Rockhampton in central Queensland to Victoria. They are widespread throughout their range in summer occupying only coastal lowlands during autumn and winter. It is infrequently found west of the Great Dividing Range. Grey-headed flying-fox are a canopy-feeding frugivore and nectarivore. Primary food source *Eucalyptus* and related genera blossom but also rainforest fruits and commercial fruit crops. No camps have been recorded in the locality (DoE 2016b).	V	Predicted to occur in PMST search. Grey-headed flying-fox was recorded on one occasion within the proposal site. The nearest known roost camp site is at Blair Athol, near Inverell, approximately 120 km south-east of the proposal site. No breeding habitat (camp sites) occurs within the proposal site and breeding habitat is not likely to be impacted by the proposal. Further Assessment is provided in **Appendix B**.	Yes – refer to **Appendix B**.

4.2.1 Summary of Significance Assessment Outcomes – Species or Communities Likely to be Significantly Impacted

The controlled action notification identified Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD CEEC and the koala as likely to be significantly impacted by the proposal. The impacts of the proposal on this community and species is discussed below.

4.2.1.1 Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern Queensland

Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD is listed as a CEEC under the EPBC Act. This community occurs from the Darling Downs in Queensland to Dubbo in New South Wales however within this broad geographical area it confined to where climate, soils and landform are conducive to the development of tussock grasslands. The community is typically dominated by tussock grasses in the genera *Austrostipa, Bothriochloa, Chloris, Enteropogon, Rytidosperma* or *Themeda*.

The Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales (NSW) and southern Queensland are native grasslands typically composed of perennial native grasses. They are found on soils that are fine textured (often cracking clays) derived from either basalt or alluvium on flat to low slopes (< 1 degree). A tree canopy is usually absent, but when present, comprises ≤10% projective foliage cover (Threatened Species Scientific Committee 2008).

An analysis of PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion/Native Grassland (Moderate to Good condition) (PCT 52) was undertaken to determine if the community conforms to Listing Advice provided by the Department of the Environment and Energy under the EPBC Act (TSSC 2008). The analysis is provided in Appendix D of the BAR (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a), concluding that PCT 52 Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion/Native Grassland (Moderate to Good condition) meets the Listing Advice criteria for the CEEC and 146.7 hectares of PCT52 was mapped in the proposal site.

4.2.1.2 Koala (combined populations) (*Phascolarctos cinereus)*

Fifteen koalas were recorded at four locations during targeted surveys undertaken to determine the impact of the proposal on nationally threatened species. Analysis of koala records from the local area indicated that prior to surveys; the nearest record of this species was from near Belata, approximately 200 metres from the proposal site. Within the proposal site potential woodland habitat is restricted to small linear patches and scattered trees, sometimes with adjoining woodland areas.

Koalas were recorded on 10 December 2015, with six individuals located. Two of these were juveniles still confined to their mother. The first female and juvenile were located at KP 695.3 (refer to Appendix 1 of *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a) within the proposal site. Another koala (not sexed) was located outside of the proposal site at KP 695.4. Another female with juvenile was spotted at KP 697 within the proposal site and a male koala was identified on the opposite side of the rail line within the proposal site.

On 11 December 2015, a female and juvenile were sighted at KP 706.5 crossing over Country Boundary Road near Milguy Silo. One individual (not sexed) was sighted opportunistically in riparian vegetation on the Gwydir River at KP 676.3 mark.

Three separate unsexed individuals were spotlighted opportunistically within the proposal site during two separate spotlighting events. One individual was located at KP 704.4 within a Brigalow dominated patch, while another was identified at KP 730 on 13 December 2015. The final individual was sighted in proximity to Moree on 16 December 2015 at KP 680.6. This individual was located approximately 50 m away from the proposal site.

Koala scats were located at two additional locations, at KP 711.6 and KP 716.8.

Additional surveys in 2016 identified one individual at KP 676 and an additional individual was opportunistically recorded at KP 695.

A further 72 records exist within 10 kilometres of the proposal site on the OEH Atlas of NSW Wildlife (OEH 2016). The four locations at which koalas were recorded within the proposal site are all within 40 kilometres of one another and occur in the northern portion of the alignment, close to Moree. The majority of the records from the OEH Atlas of NSW Wildlife also occur within this northern portion of the alignment but tend to be located in larger patches of woodland habitat in reserves such as Bullala State Forest (40 kilometres north-east of Moree).

Koala feed trees for the Western Slopes and Plains Koala Management Area (KMA) were determined from the NSW Recovery Plan (OEH 2014). Koala feed trees that occur in the proposal site include:

Primary Food Tree Species:

- river red gum (*Eucalyptus camaldulensis*)
- coolibah (*Eucalyptus coolabah*)

Secondary Food Tree Species:

- bimble box (*Eucalyptus populnea*).

Table 4.3 below identifies the extent of koala habitat within the proposal site based on the extent of primary and secondary koala feed trees occurring within discrete vegetation communities. High quality habitat occurs in those communities that contain primary koala food trees, which are known to occur within riparian areas within the proposal site. Secondary koala food trees (*Eucalyptus populnea*) were recorded as a dominant canopy species in Bimble Box - Belah Woodland, Bimble Box - White Cypress Pine Woodland and Bimble Box Woodland. Communities within the overarching plant community type PCT-56/BVT-BR186, NA182/Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW/Moderate – Good that were not dominated by bimble box (*Eucalyptus populnea*) were excluded from the assessment below as they do not provide potential koala habitat in accordance with the recovery plan. The assessment result accords with the results of koala habitat mapping prepared for the Moree Plains LGA (PB 2008) which identified riparian vegetation within the LGA as primary koala habitat (PB 2008).

Remnant vegetation associated with rivers and creeks are likely to provide important corridors for the species within the highly modified and fragmented landscape in the western slopes and plains KMA. As identified in **Table 4.3** below, approximately 2.18 hectares of primary koala habitat will be directly impacted in the proposal site.

Table 4.3 also shows that approximately 13.44 hectares of moderate quality habitat for the koala that includes one secondary koala food tree species will be directly impacted within the proposal site.

Table 4.3 Koala Habitat Quality in the Proposal Site

Koala Habitat/Vegetation Community	Area within Proposal Site (ha)
Area of Habitat containing Primary Food Trees	
PCT-39/BVT-BR130, NA129/Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion/Moderate – Good	0.09
PCT-78/BVT-BR196, NA193/River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion/Moderate – Good	2.09
Sub-total	**2.18**
Area of Habitat containing Secondary Food Trees	
PCT-56/BVT-BR186, NA182/Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW/Moderate – Good	13.44
Sub –total	**13.44**
TOTAL	**15.62**

The Koala Habitat Assessment Tool as outlined in Table 3 of the Referral Guidelines is provided in **Appendix B**, concluding that the proposal site provides habitat critical to the koala.

The proposed action involves works on an existing rail line and in terms of disturbance, will essentially involve minor clearing associated with rail upgrade works along the length of the 188 km corridor. As the rail line exists, the corridor is already impacted and the impact is spread out along the corridor, reducing the potential for the proposal to result in a significant change to the existing environment. Known and potential koala habitat will be impacted through the clearing of vegetation within the proposal site. This incremental widening of the disturbed portions of the current rail alignment is not expected to adversely affect the ability of the species to traverse the corridor and access preferred or potential habitat areas or to potentially disperse across the rail corridor in a similar manner as they do now.

In the controlled action notification (26 September 2016) DoEE consider that the proposal will significantly impact the koala based on the removal of 159 hectares of foraging habitat. No advice was provided as to what communities were considered to constitute foraging habitat for the species and it is unclear what the 159 hectares of habitat equates to in relation to the proposal. Based on the assessment of significance provided in **Appendix B**, the proposal will result in the direct impact of 15.62 hectares of koala habitat. Vegetation community associations that do not contain known food trees, based on the NSW recovery plan, or are not located within riparian corridors that have been identified as important corridors for the species, are not considered to be important habitat for the species and are therefore not proposed to be offset as part of the proposal. Offsetting for this species will be focussed on offsetting the impacts of the proposal on koala habitat as defined using the NSW recovery plan.

4.2.1 Summary of Significance Assessment Outcomes – Species or Communities Not Likely to be Significantly Impacted

A summary of the outcomes of the significance assessment provided in **Appendix B** is provided below for the range of species and ecological communities that are not expected to be significantly impacted by the proposal.

An Assessment of Significance was undertaken in accordance with the EPBC Act Policy Statement 1.1 – Significant Impact Guidelines – Matters of National Environmental Significance (DoE 2013) to determine whether the proposal would result in a significant impact on threatened species. The Assessments of Significance included thorough consideration of each of the assessment criteria listed in the EPBC Act Policy Statement 1.1 (DoE 2013), including information regarding the extent of the population of the species, the area of occupancy of the species, the presence and extent of habitat critical to the survival of the species occurring within the proposal site, the breeding cycle of the population, and the availability or quality of habitat for the species. Species and communities that are considered unlikely to be significantly impacted by the proposal include:

Ecological Communities

- Brigalow (*Acacia harpophylla* dominant and co-dominant)
- Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
- Weeping Myall Woodlands

Critically Endangered Species

- Regent Honeyeater (*Anthochaera phrygia*)
- Swift Parrot (*Lathamus discolor*)

Endangered Species

- *Tylophora linearis*

Vulnerable Species

- Belson's panic (*Homopholis belsonii*)
- Murray Cod (*Maccullochella peelii*)
- Five-clawed worm-skink (*Anomalopus mackayi*)
- Pink-tailed worm-lizard (*Aprasia parapulchella*)
- Border thick-tailed gecko (*Uvidicolus sphyrurus*)
- Squatter pigeon (*Geophaps scripta scripta*)
- Painted honeyeater (*Grantiella picta*)
- South-eastern long-eared bat (*Nyctophilus corbeni*)

- Pilliga mouse (*Pseudomys pilligaensis*)
- Grey-headed flying-fox (*Pteropus poliocephalus*)

Reasons for these species and ecological communities considered as unlikely to be significantly impacted by the proposal include:

- the highly modified, fragmented and disturbed nature of the proposal site
- intensive and targeted field surveys failed to detect the species or ecological communities
- characteristic or potential habitat is absent or represents minimal areas in the proposal site and
- the proposal site outside the known species ranges and there are no nearby records, and/or
- important populations, using the definition in the EPBC Act Policy Statement 1.1 – Significant Impact Guidelines – Matters of National Environmental Significance (DoE 2013), are not present within the proposal site as the area is not considered to contain key source populations either for breeding or dispersal, populations that are necessary for maintaining genetic diversity, and/or populations that are near the limit of the species range.

4.2.2 Summary of Technical Data and Other Information Used or Needed to Make a Detailed Assessment of the Relevant Impacts

The detailed assessment of the relevant impacts of the proposal was based on a thorough review of technical data and other relevant information, including but not limited to the following key resources, policies and documents:

- Matters of National Environmental Significance Significant Impact Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999* (DoE 2013)
- Department of the Environment, Water, Heritage and the Arts (DEWHA) (2010a) Survey guidelines for Australia's threatened bats: Guidelines for detecting mammals listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*
- Department of the Environment, Water, Heritage and the Arts (DEWHA) (2010b) Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*
- Department of the Environment, Water, Heritage and the Arts (DEWHA) (2010c) Survey guidelines for Australia's threatened frogs: Guidelines for detecting frogs listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999.*
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2011a) Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2011b) Survey guidelines for Australia's threatened fish: Guidelines for detecting fish listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*

- Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2011c) Survey guidelines for Australia's threatened reptiles: Guidelines for detecting reptiles listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*

- (DoEE)– Department of the Environment and Energy (2016). *Species Profile and Threats Database*

- Credit Calculator for Major Projects and BioBanking Operational Manual (OEH 2016a)

- Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects (OEH 2014a)

- Threatened species assessment guidelines The Assessment of Significance, DECCW (2007)

- BioBanking Assessment Methodology 2014 (OEH 2014b)

- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities –Working Draft (DEC 2004)

- BioBanking Credit Calculator (Major Project Assessment Type) (BBCC 2016), accessed in July 2016

- OEH Threatened Species Profile Database (TSPD) (OEH 2016b), assessed between April and July 2016

- Vegetation Information System (VIS) Classification Database (OEH 2016c), accessed between April and July 2016

- BioNet Atlas of NSW Wildlife database and mapping tool (OEH 2016d), accessed in April 2016 and March 2017

- PlantNET (Royal Botanic Gardens Sydney) database search for Rare or Threatened Australian Plant species within the Narrabri and Moree LGAs, accessed July 2016

- DoEE Protected Matters Database, accessed in December 2016 and March 2017 (see **Appendix A**)

- NSW Guide to Surveying Threatened Plants (OEH 2016e)

- Regional and sub-regional vegetation mapping reports including:

    - Benson JS, Allen CB, Togher C and Lemmon J (2006) New South Wales Vegetation Classification and Assessment: Part 1 Plant communities of the NSW Western Plains. Cunninghamia 9: 383-450.

    - Cannon, G., Cannon, M., Harding, W., McCosker, R., Spanner, G. and Watson, G. (2002) Native Vegetation Map Report: Abridged Version No. 3 Bellata, Gravesend, Horton and Boggabri 1:100 000 Map Sheets, NSW Department of Land and Water Conservation, Sydney.

    - EcoLogical Australia Pty Ltd (ELA) (2010) Mapping of the EPBC-list "Natural Grasslands on the basalt and fine textured alluvial plains of the northern NSW and southern Queensland" in the Namoi Catchment. A report prepared for Namoi CMA.

    - Office of Environment and Heritage (OEH) (2015) Border Rivers Gwydir/Namoi Regional Native Vegetation Mapping. NSW Office of Environment and Heritage, Sydney, Australia.

    - White, M.D. (2002) The Reconstructed Distribution and Extent of Indigenous Vegetation Types in the Moree Plains Shire. A draft report to the NSW NPWS. Ecology Australia P/L.

- results from the comprehensive ecological surveys undertaken by Umwelt (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a and Aquatic Ecology Assessment Umwelt 2017b);

- relevant listing/conservation advices and policy statements including:

  - Department of the Environment and Heritage (DEH) (2006) *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community Species List*, Appendix A of the *EPBC Act Policy Statement 3.5 for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community*.

  - Department of Sustainability, Environment, Water, Population and Communities (2012) *Grey Box (Eucalyptus macrocarpa) Grassy Woodlands and Derived native Grasslands of South-eastern Australia, A guide to the identification, assessment and management of a nationally threatened ecological community.* EPBC Act Policy Statement.

  - NSW Scientific Committee (NSWSC) (2002) Final Determination to list *White Box Yellow Box Blakely's Red Gum Woodland* as an endangered ecological community, 15 March 2002.

  - NSW Scientific Committee (NSWSC) (2007) Final Determination to list *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions* as an endangered ecological community, 27 April 2007.

  - Threatened Species Scientific Committee (TSSC) (2006) *White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands* Listing Advice, registered 17 May 2006.

  - Threatened Species Scientific Committee (TSSC) (2008) Approved Conservation Advice for *Tylophora linearis*. October 2008.

  - Threatened Species Scientific Committee (TSSC) (2010) *Listing Advice for Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia*.

  - Threatened Species Scientific Committee (TSSC) (2015*) Conservation Advice for Anthochaera phrygia Regent Honeyeater*.

  - Threatened Species Scientific Committee (TSSC) (2016*) Conservation Advice for Lathamus discolor Swift Parrot*.

  - Threatened Species Scientific Committee (TSSC) (2016*) Conservation Advice for Polytelis swainsonii Superb Parrot*.

  - Threatened Species Scientific Committee (2001) Brigalow (*Acacia harpophylla* dominant and co-dominant) recommendation to the Minister for the Environment and Water Resources from the Threatened Species Scientific Committee (TSSC) on a public nomination for an ecological community listing on the *Environment Protection and Biodiversity Conservation Act 1999*

  - Threatened Species Scientific Committee (TSSC) (2008) Commonwealth Conservation Advice on *Anomalopus mackayi* (Five-clawed Worm-skink). Department of the Environment, Water, Heritage and the Arts.

  - Threatened Species Scientific Committee (TSSC) (2008) Commonwealth Conservation Listing Advice on *Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern New South Wales and Southern Queensland*. Department of the Environment.

- Threatened Species Scientific Committee (TSSC) (2008) Listing Advice for Weeping Myall Woodlands.
- Threatened Species Scientific Committee (TSSC) (2009) Listing Advice for Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD
- Threatened Species Scientific Committee (TSSC) (2011) Listing Advice for Coolibah – Black Box Woodland of the Darling Riverine Plains and the Brigalow Belt South Bioregion EEC
- Threatened Species Scientific Committee (TSSC) (2013) Listing Advice for Brigalow (*Acacia harpophylla* dominant and co-dominant) EEC.
- NSW Scientific Committee (NSWSC) (2002) Final Determination to list *Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains bioregions* as an endangered ecological community, 23 August 2002.
- NSW Scientific Committee (NSWSC) (2005) Final Determination to list Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South western Slopes bioregions as an endangered ecological community, 15 July 2005.
- NSW Scientific Committee (NSWSC) (2011a) *Native Vegetation on Cracking Clay Soils of the Liverpool Plains* – Determination to Make Minor Amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act.
- NSW Scientific Committee (NSWSC) (2011b) Carbeen Open Forest community in the Darling Riverine Plains and Brigalow Belt South Bioregions - Minor amendment to Endangered ecological community determination.
- NSW Scientific Committee (NSWSC) (2012) Final Determination to list Coolibah - Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions as an endangered ecological community, 5 October 2012.

- relevant national and/or NSW recovery plans including:
  - Baker-Gabb (2011) *National Recovery Plan for the Superb Parrot Polytelis swainsonii*. Department of Sustainability and Environment (DSE) Melbourne, Victoria.
  - Department of the Environment (2016) *National Recovery Plan for the Regent Honeyeater* (*Anthochaera phrygia*). Commonwealth of Australia, 2016.
  - Department of Environment, Climate Change and Water (DECCW) (2010) *National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. Department of Environment, Climate Change and Water NSW, Sydney.
  - National Murray Cod Recovery Team (2010) Background and Implementation Information for the National Recovery Plan for the Murray Cod *Maccullochella peelii peelii*. Department of Sustainability and Environment, Melbourne.
  - Saunders and Tzaros (2011) National Recovery Plan for the Swift Parrot *Lathamus discolor*. Birds Australia, Melbourne.
  - Department of Environment and Climate Change (DECC) (2008) Approved Recovery Plan for the Koala (*Phascolarctos cinereus*), November 2008.

- Department of Environment and Resource Management (DERM) (2011) National recovery plan for the large-eared pied bat *Chalinolobus dwyeri*. Report to the Department of Sustainability, Environment, Water, Population and Communities, Canberra.

The technical data and other information considered in determining the relevant impacts of the Proposal on listed threatened and migratory species is provided in Sections 3.1 and 3.2 of the BAR (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a of the EIS).

5.0 Avoidance, Mitigation and Offsetting

A range of avoidance, mitigation and offset strategies are proposed to minimise the impact of the proposal on threatened species and ecological communities listed under the EPBC Act.

5.1 Avoidance

5.1.1 Site Selection

ARTC has commissioned a range of studies to guide the site selection for the proposal. Two major studies have been undertaken in relation to the development of an inland rail route between Melbourne and Brisbane. The first study, completed in 2006, considered potential corridors for the rail line to determine which route would deliver the best economic and financial outcome.

The Melbourne-Brisbane Inland Rail Alignment Study (ARTC 2010) was finalised in 2010 and was prepared to determine the optimum alignment of the entire route in terms of operational, engineering and environmental factors. At each stage the options were analysed in sufficient detail to enable key decisions to be made and finally narrow the rail corridor options down to a single rail alignment. The successive stages of route analysis included:

- Inland rail route options – identification of a range of available route options. Environmental and land use assessments were undertaken along each route section.
- Identification of the route – evaluation of the route options and preliminary analysis of: Melbourne to Parkes; Parkes to Moree; and Moree to Brisbane.
- Analysis of the route – the route was analysed in terms of capital cost, environmental impacts and journey times as well as its preliminary economic and financial viability. Environmental constraints mapping was produced and survey data was obtained to assist with the alignment development.
- Development of the rail alignment – the rail alignment was developed considering environmental and engineering factors. Environmental risks were eliminated or minimised through consideration of local alternatives and moving the alignment to avoid significant constraints were possible.

For the Narrabri to North Star section of the Inland Rail, the proposal primarily includes upgrades to existing tracks as opposed to the construction of new track or work in greenfield sites. As a result, the overall disturbance footprint of the proposal is reduced through the use of the existing corridor. As the proposed works occur along or adjacent to the existing track, further positioning works to avoid native vegetation and habitat areas would only be possible in some cases. Conversely, these works would be primarily undertaken in the existing rail corridor that is regularly subject to disturbances relating to the rail corridor and surrounding agricultural activities and with relatively few important biodiversity features and habitats.

Further information on proposal alternatives and options is outlined in Chapter 6 of the EIS.

5.1.2 Planning Phase

Ecological investigations were also undertaken during the constraints analysis phase to help to determine the potential impacts of the proposal. This facilitated the amendment of the design, where possible, to minimise potential impacts on threatened species, communities and their habitats.

The ecological investigations undertaken by Umwelt (2014) identified a range of key biodiversity constraints in the Narrabri to North Star section of Inland Rail. These investigations included database and literature reviews and rapid ecological field surveys of the rail corridor that included vegetation assessments, targeted inspections of bridge structures for micro-bats and rapid aquatic assessments. The investigations identified the presence of multiple threatened ecological communities (TECs) under the TSC and EPBC Acts occurring within and adjacent to the rail corridor. Fauna habitats, however, were found to be relatively limited due to the previous and ongoing disturbances within the rail corridor and extensive agricultural lands surrounding the proposal site.

Following these investigations, where works could be relocated outside of native vegetation (such as the placement of site offices and storage bunds) these were to be located in primarily disturbed or exotic landscapes. However, in most cases there was little scope for further avoidance of ecological impacts for the construction of the proposal itself as the location of works is constrained by the existing rail line and the existing rail corridor.

Further mitigation measures are described below with the aim of further minimising impacts.

5.1.3 Avoidance Summary

ARTC undertook a detailed ecological constraints study to guide the design of the proposal which allowed for early consideration of the impacts of the proposal on significant ecological features, including MNES. ARTC was then able to implement avoidance measures, as described in **Table 5.1** that reduced the area of direct impact on EPBC Act listed threatened ecological communities and threatened species habitats.

Table 5.1 below outlines a summary of the avoidance measures that have been or will be implemented to minimise the impacts of the proposal.

Table 5.1 Avoidance Measures

Action	Outcome	Timing	Responsibility
The Melbourne-Brisbane Inland Rail Alignment Study	• Identification of a preliminary proposal route • Avoidance of native vegetation and habitat areas, where practicable	Site Selection	ARTC
Ecological constraints investigations	• Identification of areas of high conservation value • Relocation of works outside native vegetation and habitat areas, where practicable • Maximising disturbances within areas of low conservation value (exotic grasslands, disturbed areas)	Planning Phase	ARTC

Action	Outcome	Timing	Responsibility
Demarcation of areas approved for clearing, where practicable	• Minimisation of accidental clearing/disturbance of surrounding native vegetation	Construction	Construction contractor

5.2 Statutory or Policy Basis for Mitigation Measures

No specific State or Commonwealth policies are currently available to form the basis of the proposed mitigation strategy. The mitigation strategy has been developed specifically for the proposal based on previous learning and experience at ARTC and utilising best practise guidelines in ecological impact minimisation. Consideration has also been given to State and Commonwealth Recovery Plans and Threat Abatement Plans, where relevant.

5.3 Impact Mitigation and Biodiversity Management Measures

5.3.1 Construction

A CEMP would be prepared to detail the approach to environmental management during construction, as outlined below and in accordance with the conditions of approval for the proposal. The CEMP would include a number of sub-plans and management measures including for biodiversity. The key aspects of the proposed management plans are provided in **Table 5.2** and further detail regarding proposed environmental management is provided in the EIS. The measures identified in **Table 5.2** are a subset of the total measures provided in the EIS as these are measures that will mitigate impacts on the threatened species and ecological communities recorded or assessed as being potentially significantly impacted in **Section 4.2**.

Table 5.2 Proposed Management Measures for Subject Species and Ecological Communities

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
1. General	The CEMP would outline the construction conditions and temporary environmental protection measures to manage the impact of construction activities. It would be consistent with the mitigation and management measures documented in this EIS, conditions of the approval, the conditions of any licences or permits issued by government authorities, and ARTC's environmental management system.	Site induction	All employees, contractors and subcontractors would receive an environmental induction which would include: • all proposal specific and standard noise and vibration mitigation measures • relevant conditions of licences/approvals/determinations etc • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • heritage requirements • construction employee areas • designated loading/unloading areas and procedures • construction traffic routes • site opening/closing times (including deliveries) • environmental incident procedures.	Informing employees and contractors of their responsibilities will encourage environmental awareness and should reduce unnecessary impacts on surrounding habitats and vegetation. This is applicable for: • Brigalow (*Acacia harpophylla* dominant and co-dominant) • Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions • Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland • Weeping Myall Woodlands • Belson's panic (H*omopholis belsonii*) • koala (*Phascolarctos cinereus*) • grey-headed flying-fox (*Pteropus poliocephalus*)

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
		Roles and responsibilities	The CEMP would identify all members of the Inland Rail and construction team, including roles and responsibilities relevant to implementation of the CEMP. Contact details would be provided, including contacts in the case of emergencies or incidents as well as out-of-hours contacts.	
		Reporting and communication	The CEMP would outline reporting requirements for different levels of environment incidents, as well as the required procedure for emergency and incident management, non-compliance management and corrective and preventative actions Any additional training requirements would be identified (in addition to the site induction). Reporting requirements would be included, including for the control of environmental records.	Early communication of any issues through reporting, monitoring and auditing will allow adaptive management to be undertaken to improve the environmental outcomes during construction. This is applicable for: • Brigalow (*Acacia harpophylla* dominant and co-dominant) • Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
		Monitoring and auditing	The CEMP would identify monitoring, auditing and inspection requirements, and determine the framework for the management of key environmental issues for construction.	• Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland • Weeping Myall Woodlands • Belson's panic (*Homopholis belsonii*) • Pilliga mouse (*Pseudomys pilligaensis*) • grey-headed flying-fox (*Pteropus poliocephalus*)

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
		Environmental control maps	The location of sensitive areas (e.g. heritage items and trees/vegetation to be retained) would be clearly identified on environmental control maps, which would be supplied to construction managers and workers.	Clear communication on areas approved for disturbance and the locations of sensitive environmental features should reduce unnecessary impacts on surrounding habitats and vegetation. This is applicable for: • Brigalow (*Acacia harpophylla* dominant and co-dominant) • Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions • Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland • Weeping Myall Woodlands • Belson's panic (*Homopholis belsonii*) • koala (*Phascolarctos cinereus*) • grey-headed flying-fox (*Pteropus poliocephalus*).

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
		Working hours and out of hours protocol	Permissible working hours and activities would be defined. An out-of-hours work protocol would be developed to guide the assessment, management, and approval of works for proposal construction hours according to the Inland Rail Construction Noise and Vibration Management Framework.	Clear working hours and activities will assist in controlling access to work sites and may help reduce unnecessary impacts to surrounding areas of habitat and vegetation. This is applicable for: • Brigalow (*Acacia harpophylla* dominant and co-dominant) • Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions • Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland • Weeping Myall Woodlands • Belson's panic (*Homopholis belsonii*) • koala (*Phascolarctos cinereus*) • grey-headed flying-fox (*Pteropus poliocephalus*).

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
Soil and water	The soil and water management sub-plan would detail how potential impacts on soils, erosion, sedimentation, watercourses and water quality (surface and groundwater) would be mitigated and managed during construction. The plan would provide for incident management in relation to potential water quality contamination incidents. It would include procedures to manage the impact of the proposal on flooding, and would take into account the requirements of relevant guidelines, including: • Managing Stormwater: Urban Soils and Construction Vol 1 (Landcom, 2004) • Managing Stormwater: Urban Soils and Construction Vol 2A Installation of Services (DECC, 2008)	Erosion of exposed soils and sediment management	Sediment and erosion control devices would be installed to minimise mobilisation and transport of sediment in accordance with Managing Urban Stormwater, Soils and Construction (Landcom, 2004). Maintenance and checking of the erosion and sedimentation controls would be undertaken on a regular basis and any subsequent records retained. Sediment would be cleared from behind barriers/sand bags on a regular basis as required and all controls would be managed to ensure they work effectively at all times. The area of exposed surfaces would be minimised. Disturbed areas would be stabilised progressively to ensure that no areas remain unstable for any extended length of time. Soil and sediment that accumulates in erosion and sediment control structures would be reused where practicable during site reinstatement, unless it is contaminated or otherwise inappropriate for reuse.	Management of sediment and erosion will assist in the maintenance of habitat quality and vegetation community integrity and therefore minimise and mitigate the impacts of construction on the following MNES: • Brigalow (*Acacia harpophylla* dominant and co-dominant) • Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions • Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland • Weeping Myall Woodlands • Belson's panic (*Homopholis belsonii*) • koala (*Phascolarctos cinereus*) • grey-headed flying-fox (*Pteropus poliocephalus*)

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
	• Managing Urban Stormwater Volume 2C: Unsealed roads (DECC, 2008) • OEH, 2012, Erosion and sediment control on unsealed roads (OEH, 2012) • Technical Guideline: Temporary stormwater drainage for road construction (RMS, 2011) • Waste Classification Guidelines (EPA, 2014).		Work would cease where practicable during heavy rainfall events when there is a risk of sediment loss off site or ground disturbance due to waterlogged conditions. Equipment, plant and materials would be placed in designated construction/storage areas where they are least likely to cause erosion. Erosion control devices would be removed as part of the final site clean-up. This would include removing any sediment in drainage lines that has been trapped by erosion control devices, and restoring disturbed areas. Exposed surfaces would be stabilised, and final landscaping implemented, as soon as practicable.	

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
Soil and water cont'd		Stockpile management	Stockpiles would be managed by implementing sediment and erosion control devices in accordance with Managing Urban Stormwater, Soils and Construction (Landcom, 2004). No stockpiles of materials or storage of fuels or chemicals would be located within high/medium flood risk areas or flow paths.	Stockpile management manages weeds and therefore mitigates potential for vegetation community integrity degradation for: • Brigalow (*Acacia harpophylla* dominant and co-dominant) • Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions • Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland • Weeping Myall Woodlands • Belson's panic (*Homopholis belsonii*).

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
		Spill/incident management	Spill kits would be maintained on-site at all times. Machinery would be checked daily to ensure that no oil, fuel or other liquids are leaking. Refuelling of plant and equipment would be undertaken within designated areas with appropriate controls. Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) would be undertaken on a regular basis to identify any potential spills. Vehicle wash down and/or cement truck washout would occur in a designated bunded area or off-site.	Spill management will assist in the maintenance of habitat quality and vegetation community integrity and therefore minimise and mitigate the impacts of construction in relation of the following MNES: • Brigalow (*Acacia harpophylla* dominant and co-dominant) • Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions • Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland • Weeping Myall Woodlands • Belson's panic (*Homopholis belsonii*) • koala (*Phascolarctos cinereus*) • grey-headed flying-fox (*Pteropus poliocephalus*).

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
		Groundwater	Any groundwater encountered during construction would be managed and disposed of in accordance with the Waste Classification Guidelines (EPA, 2014). Groundwater would be managed to ensure it does not cause pollution of waters in accordance with section 120 of the POEO Act. If dewatering is required during construction, the water would be tested, and treated if necessary, prior to re-use, discharge or disposal in accordance with the testing results.	Groundwater management (where required) will assist in the maintenance of habitat quality and vegetation community integrity and therefore minimise and mitigate the impacts of construction in relation of the following MNES: • Brigalow (*Acacia harpophylla* dominant and co-dominant) • Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions • Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland • Weeping Myall Woodlands • Belson's panic (*Homopholis belsonii*) • koala (*Phascolarctos cinereus*) • grey-headed flying-fox (*Pteropus poliocephalus*)

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
Biodiversity management	The biodiversity management sub-plan would detail how construction impacts on aquatic and terrestrial flora and fauna would be mitigated, managed and monitored.	Vegetation management	Employee education and training including inductions for staff, contractors and visitors to the site would include the biodiversity issues present at the site and so they know their role and responsibilities in relation to the protection and/or minimisation of impacts to native biodiversity. The CEMP and construction plans would document the location and full extent of clearing required.	Employee education and training will encourage environmental awareness and should reduce unnecessary impacts on surrounding habitats and vegetation. This is applicable for: • Brigalow (*Acacia harpophylla* dominant and co-dominant) • Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions • Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland • Weeping Myall Woodlands • Belson's panic (*Homopholis belsonii*) • koala (*Phascolarctos cinereus*) • grey-headed flying-fox (*Pteropus poliocephalus*)

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
		Management of trees to be retained	The management of trees in the vicinity of the construction zone would be consistent with the AS 4970-2009 Protection of trees on development sites (incorporating Amendment No. 1 (March 2010)).	The management of trees in the vicinity of the construction zone should reduce unnecessary impacts on surrounding habitats and vegetation. This is applicable: • Brigalow (*Acacia harpophylla* dominant and co-dominant) • Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions • Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland • Weeping Myall Woodlands • koala (*Phascolarctos cinereus*) • grey-headed flying-fox (*Pteropus poliocephalus*)

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
		Pre-clearance surveys – woody native vegetation	Pre-clearance surveys would be implemented within areas of woody native vegetation that are to be cleared. Pre-clearance surveys will be undertaken by suitably qualified and experienced ecologists and involve the following: The demarcation of areas approved for clearing to reduce risk of accidental clearing/disturbance of surrounding native vegetation where practicable.	Pre-clearance surveys provide the opportunity to minimise impacts on flora and fauna species occupying the habitat to be cleared and will therefore reduce potential impacts to: • Belson's panic (*Homopholis belsonii*) • koala (*Phascolarctos cinereus*) • grey-headed flying-fox (*Pteropus poliocephalus*)

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
			The likely habitat resources and habitat trees would be identified and marked. Habitat trees are those containing hollows, cracks or fissures and spouts, active nests, dreys or other signs of recent fauna usage. Other habitat features to be identified include fallen timber/hollow logs and burrows. The potential presence of threatened flora and fauna species, endangered populations and TECs would be identified. The identification of species or habitat features that are suitable for translocation or salvage. In areas of koala habitat, visual inspection of trees for koalas prior to clearing.	

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
Biodiversity Management (Cont'd)		Tree-felling	Tree clearing would be completed as close to the completion of pre-clearance surveys as practicable and would include: All habitat trees would be vigorously shaken with heavy machinery the day prior to clearing. On the day of habitat tree felling, the following would be undertaken: • all habitat trees would be subject to a visual inspection for threatened species • all reasonable attempts would be made to reduce the impact of felling on all fauna species • the lowering of hollow-bearing trees would be done as gently as possible with heavy machinery • if a native fauna species is identified in a habitat tree on the day of felling, the supervising ecologist or appropriately qualified fauna handler would advise the most appropriate method to minimise potential harm	Tree-felling supervision provides the opportunity to minimise impacts on fauna species occupying the habitat to be cleared and will therefore reduce potential impacts to: • koala (*Phascolarctos cinereus*) • grey-headed flying-fox (*Pteropus poliocephalus*)

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
			• uninjured animals would be released on the day of capture into nearby suitable secure habitat and would not be held for extended periods of time • injured animals would be taken to the nearest veterinary clinic or wildlife carer as soon as possible for assessment and treatment. Following felling, habitat trees would be inspected for remaining or injured fauna species and to ensure that no hollows are blocked against the ground. This may require the tree to be rolled to ensure adequate access. All felled habitat trees would remain in place for a least one night to allow any fauna still present to move on.	

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
		Weed management	Weeds would be managed and disposed of in accordance with the requirements of the *Noxious Weeds Act 1993* and/or the Weeds of National Significance Weed Management Guide. Weed control mitigation and management strategies would be documented and implemented as follows: • vehicles or equipment being brought onto the proposal site and/or travelling around the site must be inspected and cleaned prior to commencing work to limit the spread of seeds and plant material • regular inspections to monitor the spread of weed species • training of environmental personnel on the identification of target weed species.	Weed management will mitigate the potential for vegetation community integrity degradation for: • Brigalow (*Acacia harpophylla* dominant and co-dominant) • Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions • Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland • Weeping Myall Woodlands • Belson's panic (*Homopholis belsonii*).

Item/sub-plan	What would the plan address?	Issue	Management measures to be included in the CEMP and implemented during construction	MNES benefited by Proposed Management Measures
			• Any outbreak of noxious weeds will be controlled and eradicated as required under the *Noxious Weeds Act 1993*, and as required by the Local Land Services and other relevant authorities. Weed control and eradication techniques may include: o spraying with herbicides o physical removal and/or o minimisation of area available for weed infestation, through prompt revegetation of bare areas.	

5.3.2 Operation

An Operational Environmental Management Plan (OEMP) will also be developed for the proposal. Specific to MNES, the following management measures will be included in the OEMP:

- annual inspections would be undertaken for weed infestations and to assess the need for control measures
- any outbreak of noxious and/or weeds of national environmental significance would be managed in accordance with the *Noxious Weeds Act 1993*, the Weeds of National Significance Weed Management Guide, and the requirements of relevant authorities.

These management actions will assist in the maintenance of habitat quality and vegetation community integrity. Furthermore, the communication of any issues through reporting, monitoring and auditing will allow adaptive management to be implemented to improve environmental outcomes during operation. This will result in the mitigation of impacts to the following MNES that have been recorded or could be significantly impacted during operation of the proposal:

- Brigalow (*Acacia harpophylla* dominant and co-dominant)
- Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
- Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland
- Weeping Myall Woodlands
- Belson's panic (*Homopholis belsonii*)
- koala (*Phascolarctos cinereus*)
- grey-headed flying-fox (*Pteropus poliocephalus*).

5.4 Predicted Effectiveness of the Mitigation Measures

As discussed in **Section 5.3**, the CEMP will include a biodiversity management sub-plan in accordance with the EIS and conditions of approval. The measures proposed to be implemented for the proposal are well established mitigation techniques that are commonly used and are well understood. The measures have been found to be effective in mitigating impacts, however, as they rely on procedural implementation (i.e. erection of no go fencing, clearing supervision undertaken etc.) there is an element of human error risk. This risk will be mitigated by development of the biodiversity management sub-plan and appropriate personnel training. The human error risk is further mitigated be the mitigation measures being well established approaches that are therefore commonly understood by construction personnel and management.

Ongoing site inspections will be used to assess and inform the implementation and effectiveness of mitigation and management actions. The effectiveness and long-term success of mitigation actions will be evaluated against key outcomes, which necessitate regular and appropriately targeted monitoring. This will be achieved by using formal monitoring programs and due diligence assessments as part of periodic audits of the program to examine measurable changes over time and provide information on impacts and the success or otherwise of mitigation actions. This process will provide for adaptive management allowing mitigation measures to be modified as required during construction or operations so that they remain effective.

The techniques proposed to be used to monitor the effectiveness of mitigation measures will be documented in the CEMP and biodiversity and soil and water management sub plans, however it will be targeted, systematic and repeatable.

5.5 Biodiversity Offset Strategy

In accordance with the Bilateral Agreement, biodiversity offsets will be provided through the offset contribution required by the NSW FBA.

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 EPBC Act Environmental Offsets Policy and the NSW *Biodiversity Offsets Policy for Major Projects* (OEH 2014a). Firstly, ARTC has, where possible, altered the proposal to avoid and minimise ecological impacts in the proposal planning stage, and a range of impact mitigation strategies have been included in the proposal to mitigate the impact on ecological values (refer to **Section 4.0**) prior to the consideration of offsetting requirements.

5.5.1 NSW Framework for Biodiversity Assessment Biodiversity Credit Report

The controlled action notification identified that the proposal was to be assessed via the Bilateral Agreement and the biodiversity assessment has been conducted in accordance with the NSW Framework for Biodiversity Assessment (FBA). The FBA process requires the calculation of biodiversity credits using a NSW Government credit calculator. The credits calculated and presented in this report have been prepared based on a proposal site provided by GHD in April 2016 (refer to **Appendix A**). It is noted that since this time, a range of alterations to the proposal were made following completion of further technical assessments and engineering design of the proposal which result in some changes to the proposal site. For this reason the proposal site used in this assessment, whilst substantially similar to the final proposal site, is different to that described in the remainder of the EIS. It is expected that the final credit generation for the proposal will be confirmed as an outcome of the detailed design process and that biodiversity offsetting for the proposal will be based on the final credit calculations.

Table 5.3 below provides a summary of the ecosystem and species credits that require offsetting as a result of this proposal in accordance with the NSW FBA and Major Projects Offset Policy. The total area of each PCT is included in **Table 5.3** and several PCTs are consistent entirely or in-part with EPBC Act listed threatened ecological communities (refer to **Section 4.1.1**). Ecosystem credits requiring offsetting in accordance with the FBA include communities that conform to *Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland* CEEC and *Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions* EEC and *Brigalow (Acacia harpophylla dominant and co-dominant)* EEC. The retirement of credits associated with the native vegetation communities occurring in the proposal site also ensures that the habitat for EPBC Act listed threatened species are all offset as part of the proposal.

Like-for-like credit retirement is to be undertaken for MNES directly impacted by the proposal in accordance with the biodiversity offset strategy and Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects (OEH 2014a). The final application of offset credits following the like-for-like principal will be determined during the assessment process considering the detailed design.

Table 5.3 Plant Community Types Requiring Offset and the Total Ecosystem and Species Credits Required in Accordance with the NSW FBA

Plant Community Type/Threatened Species	Corresponding MNES	Credits Required
Ecosystem Credits		
PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	Weeping Myall Woodlands in part	254
PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion	Brigalow (*Acacia harpophylla* dominant and co-dominant)	250
PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion	Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	63
PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	11,046
PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	-	6,303
PCT71 (BR127, NA126) Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and aeolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion	-	2
PCT78 (BR196, NA193) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	-	675
PCT135 (BR284, NA271) Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion	-	133
PCT413 (BR346, NA348) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion	-	100

Plant Community Type/Threatened Species	Corresponding MNES	Credits Required
Total		**18,826**
Species Credits		
finger panic grass (*Digitaria porrecta*)		364
creeping tick-trefoil (*Desmodium campylocaulon*)		2,607
Belson's panic (*Homopholis belsonii*)		1,898
koala (*Phascolarctos cinereus*)		1,632
Total		**6,501**

As detailed in **Table 5.3**, a total of 18,826 ecosystem credits and 6,501 species credits are required to offset the direct impacts of the proposal. The final credit generation for the proposal will be confirmed as an outcome of the detailed design process and the biodiversity offsetting for the proposal will be based on the final credit calculations. ARTC commits to the retirement of credits in accordance with the FBA and the delivery of an appropriate offset strategy for *Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland CEEC* in accordance with the EPBC Act Environmental Offsets Policy.

6.0 Summary of Impacts on Relevant MNES

Based on the direct and permanent impacts associated with the proposal that are summarised in **Section 4.1.1** and the range of avoidance, mitigation and management measures described in **Section 5.0**, the proposal is considered likely to result in a significant impact on *Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD CEEC* and the koala. Impacts of the proposal on MNES recorded in the proposal site will be offset in accordance with the NSW FBA, as detailed below in **Table 6.1**.A summary of the impact assessment in **Section 4.0** and the assessments of significance provided in **Appendix B** is provided below for each species and ecological community assessed as part of the impact assessment.

Ecological Communities

- Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD
    - The proposal is likely to significantly impact this ecological community. The reduction in the extent of the CEEC within the proposal site of 146.7 hectares is likely to result in a significant impact on the ecological community. Residual significant impacts on this community will be offset in accordance with the DoEE Environmental Offsets Policy.
- Brigalow (*Acacia harpophylla* dominant and co-dominant)
    - The proposal would result in the removal of approximately 0.6 hectares of Brigalow (*Acacia harpophylla* dominant and co-dominant) from within the proposal site. This small area of impact is unlikely to result in a significant impact on Brigalow (*Acacia harpophylla* dominant and co-dominant) EEC.
- Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
    - The proposal will result in the removal of approximately 1.19 hectares of Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions from within the proposal site. This small area of impact is unlikely to result in a significant impact on Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions EEC.
- Weeping Myall Woodlands
    - The proposal will result in the permanent loss of approximately 0.43 hectares within the proposal site. This small area of impact is unlikely to result in a significant impact on Weeping Myall Woodlands EEC.

Critically Endangered Species

- Regent Honeyeater (*Anthochaera phrygia*)
    - The proposal is unlikely to result in a significant impact on a population of the regent honeyeater given that it has not been recorded within the proposal site despite thorough diurnal bird surveys and is not known to occur based on analysis of regional records. Additionally key feed species, as documented in the National Recovery Plan (CoA 2016), were not recorded during detailed flora surveys.

- Swift Parrot (*Lathamus discolor*)

    - The proposal is unlikely to result in a significant impact on a population of the swift parrot. There are no known records of swift parrot within 10km of the proposal site. Additionally, important habitat does not occur in the proposal site as none of the key tree species for foraging habitat on mainland Australia as per the National Recovery Plan are present (Saunders and Tzaros 2011).

Endangered Species

- *Tylophora linearis*

    - The proposal is unlikely to result in a significant impact on a population of *Tylophora linearis* given that a population of this species is considered unlikely to occur in the proposal site.

Vulnerable Species

- Bluegrass (*Dichanthium setosum*)

    - Despite the presence of suitable habitat bluegrass was not recorded within the proposal site as part of thorough vegetation surveys undertaken in accordance with the seasonal requirements for this species. The proposal is unlikely to result in a significant impact on an important population of bluegrass.

- Belson's panic (*Homopholis belsonii*)

    - Given the relatively small number of individuals recorded in the proposal site, the highly disturbed and fragmented nature of the proposal site and the reasonable number of records of this species outside the proposal site at this locality according to the OEH Atlas of NSW Wildlife, it is unlikely that a key source population either for breeding or dispersal, a population that is necessary for maintaining genetic diversity or a populations that is near the limit of its known range occurs within the proposal site. Therefore these individuals of Belson's panic within the proposal site are not considered to form part of an *important population*. Therefore the proposal is unlikely to result in a significant impact on an *important population* of Belson's panic.

- Murray Cod (*Maccullochella peelii*)

    - The proposal is unlikely to result in a significant impact on an *important population* of the Murray cod as the proposal is unlikely to adversely affect the extent or quality of habitat for the species within the proposal site.

- Five-clawed worm-skink (*Anomalopus mackayi*)

    - Despite targeted surveys this species was not recorded in the proposal site. When taking into account the level of disturbance in the proposal site it is considered unlikely that an *important population* of this species would occur. Therefore the proposal is unlikely to result in a significant impact on an *important population* of five-clawed worm-skink.

- Pink-tailed worm-lizard (*Aprasia parapulchella*)

    - The pink-tailed worm-lizard was not recorded despite intensive fauna surveys undertaken throughout the proposal site. There are no known records of this species within 10 kilometres of the proposal site. It is considered unlikely that this species will occur within the proposal site. Therefore an important population of this species was not considered to occur within the proposal

site. The proposal is unlikely to result in a significant impact on an *important population* of pink-tailed worm-lizard.

- Border thick-tailed gecko (*Uvidicolus sphyrurus*)

  - The border thick-tailed gecko was not recorded within the proposal site despite targeted fauna surveys undertaken in accordance with the seasonal requirements for this species. There is one outlying record from Moree area in 1990 with the nearest records to the proposal site being Mount Kaputar National Park east of Narrabri. Given the absence of preferred habitat, microhabitats and also the lower elevations (less than 500 m) along the proposal site this species is unlikely to occur. Therefore an *important population* of this species is unlikely to occur in the proposal site. The proposal is unlikely to result in a significant impact on an *important population* of the border-thick tailed gecko.

- Squatter pigeon (*Geophaps scripta scripta*)

  - Given the scarcity of records found in NSW for this species and the lack of sightings during the extensive fauna surveys undertaken it is considered unlikely that a portion of the NSW sub-population of squatter pigeon would occur in the proposal site. Therefore an important population of this species was not considered to occur on site. The proposal is unlikely to result in a significant impact on an *important population* of the squatter pigeon.

- Painted honeyeater (*Grantiella picta*)

  - The painted honeyeater was not recorded in the proposal site despite extensive fauna surveys undertaken throughout the proposal site across multiple seasons and potential habitat is considered poor due to its fragmented nature and disturbance. The proposal is therefore unlikely to result in a significant impact on an important population of painted honeyeater.

- South-eastern long-eared bat (*Nyctophilus corbeni*)

  - Based on this species not being recorded as part of targeted surveys , the scarcity of local records and small area of habitat within the proposal site, it is unlikely that an important population of the south-eastern long-eared bat occurs within the proposal site. The proposal is unlikely to result in a significant impact on an *important population* of the south-eastern long-eared bat.

- Pilliga mouse (*Pseudomys pilligaensis*)

  - The Pilliga mouse is not known to occur within the proposal site. Potential habitat was identified in one vegetation community occurring within the proposal site, occupying a total of 0.11 hectares. All records identified during the assessment for the Pilliga mouse are concentrated in Pilliga scrub area to the south of Narrabri, south of the proposal site. Therefore an *important population* of this species is not likely to occur on site as it is not expected to be a key site for breeding and dispersal or important for maintaining genetic diversity. The proposal is unlikely to result in a significant impact on an important population of the Pilliga mouse.

- Koala (*Phascolarctos cinereus*)

  - The assessment of significance concludes that the proposal is unlikely to result in a significant impact on an important population of the koala, however the DoEE has determined that the proposal is likely to result in a significant impact on the koala. The Koala Habitat Assessment Tool as outlined in Table 3 of the Referral Guidelines was used to complete this assessment of significance (refer to **Appendix B**) and the loss of 2.18 hectares of primary habitat and

13.44 hectares of secondary habitat is not expected to significantly impact the koala and residual significant impacts are not predicted due to the range of impact minimisation and mitigation strategies that are proposed to be implemented and the offsetting of plant community types in accordance with the NSW FBA.

- Grey-headed flying-fox (*Pteropus poliocephalus*)

- One grey-headed flying-fox was recorded within the proposal site. There are no records of grey-headed flying-fox on the OEH Atlas of NSW Wildlife within 10 kilometres of the proposal site. There are no camp sites or breeding habitat for this species within the proposal site and therefore, it is unlikely to be a key source population either for breeding or dispersal or comprise a population that is necessary for maintaining genetic diversity. The species is not near the limits of its known range within the proposal site. Therefore any potentially occurring population of grey-headed flying-fox within the proposal site would not be considered to be an *important population*. The proposal is unlikely to result in a significant impact on an important population of the grey-headed flying-fox.

Table 6.1 provides a summary of the direct and permanent impacts associated with the proposal that are described in **Section 3.2** and the range of avoidance, mitigation and management, and biodiversity offset strategies described in **Section 4.0**. As detailed in **Section 4.5** above, like-for-like offsets for MNES impacted by the proposal will be retired in accordance with the NSW FBA.

Table 6.1 Summary of the Impacts and Offsets of the Proposal on Impacted MNES, in accordance with the NSW FBA

Matter	Avoidance and Mitigation	Proposal Impact	Like-for-like Offset In accordance with NSW FBA
Endangered Ecological Communities			
Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD	Avoidance of native vegetation and habitat areas through proposal design, where practicable and maximising disturbances within areas of low conservation value (exotic grasslands, disturbed areas) Mitigation of impacts through controls described in Table 4.3 to be implemented as described in the: • CEMP • Soils and Water Management Sub-plan • Biodiversity Management Sub-plan.	The proposal is likely to significantly impact this ecological community. The reduction in the extent of the CEEC within the proposal site of 146.7 hectares is likely to result in a significant impact on the ecological community.	Subject to the revision of credits as part of the detailed design process, 11,046 ecosystem credits will be retired to offset impacts to this CEEC, in accordance with the Programme Biodiversity Offset Strategy and the NSW FBA.
Brigalow (*Acacia harpophylla* dominant and co-dominant)	Avoidance of native vegetation and habitat areas through proposal design, where practicable and maximising disturbances within areas of low conservation value (exotic grasslands, disturbed areas) Mitigation of impacts through controls described in Table 4.3 to be implemented as described in the proposed: • CEMP	The proposal would result in the removal of approximately 0.6 hectares of Brigalow (*Acacia harpophylla* dominant and co-dominant) from within the proposal site.	Subject to the revision of credits as part of the detailed design process, 250 ecosystem credits will be retired to offset impacts to this EEC, in accordance with the Programme Biodiversity Offset Strategy and the NSW FBA.

Matter	Avoidance and Mitigation	Proposal Impact	Like-for-like Offset In accordance with NSW FBA
	• Soils and Water Management Sub-plan • Biodiversity Management Sub-plan.		
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Avoidance of native vegetation and habitat areas through proposal design, where practicable and maximising disturbances within areas of low conservation value (exotic grasslands, disturbed areas) Mitigation of impacts through controls described in Table 4.3 to be implemented as described in the proposed: • CEMP • Soils and Water Management Sub-plan • Biodiversity Management Sub-plan.	The proposal will result in the removal of approximately 1.19 hectares of Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions from within the proposal site.	Subject to the revision of credits as part of the detailed design process, 63 ecosystem credits will be retired to offset impacts to this EEC, in accordance with the Programme Biodiversity Offset Strategy and the NSW FBA.
Weeping Myall Woodlands	Avoidance of native vegetation and habitat areas through proposal design, where practicable and maximising disturbances within areas of low conservation value (exotic grasslands, disturbed areas) Mitigation of impacts through controls described in Table 4.3 to be implemented as described in the proposed:	The proposal will result in the permanent loss of approximately 0.43 hectares within the proposal site.	Subject to the revision of credits as part of the detailed design process, 254 ecosystem credits will be retired to offset impacts to this EEC, in accordance with the Programme Biodiversity Offset Strategy and the NSW FBA.

Matter	Avoidance and Mitigation	Proposal Impact	Like-for-like Offset In accordance with NSW FBA
	• CEMP • Soils and Water Management Sub-plan • Biodiversity Management Sub-plan.		
Threatened Species			
Koala (*Phascolarctos cinereus*)	Avoidance of native vegetation and habitat areas, where practicable and maximising disturbances within areas of low conservation value (exotic grasslands, disturbed areas) Mitigation of impacts through controls described in Table 4.3 to be implemented as described in the proposed: • CEMP • Soils and Water Management Sub-plan • Biodiversity Management Sub-plan.	The assessment of significance concludes that the proposal is unlikely to result in a significant impact on an important population of the koala, however the DoEE has determined that the proposal is likely to result in a significant impact on the koala. The Koala Habitat Assessment Tool as outlined in Table 3 of the Referral Guidelines was used to complete this assessment of significance (refer to **Appendix B**) and the loss of 2.18 hectares of primary habitat and 13.44 hectares of secondary habitat is not expected to significantly impact the koala and residual significant impacts are not predicted due to the range of impact minimisation and mitigation strategies that are proposed to be implemented and the offsetting of plant community types in accordance with the NSW FBA.	Subject to the revision of credits as part of the detailed design process, 1,632 species credits will be retired to offset impacts to the habitat of this threatened species, in accordance with the Programme Biodiversity Offset Strategy and the NSW FBA.

Matter	Avoidance and Mitigation	Proposal Impact	Like-for-like Offset In accordance with NSW FBA
Belson's panic (*Homopholis belsonii*)	Avoidance of native vegetation and habitat areas, where practicable and maximising disturbances within areas of low conservation value (exotic grasslands, disturbed areas) Mitigation of impacts through controls described in Table 4.3 to be implemented as described in the proposed: • CEMP • Soils and Water Management Sub-plan • Biodiversity Management Sub-plan.	Given the relatively small number of individuals recorded in the proposal site, the highly disturbed and fragmented nature of the proposal site and the reasonable number of records of this species outside the proposal site at this locality according to the OEH Atlas of NSW Wildlife, it is unlikely that a key source population either for breeding or dispersal, a population that is necessary for maintaining genetic diversity or a populations that is near the limit of its known range occurs within the proposal site. Therefore these individuals of Belson's panic within the proposal site are not considered to form part of an important population. Therefore the proposal is unlikely to result in a significant impact on an important population of Belson's panic.	Subject to the revision of credits as part of the detailed design process, 1,898 species credits will be retired to offset impacts to the habitat of this threatened species, in accordance with the Programme Biodiversity Offset Strategy and the NSW FBA.

7.0 Environmental Record of the Proponent

Table 7.1 provides a summary of the environmental record of the proponent.

Table 7.1 The Environmental Record of the Proponent.

Environmental Record of the Proponent	Yes	No
Does the party taking the action have a satisfactory record of responsible environmental management?	X	
Provide details Through implementation of ARTC's Code of Practice, Environmental Management System, and Environmental Management Plans for a variety of construction projects, ARTC has maintained a satisfactory record of responsible environmental management.		
Has either (a) the party proposing to take the action, or (b) if a permit has been applied for in relation to the action, the person making the application - ever been subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources?		X
If yes, provide details		
If the party taking the action is a corporation, will the action be taken in accordance with the corporation's environmental policy and planning framework?	X	
If yes, provide details of environmental policy and planning framework ARTC Code of Practice for environmental impact assessment of development proposals in NSW ARTC Environmental Management System (EMS)		
Has the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?	X	
Provide name of proposal and EPBC reference number (if known) Kooragang Coal Terminal Arrival Roads Stage 2 Upgrade, Newcastle, NSW (2014/7229) Rail Upgrades at Geelong Port Project (2010/5363) Maitland to Minimbah Third Track Project, NSW (2009/4897)		

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Threatened Species Scientific Committee (TSSC) (2008a) Commonwealth Listing Advice for Weeping Myall Woodlands. Department of the Environment, Water, Heritage and the Arts. December 2008

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Threatened Species Scientific Committee (TSSC) (2008c) Approved Conservation Advice for slender darling pea (*Swainsona murrayana*). October 2008.

Threatened Species Scientific Committee (TSSC) (2008d) Approved Conservation Advice for *Tylophora linearis*. October 2008.

Threatened Species Scientific Committee (TSSC) (2008e) Commonwealth Conservation Advice on *Anomalopus mackayi* (Five-clawed Worm-skink). Department of the Environment, Water, Heritage and the Arts.

Threatened Species Scientific Committee (TSSC) (2008f) Commonwealth Approved Conservation Advice for *Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern New South Wales and Southern Queensland*. Department of the Environment, Water, Heritage and the Arts. December 2008

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Threatened Species Scientific Committee (TSSC) (2013a*)* Approved Conservation Advice for Australian painted snipe (*Rostratula australis)*. May 2013.

Threatened Species Scientific Committee (TSSC) (2013b) Approved Conservation Advice for the Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community. December 2013.

Threatened Species Scientific Committee (TSSC) (2014) Approved Conservation Advice for *Furina dunmalli* (Dunmall's Snake). April 2014.

Threatened Species Scientific Committee (TSSC) (2015a) Approved Conservation Advice for pink-tailed worm-lizard (*Aprasia parapulchella*). October 2015.

Threatened Species Scientific Committee (TSSC) (2015b*) Approved Conservation Advice for curlew sandpiper (Calidris ferruginea*). May 2015.

Threatened Species Scientific Committee (TSSC) (2015c) Approved Conservation Advice for *Geophaps scripta scripta* Squatter Pigeon (Southern). October 2015.

Threatened Species Scientific Committee (TSSC) (2015d) Approved Conservation Advice for painted honeyeater *(Grantiella picta)*. July 2015.

Threatened Species Scientific Committee (TSSC) (2015e) Conservation Advice for south-eastern long-eared bat (*Nyctophilus corbeni*). October 2015.

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Threatened Species Scientific Committee (TSSC) (2016c) Conservation Advice for *Petauroides volans* Greater Glider.

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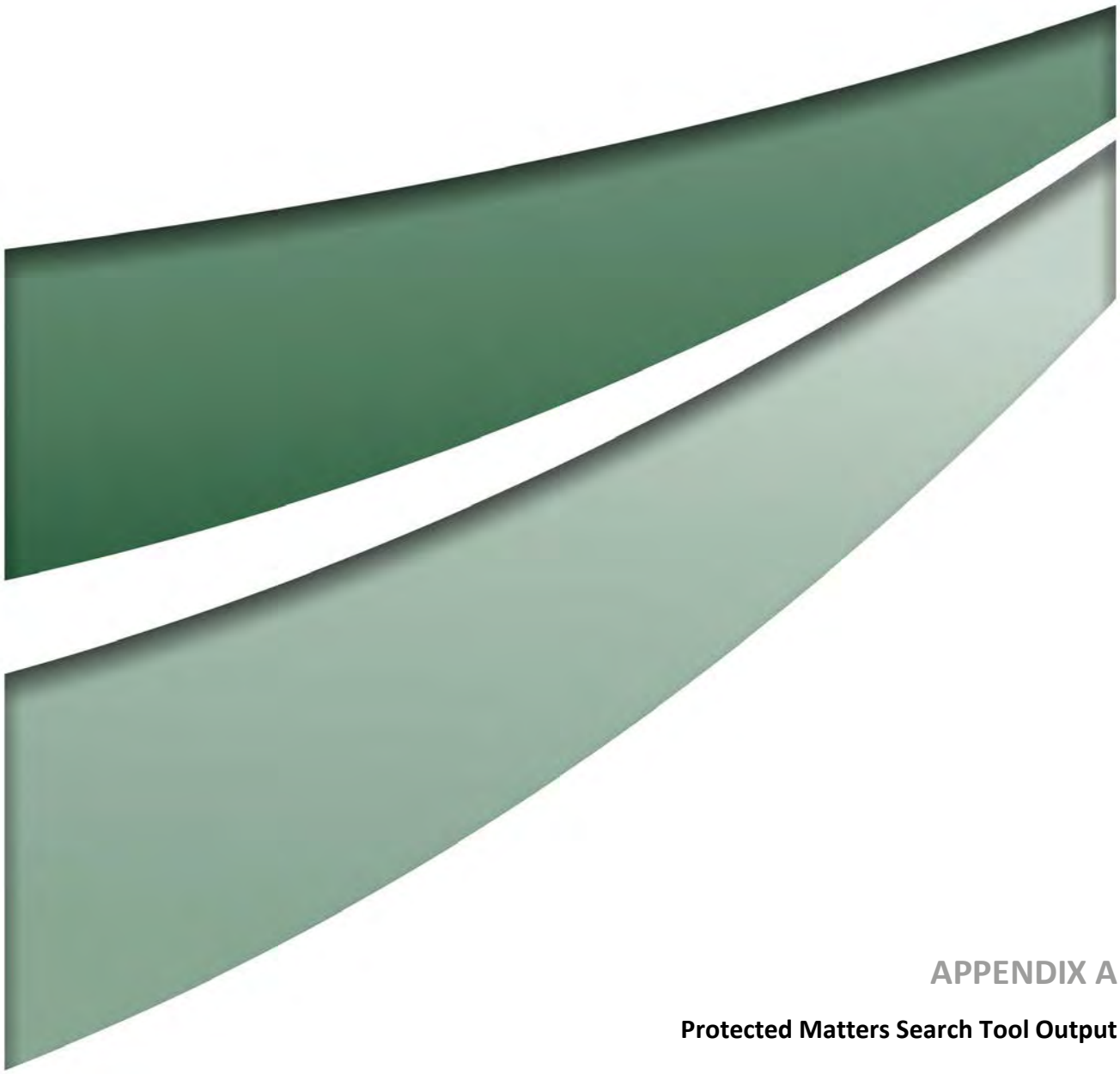

APPENDIX A

Protected Matters Search Tool Output

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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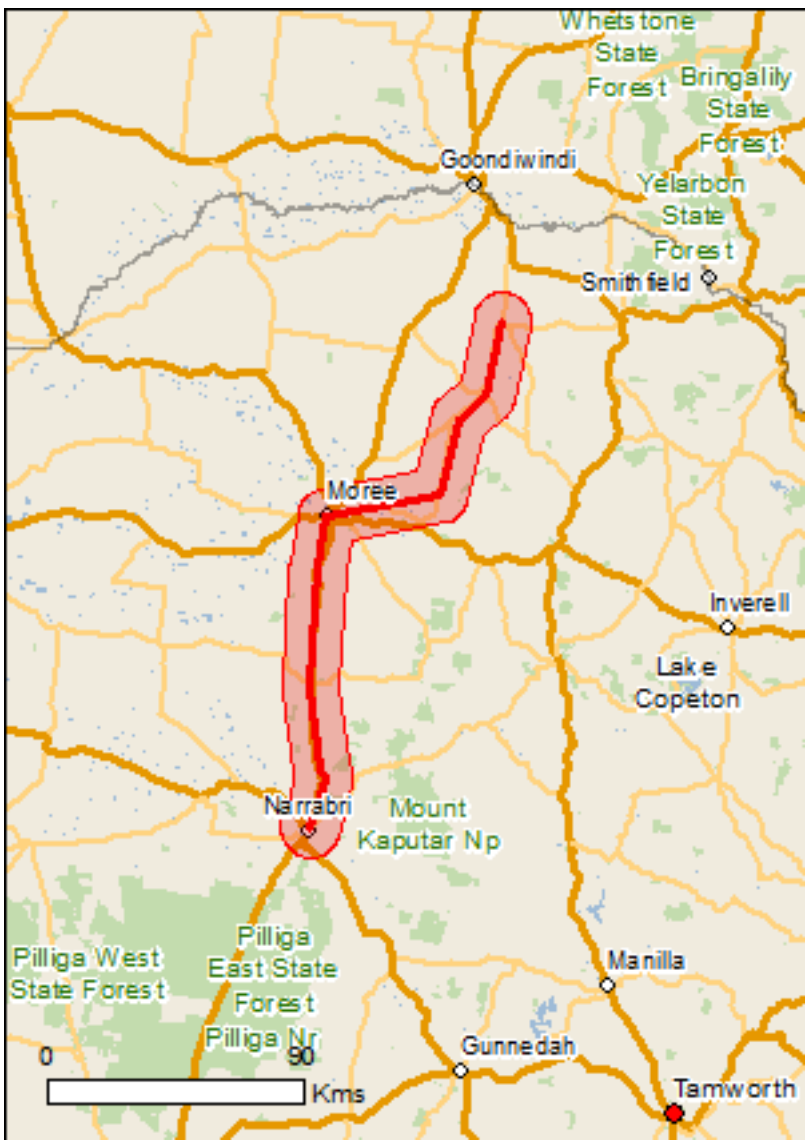

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

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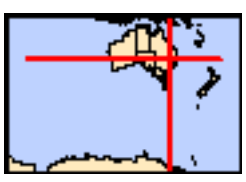

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	7
Listed Threatened Species:	28
Listed Migratory Species:	8

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	6
Commonwealth Heritage Places:	1
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	4
Regional Forest Agreements:	None
Invasive Species:	29
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties [Resource Information]

Name	State	Status
Indigenous		
Moree Baths and Swimming Pool	NSW	Listed place

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	900 - 1000km upstream
Gwydir wetlands: gingham and lower gwydir (big leather) watercourses	30 - 40km upstream
Riverland	900 - 1000km upstream
The coorong, and lakes alexandrina and albert wetland	1100 - 1200km

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community likely to occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community may occur within area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community likely to occur within area
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur

Name	Status	Type of Presence
		within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Frogs		
Litoria booroolongensis Booroolong Frog [1844]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pseudomys pilligaensis Pilliga Mouse, Poolkoo [99]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Androcalva procumbens [87153]	Vulnerable	Species or species habitat likely to occur within area
Bertya opponens [13792]	Vulnerable	Species or species habitat likely to occur within area
Cadellia pentastylis Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat known to occur within area
Homopholis belsonii Belson's Panic [2406]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
[Swainsona murrayana](#) Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area
[Thesium australe](#) Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
[Tylophora linearis](#) [55231]	Endangered	Species or species habitat likely to occur within area
Reptiles		
[Anomalopus mackayi](#) Five-clawed Worm-skink, Long-legged Worm-skink [25934]	Vulnerable	Species or species habitat known to occur within area
[Aprasia parapulchella](#) Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area
[Uvidicolus sphyrurus](#) Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko [84578]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
[Hirundapus caudacutus](#) White-throated Needletail [682]		Species or species habitat known to occur within area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Scientific & Industrial Research Organisation
Commonwealth Land - Commonwealth Trading Bank of Australia
Commonwealth Land - Telstra Corporation Limited

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Narrabri Post Office and former Telegraph Office	NSW	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Breeding likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Bobbiwaa	NSW
Bullala	NSW
Killarney	NSW
Kirramingly	NSW

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis		
Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis		
Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris		
Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula		
Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Senecio madagascariensis		
Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Tamarix aphylla		
Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-28.923976 150.389415,-28.923976 150.389415,-29.130512 150.339976,-29.197667 150.252086,-29.403653 150.191661,-29.465846 149.834605,-29.604447 149.807139,-29.933456 149.785167,-30.156943 149.818126,-30.180689 149.829112,-30.3183 149.785167,-30.308816 149.779674

Acknowledgements

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

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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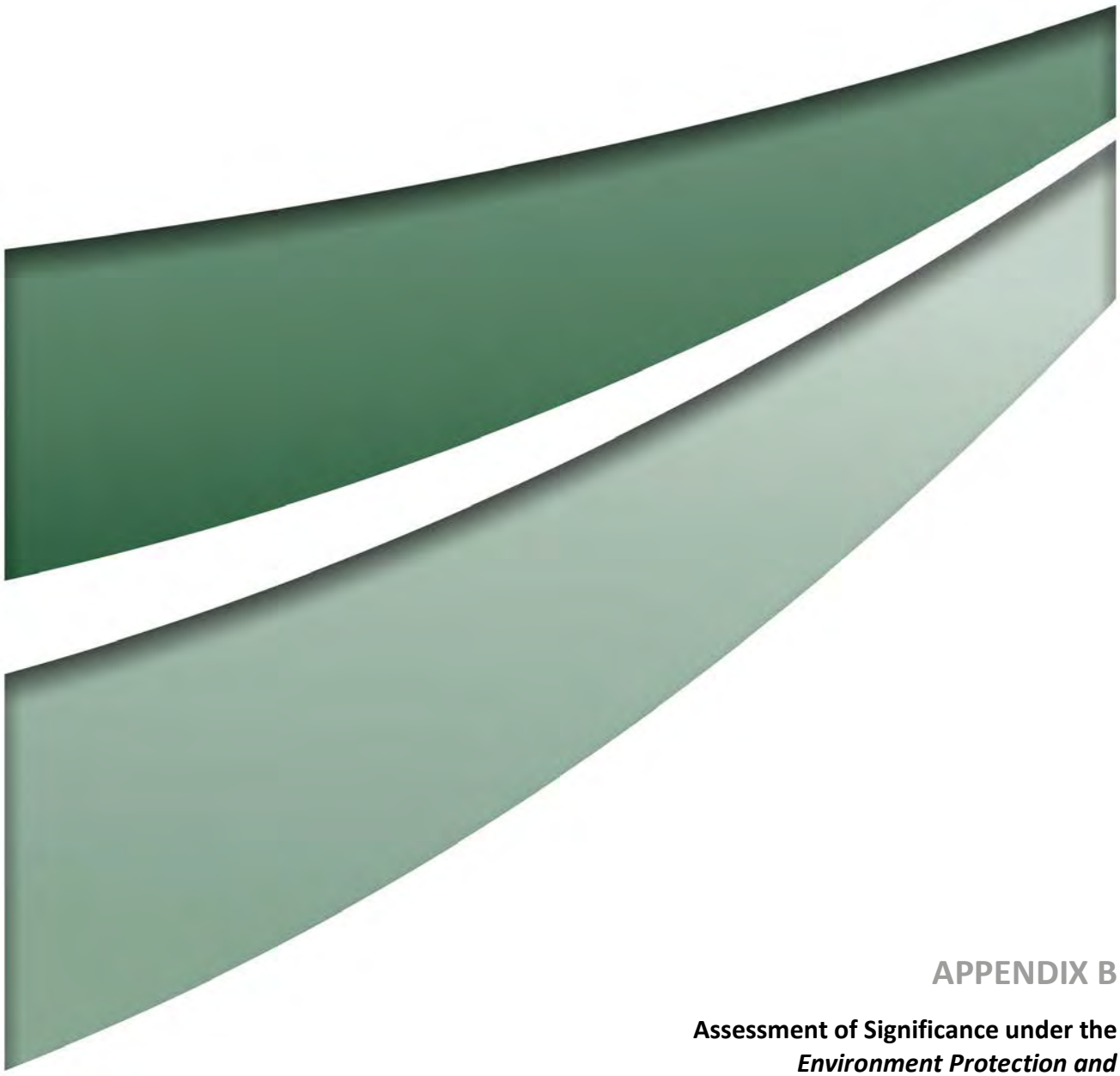


APPENDIX B

Assessment of Significance under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

Appendix B – Assessment of Significance under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires the completion of an Assessment of Significance relating to the potential impacts of the proposal on listed Matters of National Environmental Significance (MNES). A search of the Department of the Environment and Energy (DoEE) Protected Matters Database (undertaken March 2017) identified threatened species and ecological communities known to occur or considered likely to occur, on the basis of habitat modelling, within 10 kilometres of the proposal site.

Following vegetation community and fauna habitat assessment and targeted threatened species surveys, an assessment of the likelihood of occurrence of each ecological community and threatened species identified in the Protected Matters Database search was completed (see **Section 4.2**).

An Assessment of Significance (according to the EPBC Act significant impact guidelines 1.1 (DotE 2013) is provided below for those ecological communities and threatened species considered to be impacted by the proposal. As outlined in the referral documentation, no migratory species are considered to be potentially significantly impacted by the proposal, and further assessment of migratory species is not provided.

Table 1 presents the threatened ecological communities and **Table 2** presents the threatened species considered in the following assessment.

Table 1 Threatened Ecological Communities Considered in the Assessments of Significance

Threatened Ecological Communities
Critically Endangered Ecological Communities
Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD
Endangered Ecological Communities
Brigalow (*Acacia harpophylla* dominant and co-dominant)
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions in northern NSW and southern Queensland
Weeping Myall Woodlands ecological community occur on the inland alluvial plains west of the Great Dividing Range in NSW and Queensland

Table 2 Threatened Species Considered in the Assessments of Significance

Common Name	Scientific Name
Critically Endangered	
regent honeyeater	*Anthochaera phrygia*
swift parrot	*Lathamus discolor*
Endangered	
	Tylophora linearis
Vulnerable Species	
Bluegrass	*Dichanthium setosum*
Belson's panic	*Homopholis belsonii*
-	*Tylophora linearis*
Murray cod	*Maccullochella peelii*
five-clawed worm-skink	*Anomalopus mackayi*
pink-tailed worm-lizard	*Aprasia parapulchella*
border thick-tailed gecko	*Uvidicolus sphyrurus*
squatter pigeon	*Geophaps scripta scripta*
painted honeyeater	*Grantiella picta*
large-eared pied-bat	*Chalinolobus dwyeri*
south-eastern long-eared bat	*Nyctophilus corbeni*
Koala	*Phascolarctos cinereus*
Pilliga mouse	*Pseudomys pilligaensis*
grey-headed flying-fox	*Pteropus poliocephalus*

Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD CEEC under the EPBC Act

Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD is listed as a CEEC under the EPBC Act. This community occurs from the Darling Downs in Queensland to Dubbo in NSW however within this broad geographical area it is confined to where climate, soils and landform are conducive to the development of tussock grasslands. The community is typically dominated by tussock grasses in the genera *Austrostipa, Bothriochloa, Chloris, Enteropogon, Rytidosperma* or *Themeda*.

The *Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern Queensland* are native grasslands typically composed of perennial native grasses. They are strongly reliant on soil type as it is associated with fine textured (often cracking clays) derived from either basalt or alluvium on flat to low slopes (< 1 degree). A tree canopy is usually absent, but when present, comprises ≤10% projective foliage cover (TSSC 2008f, TSSC 2008g, DSEWPC 2012a).

A total of 146.7 hectares of the CEEC was mapped in the proposal site and will be impacted as a result of the proposal.

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- **Reduce the extent of an ecological community**

The proposal would result in the permanent reduction in extent of approximately 146.7 hectares of *Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern Queensland* from within the proposal site.

The estimated total current national extent of the CEEC is 29,318 hectares (TSSC 2008g). With over 90% of the original extent of these grasslands being removed from the Moree Plains and at least a 95% reduction of the total original extent of this ecological community, any notable further impacts to the extent of this community is likely to have the potential to be significant. The permanent loss of 146.7 hectares as a result of the proposal represents an approximately 0.5% reduction in the estimated current extent of the community across its range.

- **Fragment or increase fragmentation of an ecological community**

A total of 146.7 hectares of *Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern Queensland* occurs within the proposal site. This community is already highly fragmented within the local region with adjacent land typically comprising heavily disturbed agricultural land.

The proposal has the potential to further fragment or increase the degree of fragmentation of the ecological community within the local area.

- **Adversely affect habitat critical to the survival of an ecological community**

Due to a long history of agricultural practices within the local area, the habitat of *Natural Grasslands on Basalt and Fine-textured Alluvial plains of Northern NSW and southern Queensland* exists in a relatively disturbed and fragmented state. The patch size of remnants of this ecological community averages 16 hectares but the median is less than 4 hectares (TSSC 2008g). The proposal site contains a large patch of the community between Gurley and Moree of in excess of 150 hectares that is linked to additional areas that are likely to conform to the CEEC on adjacent private land and in travelling stock reserves. Due to the highly fragmented condition of the community across its range it is expected that few patches remain that

are in excess of 100 hectares and therefore, the patch occurring in the proposal site may be critical to the survival of the community.

- **Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alternation of surface water drainage patterns**

The proposal would result in the modification of abiotic factors necessary for this ecological community's survival within the proposal site. However the proposal would be unlikely to adversely modify or destroy abiotic factors necessary for the survival of the ecological community in the local area.

- **Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting**

The proposal will impact 146.7 hectares of the CEEC within the proposal area. The proposal is unlikely to impact upon the species composition (including causing a decline or loss of functionally important species) of this ecological community in areas adjacent to or connected with the proposal site.

- **Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:**
    - **Assisting invasive species, that are harmful to the listed ecological community, to become established, or**
    - **Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community,**

The proposal is not expected to result in the introduction of invasive species or cause the regular mobilisation of fertilisers, herbicides or other chemicals or pollutants.

- **Interfere with the recovery of an ecological community.**

The proposal will impact 146.7 hectares of *Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern New South Wales and Southern Queensland* from within the proposal site. This reduction in the area of occupancy of the community is likely to interfere with the recovery of this ecological community via a reduction in its extent in the local area.

Conclusion

The proposal is **likely** to significantly impact *Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern New South Wales and Southern Queensland*. The reduction in the extent of the CEEC within the proposal site of 146.7 hectares is likely to result in a significant impact on the community.

Brigalow (*Acacia harpophylla* dominant and co-dominant) EEC under the EPBC Act

Brigalow (*Acacia harpophylla* dominant and co-dominant) is listed as an EEC under the EPBC Act. This community occurs within Queensland and New South Wales. It is characterised by the presence of brigalow (*Acacia harpophylla*) as one of the most abundant trees occurring as either dominant or co-dominant with other species – notably belah (*Casuarina cristata*), other species of *Acacia*, or species of *Eucalyptus* (TSSC 2013b).

The EEC occurs predominantly west of the Great Dividing Range, extending north almost to Townsville in QLD, south to Narrabri in NSW, and west to Bourke on the Darling River and Blackall in central western QLD. Within NSW, remnants of the listed community mostly occur north of Bourke, west of Narrabri and north of Moree with minor occurrences near Walgett and Gunnedah, at Mt Misery and in the Pilliga East State Forest.

The proposal site supports 0.6 hectares of the EEC.

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- **Reduce the extent of an ecological community**

The proposal would result in a reduction in the extent of Brigalow (*Acacia harpophylla* dominant and co-dominant) by approximately 0.6 hectares within the proposal site. The estimated total current national extent of Brigalow (*Acacia harpophylla* dominant and co-dominant) is 804,264 hectares (TSSC 2013b).

- **Fragment or increase fragmentation of an ecological community**

The 0.6 hectares of Brigalow (*Acacia harpophylla* dominant and codominant) within the proposal site is currently highly fragmented with adjacent land typically comprising heavily disturbed agricultural land.

The loss of up to 0.6 hectares of currently fragmented Brigalow (*Acacia harpophylla* dominant and codominant) from within the proposal site is not likely to substantially fragment or increase the degree of fragmentation of the ecological community in the local area or region.

- **Adversely affect habitat critical to the survival of an ecological community**

Due to a long history of disturbance within the proposal site and local area, the EEC exists in a relatively disturbed and fragmented state. The proposal site is not considered likely to represent habitat critical to the survival of the community and therefore the proposal would be unlikely to adversely affect habitat critical to the survival of the community.

- **Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alternation of surface water drainage patterns**

The proposal would result in the permanent loss of up to 0.6 hectares of Brigalow (*Acacia harpophylla* dominant and codominant). The proposal is unlikely to result in indirect impacts that adversely modify or destroy abiotic factors necessary for the survival of the ecological community occurring beyond the proposal site, in the local area.

- **Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting**

A total of 0.6 hectares will be impacted within the proposal site. The proposal is not likely to result in a decline or loss of functionally important species from the community in the local area.

- **Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:**
    - **Assisting invasive species, that are harmful to the listed ecological community, to become established, or**
    - **Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community,**

A total of 0.6 hectares will be impacted within the proposal site.

This area of impact is very small in the context of the current estimated extent of Brigalow (*Acacia harpophylla* dominant and co-dominant) which is 804,264 hectares (TSSC 2013b).

The proposal is not likely to result in the further establishment of invasive species or cause mobilisation of fertilisers, herbicides or other chemicals or pollutants such that the proposal causes a substantial reduction in the quality or integrity of the ecological community in the local area.

- **Interfere with the recovery of an ecological community.**

The proposal would result in the removal of approximately 0.6 hectares of Brigalow (*Acacia harpophylla* dominant and codominant) from within the proposal site. The loss of this area is considered unlikely to interfere with the recovery of this ecological community via a reduction in its extent.

Conclusion

The proposal is **unlikely** to result in a significant impact on Brigalow (*Acacia harpophylla* dominant and co-dominant) EEC.

Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions

The Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions ecological community is associated with the floodplains and drainage areas of the Darling Riverine Plains and the Brigalow Belt South IBRA bioregions. This ecological community represents occurrences of one type of eucalypt woodland where *Eucalyptus coolabah* subsp. *coolabah* (coolibah, coolabah) and/or *Eucalyptus largiflorens* (black box) are the dominant canopy species and where the understorey tends to be grassy (TSSC 2011).

The Coolibah – Black Box Woodlands are found on the grey, self-mulching clays of periodically waterlogged floodplains, swamp margins, ephemeral wetlands, and stream levees (NSW Scientific Committee, 2012). The landscape is flat to low relief where small changes in slope and height can influence the species composition. Parts of the ecological community associated with drainage depressions, or areas of lower floodplain remain inundated for longer periods than parts of the ecological community associated with higher floodplain areas of the distribution (TSSC 2011).

The proposal site supports 0.09 hectares of Coolibah – Black Box Woodland of the Darling Riverine Plains and the Brigalow Belt South Bioregion EEC.

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- **Reduce the extent of an ecological community**

The proposal would result in permanent loss of approximately 0.09 hectares of Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions within the proposal site. This area of impact is very small in the context of the estimated current extent of Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions of 1,321,103 hectares (TSSC 2011).

- **Fragment or increase fragmentation of an ecological community**

The proposal site contains approximately 0.9 hectares of Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions. This environment is already highly fragmented and the local region typically comprises heavily disturbed agricultural land.

The proposal is not likely to result in further fragmentation or increase the degree of fragmentation of the ecological community.

- **Adversely affect habitat critical to the survival of an ecological community**

Due to the regions long history of agricultural activity and the current utilisation of the proposal site as an existing rail line, the habitat of this community within the proposal site exists in a relatively disturbed and fragmented state. The proposal site is not considered to represent habitat critical to the survival of this community. Therefore the proposal would be unlikely to adversely affect habitat critical to the survival of this endangered ecological community.

- **Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alternation of surface water drainage patterns**

The proposal would result in the loss of 0.09 hectares of Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions, however the proposal is not likely to modify or destroy abiotic factors necessary for this community to continue to occur within the local area.

- **Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting**

Approximately 0.09 hectares of the community will be removed as a result of the proposal, however any occurrence of this community in proximity to the proposal site will not be substantially changed in terms of species composition, and the proposal will not result in a decline or loss of functionally important species from the community in the local area.

- **Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:**
    - **Assisting invasive species, that are harmful to the listed ecological community, to become established, or**
    - **Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community,**

The proposal would result in the loss of approximately 0.09 hectares of Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions from within the proposal site.

The proposal is not likely to result in the further establishment of invasive species or cause mobilisation of fertilisers, herbicides or other chemicals or pollutants such that the proposal causes a substantial reduction in the quality or integrity of the ecological community in the local area.

- **Interfere with the recovery of an ecological community.**

The proposal will result in the complete loss of approximately 0.09 hectares of Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions from within the proposal site. This removal is not likely to interfere with the recovery of this ecological community.

Conclusion

The proposal is **unlikely** to result in a significant impact on Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions EEC.

Weeping Myall Woodlands

Weeping Myall Woodlands ecological community occur on the inland alluvial plains west of the Great Dividing Range in NSW and Queensland. It occurs in the Riverina, NSW South Western Slopes, Darling Riverine Plains, Brigalow Belt South, Brigalow Belt North, Murray-Darling Depression, Nandewar and Cobar Peneplain IBRA Bioregions. The ecological community currently occurs in small pockets throughout this range (TSSC 2008a).

Weeping Myall Woodlands occur in a range from open woodlands to woodlands, generally 4-12 m high, in which Weeping Myall (*Acacia pendula*) trees are the sole or dominant overstorey species. Weeping Myall trees often occur in monotypic stands, however other vegetation may also occur in the ecological community, though not as dominant species, including Western Rosewood (*Alectryon oleifolius* subsp. *elongatus*), Poplar Box (*Eucalyptus populnea*) or Black Box (*Eucalyptus largiflorens*) (TSSC 2008a).

The understorey of Weeping Myall Woodlands often includes an open layer of shrubs above an open ground layer of grasses and herbs, though the ecological community can exist naturally either as a shrubby or a grassy woodland. Weeping Myall goes through regular cycles of senescence and regeneration (TSSC 2008a).

The published Listing Advice for Weeping Myall Woodlands EEC under the EPBC Act (TSSC 2008a) and EPBC Policy Statement 3.17 (DEWHA 2009) provides a set of condition classes that patches of vegetation are required to meet in order to conform to the EEC. The proposal site supports a total of 0.43 hectares of Weeping Myall Woodlands EEC based on conformance with these condition classes.

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- **Reduce the extent of an ecological community**

The proposal would result in a permanent reduction in extent of approximately 0.43 hectares within the proposal site. This area of impact is very small in the context of the estimated total current national extent of Weeping Myall Woodland EEC of 220 000 to 361 000 hectares (Threatened Species Scientific Committee 2008).

- **Fragment or increase fragmentation of an ecological community**

The 0.43 hectares of Weeping Myall Woodland EEC within the proposal site occurs within or adjacent to an existing rail corridor. This environment is currently highly fragmented, with adjacent land uses typically comprising highly disturbed agricultural land.

The proposal is not likely to result in further fragmentation or increase the degree of fragmentation of the ecological community in the local area or region.

- **Adversely affect habitat critical to the survival of an ecological community**

Due to the regions long history of agricultural activity and the current utilisation of the proposal site as an existing rail line, the habitat of this community exists in a relatively disturbed and fragmented state. The proposal site is not considered to represent habitat critical to the survival of this community. Therefore, the proposal would be unlikely to adversely affect habitat critical to the survival of Weeping Myall Woodlands EEC.

Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alternation of surface water drainage patterns

The proposal would result in the permanent loss 0.43 hectares of Weeping Myall Woodlands within the proposal site. The proposal is unlikely to adversely modify or destroy abiotic factors necessary for the survival of ecological community occurring beyond the proposal site, in proximate areas.

- **Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting**

Approximately 0.43 hectares within the proposal site will be impacted, however proximate areas will not be substantially changed in terms of species composition, and the proposal will not result in a decline or loss of functionally important species from the community in the local area.

- **Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:**
    - **Assisting invasive species, that are harmful to the listed ecological community, to become established, or**
    - **Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community,**

The proposal would result in the permanent loss of approximately 0.43 hectares within the proposal site.

The proposal is not likely to result in the further establishment of invasive species or cause mobilisation of fertilisers, herbicides or other chemicals or pollutants such that the proposal causes a substantial reduction in the quality or integrity of the ecological community in the local area.

- **Interfere with the recovery of an ecological community.**

The proposal will result in the permanent loss of approximately 0.43 hectares within the proposal site. This removal is not likely to interfere with the recovery of this ecological community.

Conclusion

The proposal is **unlikely** to result in a significant impact on Weeping Myall Woodlands EEC.

CRITICALLY ENDANGERED SPECIES

Regent Honeyeater (*Anthochaera phrygia*)

The regent honeyeater has a patchy distribution extending from south-east Queensland, into NSW and the Australian Capital Territory, to central Victoria (DoE, 2016). The species is highly mobile, capable of travelling large distances and occurs only irregularly at most sites in varying numbers. Adding further difficulty to the survey and study of this species is its ability to often go long periods without being observed anywhere (DoE 2016). Its primary habitat is box-ironbark eucalypt woodland and dry sclerophyll forest, however it does utilise riparian vegetation and lowland coastal forest. Habitat critical to the survival of the regent honeyeater includes any breeding or foraging areas where the species is likely to occur and any newly discovered breeding or foraging locations.

The species is known to undertake a complex series of movements, which are thought to be governed mainly by the flowering of a select number of eucalyptus species. It is likely the species use different areas within its range in different years depending on food resources (DoE 2016).

The proposal site does not occur within the four key breeding areas for the species where it is regularly recorded, namely Bundarra-Barraba area of NSW, the Capertee Valley in NSW, Hunter Valley in NSW and the Chiltern area of north-east Victoria or the 'other' breeding areas including the Pilliga Woodlands, Mudgee – Wollar and Lurg-Benalla district in Victoria, as described by the National Recovery Plan for the species (DoE 2016).

Most records of regent honeyeaters come from box-ironbark eucalypt associations, where the species seems to prefer more fertile sites with higher soil water content, including creek flats, broad river valleys and lower slopes (CoA 2016). The National Recovery Plan identifies the key tree and mistletoe species for the regent honeyeater, including:

- Mugga (or Red) Ironbark (*Eucalyptus sideroxylon*)
- Yellow Box (*E. melliodora*)
- White Box (*E. albens*)
- Yellow Gum (*E. leucoxylon*)
- Spotted Gum (*Corymbia maculata*)
- Swamp Mahogany (*E. robusta*)
- Needle-leaf Mistletoe (*Amyema cambagei*) on River Sheoak (*Casuarina cunninghamiana*)

- Box Mistletoe (*A. miquelii*)

- Long-flower Mistletoe (*Dendropthoe vitellina*).

The regent honeyeater is not known to occur within the proposal site. The proposal site does not contain any of the key feed species listed above (although it is noted that *Amyema cambagei* was recorded within PCT78 River Red Gum and PCT56 poplar box however *Casuarina cunninghamiana* associations were not recorded) and the proposal site does not occur within the area mapped as 'species likely to occur' on Figure 1 Regent Honeyeater Distribution, as shown in the National Recovery Plan (DoE 2016). There were no records of this species within 10km of the proposal site (OEH 2016d). This species is considered to have a low likelihood of occurrence within the proposal site.

In this case, a population of a species is an occurrence of a species in a particular area that 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 occurs within a particular bioregion.**

Although there appears to be minor behavioural differences between regent honeyeaters in the three main areas inhabited by the species (the Bundarra-Barraba area in NSW, the Capertee Valley in NSW, and north-eastern Victoria), the direction and extent of movements, including evidence of movement between breeding sites, and a lack of discernible genetic differences between the sites suggest that the regent honeyeater occurs as a single, contiguous population (Garnett and Crowley 2000).

The regent honeyeater was not recorded within the proposal site despite thorough diurnal bird surveys and is not known to occur based on analysis of regional records. Key feed species, as documented in the National Recovery Plan (CoA 2016), were not recorded during detailed flora surveys. There were no records of this species within 10km of the proposal site (OEH 2016d). The closest record of the species according to the atlas of NSW wildlife occurs approximately 12 kilometres to the south-east of the proposal site near Bullawa Creek (OEH 2017). Therefore, the proposal site is not likely to contain a portion of the population of the regent honeyeater.

In this case, habitat critical to the survival of a species refers to areas that are necessary:

- **for activities such as foraging, breeding, roosting, or dispersal;**

- **for the long-term maintenance of the species, including the maintenance of species essential to the survival of the species such as pollinators;**

- **to maintain genetic diversity and long term evolutionary development; or**

- **for the reintroduction of populations or recovery of the species.**

The National Recovery Plan identifies critical habitat as:

- any breeding or foraging habitat in areas where the species is likely to occur (as defined by the distribution map provided in Figure 2 of the Plan), and

- any newly discovered breeding or foraging locations.

There are four known regularly used foraging and breeding areas, namely Bundarra-Barraba area of NSW, the Capertee Valley in NSW, Hunter Valley in NSW and the Chiltern area of north-east Victoria (DoE 2016). The proposal site does not occur within or near any of these key foraging or breeding areas. However, an

area around the Pilliga, to the south of the proposal site, is identified as a subsidiary breeding area to Bundarra-Barraba (DoE 2016). The proposal site does not occur within this subsidiary area either.

Due to the distance of the proposal site from any known foraging and breeding areas as well as the lack of suitable foraging resources the proposal site is not considered to contain habitat critical to the survival of the regent honeyeater.

An action has, will have, or is likely to have a significant impact on a critically endangered species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of a population, or;**

The proposal site does not provide critical habitat for the regent honeyeater, based on mapping provided in the National Recovery Plan and the lack of key feed species for the species. Therefore the proposal is considered unlikely to lead to a long-term decrease in the size of the regent honeyeater population.

- **reduce the area of occupancy of the species, or;**

The proposal will not result in the removal of habitat critical to the survival of the species, and key feed species were not identified in the proposal site. The regent honeyeater is not known to occur within the proposal site despite thorough diurnal bird surveys and analysis of regional records, and has not been recorded within 10 kilometres of the proposal site.

Therefore the proposal is considered unlikely to reduce the area of occupancy of the regent honeyeater population.

- **fragment an existing population into two or more populations, or;**

The regent honeyeater is not known to occur within the proposal site despite diurnal bird surveys and analysis of regional records. Therefore the proposal is not considered to support a *population* of the regent honeyeater, and thus will not fragment an existing population of the species into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The National Recovery Plan identifies critical habitat as:

- any breeding or foraging habitat in areas where the species is likely to occur (as defined by the distribution map provided in Figure 2 of the Plan), and

- any newly discovered breeding or foraging locations.

Key areas include the Bundarra-Barraba, Pilliga Woodlands, Mudgee-Wollar and the Capertee Valley and Hunter Valley areas in New South Wales; and the Chiltern and Lurg-Benalla regions of north-east Victoria.

The proposal site does not contain habitat critical to the survival of the species.

- **disrupt the breeding cycle of an population, or;**

The proposal site does not occur within one of the key breeding locations known to be important to the species, as identified in the National Recovery Plan (DoE 2016), and this species has not been previously recorded within the proposal site. Therefore the proposal is considered unlikely to disrupt the breeding cycle of the regent honeyeater population.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The proposal will not remove potential foraging or breeding habitat for the species and is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for the regent honeyeater to the extent that the species would likely decline.

- **result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat, or;**

The proposal is unlikely to result in an invasive species that is harmful to the regent honeyeater becoming established in its habitat.

- **introduce disease that may cause the species to decline, or;**

It is unlikely that the Proposal will introduce any disease that may cause regent honeyeater to decline.

- **interfere with the recovery of the species.**

The proposal is unlikely to interfere substantially with the recovery of the regent honeyeater.

Conclusion

The proposal is **unlikely** to result in a significant impact on a *population* of the regent honeyeater.

Swift Parrot (*Lathamus discolor*)

The swift parrot is a slim, medium sized parrot that breeds in Tasmania during summer migrating to mainland Australia in winter (TSSC 2016a). In NSW the species disperses widely in small flocks to forage in forests and woodlands throughout the coastal and western slopes on flowers and *psyllid* lerps in *Eucalyptus* species (TSSC 2016a). White Box – Yellow Box – Blakely's Red Gum Grassy Woodland are an important habitat in NSW as is coastal swamp mahogany (*Eucalyptus robusta*) and spotted gum (*Corymbia maculata*) (TSSC 2016a).

In this case, a population of a species is an occurrence of the species in a particular area that 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 occurs within a particular bioregion.**

The swift parrot occurs as a single population, although it migrates annually from breeding grounds in Tasmania to the winter foraging grounds on the coastal plains and slope woodlands of mainland eastern Australia (Saunders 2003). There are no known records of swift parrot within 10km of the proposal site. Additionally important habitat does not occur in the proposal site as none of the key tree species for foraging habitat on mainland Australia as per the National Recovery Plan are present (Saunders and Tzaros 2011). Therefore, the proposal site is considered highly unlikely to contain a population of the swift parrot.

In this case, habitat critical to the survival of a species refers to areas that are necessary:

- **for activities such as foraging, breeding, roosting, or dispersal;**
- **for the long-term maintenance of the species, including the maintenance of species essential to the survival of the species such as pollinators;**
- **to maintain genetic diversity and long term evolutionary development; or**
- **for the reintroduction of populations or recovery of the species.**

There are no known records of the swift parrot within 10km of the proposal site and important habitat according to the national recovery plan (Saunders and Tzaros. 2011) does not occur in the proposal site. The proposal site is not considered to contain habitat critical to the survival of the swift parrot.

An action has, will have, or is likely to have a significant impact on a critically endangered species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of a population, or;**

The proposal site does not provide critical habitat for, or a population of, the swift parrot. Therefore the proposal is unlikely to lead to a long-term decrease to a population of the swift parrot.

- **reduce the area of occupancy of the species, or;**

The proposal site does not provide critical habitat for, or a population of the species. There are no known records of swift parrot within 10km of the proposal site.

Therefore the proposal is unlikely to reduce the area of occupancy of a population of the swift parrot.

- **fragment an existing population into two or more populations, or;**

The proposal site does not provide critical habitat for, or a population of the species. There are no known records of swift parrot within 10km of the proposal site o. Therefore the proposal is not considered to support a population of the swift parrot, and thus will not fragment an existing population of the species into two or more.

- **adversely affect habitat critical to the survival of a species, or;**

There are no known records of swift parrot within 10km of the proposal site and important habitat is not present according to the descriptions provided in the National Recovery Plan (Saunders and Tzaros 2011). Therefore the proposal site is not considered to contain habitat critical to the survival of the species.

- **disrupt the breeding cycle of an population, or;**

There are no known records of swift parrot within 10km of the proposal site and important habitat is not present according to the descriptions provided in the National Recovery Plan (Saunders and Tzaros 2011). Therefore the proposal is considered unlikely to disrupt the breeding cycle of a population of the swift parrot.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The proposal is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for the swift parrot to the extent that the species would likely decline.

- **result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat, or;**

The proposal is unlikely to result in an invasive species that is harmful to the swift parrot becoming established in its habitat.

- **introduce disease that may cause the species to decline, or;**

Psittacine beak and feather disease (BFD) is a common and potentially deadly disease of parrots caused by a circovirus named beak and feather disease virus. The disease appears to have originated in Australia and is widespread and continuously present in wild populations of Australian parrots. BFD affecting endangered psittacine species (parrots and related species) was listed in April 2001 as a key threatening process under the EPBC Act.

It is unlikely that the proposal will introduce BFD or any other disease that may cause swift parrot to decline.

- **interfere with the recovery of the species.**

The proposal is unlikely to interfere substantially with the recovery of the swift parrot.

Conclusion

The proposal is **unlikely** to result in a significant impact on a population of the swift parrot.

ENDANGERED SPECIES

Tylophora linearis

Tylophora linearis is an herbaceous climber with clear latex growing to approximately 2 m in length (TSSC 2008d). In NSW the species is rarely collected and is known from less than 10 localities in the Dubbo area and Mt Crow near Barrabra (TSSC 2008d). It grows in dry scrub, open forest and woodlands. It is known to overlap in distribution with Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community and White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community (TSSC 2008d).

While the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community does not occur in the proposal site, Brigalow (*Acacia harpophylla* dominant and co-dominant) EEC does occur in the proposal site. Notwithstanding the presence of the Brigalow (*Acacia harpophylla* dominant and co-dominant) EEC that may provide habitat for this species, the proposal site occurs to the north of closest known records of this species in the Pilliga and Leard State Forests. There is a small area of potential habitat associated with this EEC in the proposal site, however targeted surveys did not record this species (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a).

In this case, a population of a species is an occurrence of the species in a particular area that 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 occurs within a particular bioregion.**

Tylophora linearis was not recorded within the proposal site despite thorough vegetation surveys undertaken in accordance with the seasonal requirements for this species. The closest record of the species occurs in the Pilliga State Forest and conservation areas approximately 30 km to the south of the proposal site. Therefore, the proposal site is considered unlikely to contain an *important population* of *Tylophora linearis*.

In this case, habitat critical to the survival of a species refers to areas that are necessary:

- **for activities such as foraging, breeding, roosting, or dispersal;**
- **for the long-term maintenance of the species, including the maintenance of species essential to the survival of the species such as pollinators;**
- **to maintain genetic diversity and long term evolutionary development; or**
- **for the reintroduction of populations or recovery of the species.**

Potential habitat associated with Brigalow (*Acacia harpophylla* dominant and co-dominant) EEC in the proposal site is to the north of known records of this species. *Tylophora linearis* was not recorded within the proposal site despite thorough vegetation surveys undertaken in accordance with the seasonal requirements for this species. Potential habitat in the proposal site is not identified as habitat critical to the survival of the species.

An action has, will have, or is likely to have a significant impact on an endangered species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of a population, or;**

The proposal will remove up to 0.62 ha of potential habitat woodland associated with Brigalow (*Acacia harpophylla* dominant and co-dominant) EEC. *Tylophora linearis* was not recorded within the proposal site despite thorough vegetation surveys undertaken in accordance with the seasonal requirements for this species. Therefore the proposal is unlikely to lead to a long-term decrease to a *population* of the species.

- **reduce the area of occupancy of the species, or;**

The proposal will remove 0.62 ha of Brigalow (*Acacia harpophylla* dominant and co-dominant) EEC which provides potential habitat for the species in the proposal site. However, the species was not recorded within the proposal site despite thorough vegetation surveys undertaken in accordance with the seasonal requirements for this species. The closest record of the species occurs approximately 30 km to the south of Narrabri (OEH 2016d). Therefore the proposal is unlikely to reduce the area of occupancy of a population of the *Tylophora linearis*.

- **fragment an existing population into two or more populations, or;**

There are no existing populations of *Tylophora linearis* in the proposal site. Known populations to the south of the proposal site will not be fragmented by the proposal.

- **adversely affect habitat critical to the survival of a species, or;**

While a small area of potential habitat is available in the proposal site this species has not been recorded and occurs approximately 30 km to the north of the nearest known records. Removal of up (0.62 hectares of potential habitat in Brigalow (*Acacia harpophylla* dominant and co-dominant) EEC will not adversely affect habitat critical to the survival of *Tylophora linearis*.

- **disrupt the breeding cycle of an population, or;**

The proposal will remove 0.62 hectares of potential habitat for the species in the proposal site. However, the species was not recorded within the proposal site despite thorough vegetation surveys undertaken in accordance with the seasonal requirements for this species. The closest record of the species occurs approximately 30 km to the south of the proposal site. Therefore the proposal is unlikely to disrupt the breeding cycle of *Tylophora linearis*.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The proposal will remove 0.62 hectares of potential habitat for the species. However, the proposal site is already substantially degraded/fragmented and therefore the proposal is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for *Tylophora linearis* to the extent that the species would likely decline.

- **result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat, or;**

The proposal is unlikely to result in an invasive species that is harmful to the *Tylophora linearis* becoming established in its habitat.

- **introduce disease that may cause the species to decline, or;**

The proposal is unlikely to introduce disease that may cause *Tylophora linearis* to decline.

- **interfere with the recovery of the species.**

The proposal is unlikely to interfere substantially with the recovery of the *Tylophora linearis*.

Conclusion

The proposal is **unlikely** to result in a significant impact on a population of *Tylophora linearis*.

VULNERABLE SPECIES

Bluegrass (*Dichanthium setosum*)

Bluegrass is an erect perennial which grows to 1 m in height associated with heavy basaltic black soils and stony red-brown hard-setting loam with clay subsoils, often in reasonably disturbed sites such as cleared woodland, roadside remnants, grazed land and disturbed pasture (TSSC 2008b). This species occurs chiefly on the New England Tablelands with large populations in the Saumarez area (near Armidale), west of Armidale, east of Guyra and Somerton Road Travelling Stock Route. It is more rarely found on the north-western slopes, central western slopes and north western plains, extending west to Narrabri.

In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

Despite the presence of suitable habitat bluegrass was not recorded within the proposal site as part of thorough vegetation surveys undertaken in accordance with the seasonal requirements for this species. Historic local populations of bluegrass are known to occur around Narrabri and Gurley with a range of regional populations to the east of the proposal site (OEH 2016d). When considering the low number of records within 10km of the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a) and the fact that no individuals were recorded as part of targeted surveys, it is considered that an important population of this species is unlikely to occur within the proposal site.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

An important population of bluegrass is not considered to occur in the proposal site given that this species was not recorded as part of intensive targeted surveys and the low number of records within 10km. Therefore the proposal is considered unlikely to lead to a long-term decrease to an important population of bluegrass.

- **reduce the area of occupancy of an important population, or;**

Bluegrass was not recorded within the proposal site despite intensive targeted searches undertaken in accordance with seasonal requirements of the species. Potential habitat for this species within the proposal site comprises any of the grassy woodlands, derived native grasslands, natural grasslands and possibly some of the disturbed areas. An important population of bluegrass is not considered to occur in the proposal site and therefore the proposal will not reduce the area of occupancy for an important population of bluegrass.

- **fragment an existing important population into two or more populations, or;**

The proposal area is not known to contain an important population of bluegrass. The proposal area occurs within a highly fragmented landscape and therefore the proposal is considered unlikely to fragment an important population of bluegrass.

- **adversely affect habitat critical to the survival of a species, or;**

The proposal site is not considered to represent habitat critical to the survival of bluegrass and therefore the proposal is unlikely to adversely affect habitat critical to the survival of the bluegrass.

- **disrupt the breeding cycle of an important population, or;**

Bluegrass is a warm season perennial, the species commences growing in spring, flowers in summers and becomes dormant in late autumn (Yu et al. 2000). An *important population* of bluegrass is considered unlikely to occur in the proposal site. Therefore the proposal is considered unlikely to disrupt the breeding cycle of an important population of bluegrass.

modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;

While potential habitat is present in the proposal site for bluegrass, this species is not known to occur within the proposal site despite intensive targeted seasonal surveys. Bluegrass is not expected to be impacted by the proposal and as a result the proposal will not modify, destroy, remove or isolate or decrease the availability or quality of habitat for bluegrass in the proposal site.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The proposal is unlikely to result in an invasive species that is harmful to Bluegrass.

- **interferes substantially with the recovery of the species.**

The proposal is unlikely to interfere substantially with the recovery of bluegrass.

Conclusion

The proposal is unlikely to result in a significant impact on an important population of bluegrass.

Belson's panic (*Homopholis belsonii*)

Belson's panic is a rhizomatous and stoloniferous perennial grass growing to 0.5 m high. It spreads mainly by the stolons and can form colonies in a matter of months (Menkins 1998). Belson's panic is known to occur in three broad habitat types (DoE 2016):

- rocky, basaltic hills supporting White Box (*Eucalyptus albens*)/Wilga (*Geijera parviflora*) woodland with assorted shrubs and a number of grass species where it is generally found among fallen timber at the base of trees or shrubs, among branches and leaves of trees hanging to ground level or along the bottom of netting fences

- flat to gently undulating alluvial areas supporting Belah (*Casuarina cristata*) forest and sometimes Brigalow (*Acacia harpophylla*) or Wilga. Understorey varies from the presence of only Belson's panic to a mixture of shrubs, sub-shrubs and grasses. Many of the recorded *C. cristata* sites were subject to intermittent inundation

- drainage lines supporting *C. cristata* and sandy country dominated by Cypress Pine-Bloodwood-Ironbark-She-Oak Forest.

In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

29 individuals of Belson's panic were recorded within the proposal site. Given the relatively small number of individuals recorded in the proposal site, highly disturbed and fragmented nature of the proposal site and the reasonable number of records of this species outside the proposal site at this locality according to the OEH Atlas of NSW Wildlife, it is unlikely to be a key source population either for breeding or dispersal, a population that is necessary for maintaining genetic diversity or a populations that near the limit of its known range. Therefore these individuals of Belson's panic within the proposal site are not considered to form part of an important population.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

An important population of Belson's panic is not considered to occur in the proposal site. Therefore the proposal is considered unlikely to lead to a long-term decrease to an important population of the Belson's panic.

- **reduce the area of occupancy of an important population, or;**

The proposal is likely to modify known and potential habitat for this species within the proposal site. This will result in a reduction of the species extent, however it is expected that this species occurs in association with fragmented woodland areas that extend beyond the proposal site in the locality. Therefore the proposal is unlikely to reduce the area of occupancy of an important population of Belson's panic.

- **fragment an existing important population into two or more populations, or;**

An important population of Belson's panic is not considered to occur in the proposal site. The impact of the proposal is considered minor given the already highly fragmented nature of populations across the proposal site. Therefore the proposal is considered unlikely to fragment an existing important population of Belson's panic into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The proposal site is not considered to represent habitat critical to the survival of Belson's panic. Therefore, the proposal is unlikely to adversely affect habitat critical to the survival of the Belson's panic.

- **disrupt the breeding cycle of an important population, or;**

An important population of Belson's panic is not considered to occur in the proposal site. Therefore the proposal is considered unlikely to disrupt the breeding cycle of an important population of Belson's panic.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The proposal would result in the removal of potential habitat for Belson's panic and will impact a small population. However, the proposal is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for Belson's panic to the extent that the species would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The proposal is unlikely to result in an invasive species that is harmful to Belson's panic becoming established in its habitat.

- **interferes substantially with the recovery of the species.**

The proposal is likely to modify known and potential habitat for this species within the proposal site. This will result in a reduction of the species extent in the proposal site, however, it is expected that this species occurs in association with fragmented woodland areas that extend beyond the proposal site in the locality. The proposal is thus unlikely to interfere substantially with the recovery of Belson's panic.

Conclusion

The proposal is unlikely to result in a significant impact on an *important population* of Belson's panic.

Murray Cod (*Maccullochella peelii*)

The Murray cod occurs naturally in the waterways of the Murray-Darling basin in a wide range of warm water habitats ranging from clear, rocky streams to slow flowing turbid rivers and billabongs. It is a long lived, highly territorial species that is highly dependent on in-stream woody structures or large rocks for habitat (National Murray Cod Recovery Team 2010).

NSW DPI Threatened and protected species – records viewer (accessed May 2016) indicates that the Murray cod has been recorded in the Mehi River upstream and downstream of Moree and in the Gwydir River downstream of Moree or in tributaries of the Gwydir River upstream of Gravesend. The majority of existing records (DPI record viewer) are located upstream of the Tareelaroi Weir. It has also been recorded to the north and west of the proposal site in the MacIntyre and Barwon Rivers in 1999, 2005 and 2000; and to the south of the proposal sites in the Namoi River upstream and downstream of Narrabri in 2001, 2005 and 2009.

Fish passage along the Mehi River is limited at the Moree Weir approximately two kilometres downstream of the proposal site and at the Tareelaroi weir located at the confluence of the Mehi and Gwydir River upstream of Moree (DPI 2006). Notwithstanding this, a recent fish community status review identified that the Mehi River near Moree is rated as good fish community value and predicted to support threatened species and noted that the Murray cod is more common in the Mehi River compared to the Gwydir River (DPI 2015).

In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

While the Murray cod has not been recorded within the immediate vicinity of either of the major bridge crossings in the Gwydir River or Mehi River, the Gwydir River population downstream of Copeton Dam is identified as an 'important population' (DPI 2015) that appears to be widespread, abundant and recruiting (National Murray Cod Recovery Team 2010). Any Murray cod within the proposal site is likely to be part of an important population.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

The Murray cod is reportedly more commonly recorded in the Mehi River and may occur in the class 1 key fish habitats in the Mehi River and Gwydir River. Disruption of habitat would be limited to a small area associated with the points at which the proposal crosses these rivers and also limited to the construction period and is unlikely to lead to a long term decrease in the size of the population in the Gwydir River.

- **reduce the area of occupancy of an important population, or;**

Disruption of preferred habitat instream in the main channels of the Mehi River and Gwydir River would be limited to a small area associated with the points at which the proposal crosses these rivers and also limited to the construction period and appropriate design of structures would not obstruct movement of fish or reduce the area of occupancy of the important population.

The proposal would not reduce the area of occupancy where the highest records of the species are recorded in the Gwydir and Horton Rivers upstream of Tareelaroi Weir.

- **fragment an existing important population into two or more populations, or;**

The majority of existing records (DPI record viewer) in the vicinity of the proposal site in the Mehi River are located upstream and downstream of existing weir structures that may limit movement. There is a record (2009) downstream of the Tareelaroi Weir indicating that part of the population may exist in this section of the Mehi River. Dispersal of individuals upstream prior to spawning may be limited by existing weir structures.

Appropriate design of structures as planned as part of the proposal would ensure that they do not obstruct fish passage and would not fragment the population that may occur upstream or downstream of the proposal.

- **adversely affect habitat critical to the survival of a species, or;**

The main channel of rivers and large tributaries and complex structural cover are important habitat features for the Murray cod. Works instream during construction may disturb submerged large snags in the relatively small areas affected by construction but would not alter the width of the main channel greater than that currently occupied by the existing structure. Therefore the proposal is unlikely to adversely affect habitat critical to the survival of the species.

- **disrupt the breeding cycle of an important population, or;**

Murray cod have an annual reproductive cycle with egg development through winter, spawning over four to five weeks when water temperatures exceed 15°C possibly in early September to mid October. Eggs are most likely laid in a sunken log. Recruitment success appears to be linked to higher river flows. Construction, particularly any removal of material, may disrupt the breeding cycle of individuals in this section of the river. However, the area impacted will be small and it is noted that the majority of records

are upstream of the Tareelaroi Weir and that the proposal is not likely to disrupt the breeding cycle of the important population.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

During construction of the bridge, habitats within the disturbance footprint and immediately upstream and downstream may be temporarily modified and isolated. However, with appropriate design of the bridge, collection and relocation of any recovered snags, in the long term, habitat would recover and would not be removed or isolated. Therefore the proposal is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for the Murray cod to the extent that the species would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The literature reports that introduced species such as carp and redfin may compete with the Murray cod for habitat resources and in case of redfin predation (National Murray Cod Recovery Team 2010). The proposed construction works are not expected to alter the number or distribution of introduced fish species in the Mehi or Gwydir Rivers.

- **introduce disease that may cause the species to decline, or;**

Little is known of the impact of diseases on Murray cod (National Murray Cod Recovery Team 2010). Naturally occurring pathogens may be a problem for injured fish. The proposal would not introduce any alien species that may act as a source of disease.

- **interferes substantially with the recovery of the species.**

The proposed construction of new watercourse crossing structures would be designed to maintain the main channel flows and allow for passage of fish and would not alter flow regimes. Any recovered snags in the disturbance footprint would be relocated and bank vegetation rehabilitated such that habitat features recover in the long run.

The proposal is not expected to substantially interfere with recovery actions for the species as set out in the national recovery plan (National Murray Cod Recovery Team 2010).

Conclusion

The proposal is **unlikely** to result in a significant impact on an *important population* of the Murray cod.

Five-clawed worm-skink (*Anomalopus mackayi*)

The five-clawed worm-skink is a medium sized species of the Scincidae family. It is a burrowing skink known to occur in both remnant and non-remnant woodlands and grasslands including grassy White Box woodland, open woodland and River Red Gum–Coolibah-Bimble Box woodland. The species lives in permanent deep tunnel-like burrows and deep soil cracks, using fallen logs and timber as sheltering sites on the surface (TSSC 2008e). In areas modified by agriculture and other human activities, the species has been found sheltering under artificial materials lying flat on the ground, such as discarded railway sleepers, sheet metal and hay bales.

Five-clawed worm-skink is predicted to occur between Narrabri and the Queensland border east to Bingara and west to Walgett (DSEWPC 2011d) and is known/likely to occur between Narrabri and Moree (DSEWPC 2011d).

In this case, an important population is a population that is necessary for a species' long-term survival In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

The five-clawed worm-skink was not recorded within the proposal site despite thorough general fauna surveys, as well as targeted surveys for the species in winter 2015, undertaken in accordance with the seasonal requirements for this species. The closest record of the species occurs around Bellata less than 1km to the west of the proposal site and also south of Narrabri (OEH 2016d). Potential habitat was found to be present within the proposal site for this species, however this habitat was found to be highly disturbed and generally in low condition due to surrounding agricultural practices and disturbance from the rail corridor. When taking into account the sites disturbance it is not considered that an important population of this species would occur within the proposal site.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

An important population of five-clawed worm-skink is not considered to occur in the proposal site. Therefore the proposal is considered unlikely to lead to a long-term decrease to an important population of the five-clawed worm-skink.

- **reduce the area of occupancy of an important population, or;**

The proposal may result in a reduction of highly disturbed potential habitat for this species. An important population of five-clawed worm-skink is not considered to occur in the proposal site. Therefore the proposal is unlikely to reduce the area of occupancy of an important population of the five-clawed worm-skink.

- **fragment an existing important population into two or more populations, or;**

An important population of five-clawed worm-skink is not considered to occur in the proposal site. Therefore the proposal is considered unlikely to lead fragment an existing important population into two or more populations.

adversely affect habitat critical to the survival of a species, or;

The proposal site is not considered to contain habitat critical to the survival of the five-clawed worm-skink. Therefore, the proposal is unlikely to adversely affect habitat critical to the survival of the five-clawed worm-skink.

- **disrupt the breeding cycle of an important population, or;**

Very little is known about the biology of the five-clawed worm-skink. Average clutch size or mortality rates for newborns is unknown. One specimen was observed laying three eggs in spring. An important population of five-clawed worm-skink is not considered to occur in the proposal site. Therefore the proposal is considered unlikely to disrupt the breeding cycle of an important population of five-clawed worm-skink.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The proposal will remove a range of native vegetation communities within the proposal site, including fragmented woodlands and derived native grassland. The majority of impacts will occur in cleared and non-native vegetation within the rail corridor. Therefore, the proposal is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for five-clawed worm skink to the extent that the species would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The proposal is unlikely to result in an invasive species that is harmful to the five-clawed worm-skink becoming established in its habitat.

Conclusion

The proposal is unlikely to result in a significant impact on an important population of five-clawed worm-skink

Pink-tailed worm-lizard (*Aprasia parapulchella*)

The pink-tailed worm-lizard is a small, legless and slender lizard growing to 25 cm in length that lives underground (TSSC 2015a). The species occupies both primary and secondary grasslands, grassy woodlands and woodlands, usually inhabiting sloping sites that contain native grasses (particularly kangaroo grass), rocky outcrops or scattered, partially buried rocks (TSSC 2015a). The pink-tailed worm-lizard occurs in NSW, Victoria and the Australian Capital Territory (ACT) where it is widely but patchily distributed along the foothills of the western slopes of the Great Dividing Range between Bendigo in Victoria and Gunnedah in NSW (TSSC 2015a).

In this case, an important population is a population that is necessary for a species' long-term survival In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

The habitats within the proposal site are generally highly disturbed and in low condition due to surrounding agricultural practices and disturbance from the rail corridor. The pink-tailed worm-lizard was not recorded despite intensive fauna surveys undertaken throughout the proposal site. There are no known records of this species within 10 kilometres of the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). It is considered unlikely that this species will occur within the proposal site. Therefore an important population of this species was not considered to occur within the proposal site.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

An important population of pink-tailed worm-lizard is not considered to occur in the proposal site. Therefore the proposal is considered unlikely to lead to a long-term decrease to an important population of the pink-tailed worm-lizard.

- **reduce the area of occupancy of an important population, or;**

The proposal site does not provide habitat for an important population of the pink-tailed worm-lizard. Therefore the proposal is unlikely to reduce the area of occupancy of an important population of the pink-tailed worm-lizard.

- **fragment an existing important population into two or more populations, or;**

Pink-tailed worm-lizard is not known to occur within the proposal site and is not expected to be impacted by the proposal. As a result the proposal will not fragment or isolate any known populations of this species

- **adversely affect habitat critical to the survival of a species, or;**

The proposal site is not considered to represent habitat critical to the survival of the pink-tailed worm-lizard. Therefore, the proposal is unlikely to adversely affect habitat critical to the survival of the pink-tailed worm-lizard.

- **disrupt the breeding cycle of an important population, or;**

An important population of pink-tailed worm-lizard is not considered to occur in the proposal site. Therefore the proposal is considered unlikely to disrupt the breeding cycle of an important population of pink-tailed worm-lizard.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The proposal will remove a range of native vegetation communities within the proposal site including fragmented woodlands and derived native grassland. The majority of impacts will occur in cleared and non-native vegetation associated within the rail corridor. Therefore, the proposal is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for pink-tailed worm-lizard to the extent that the species would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The proposal is unlikely to result in an invasive species that is harmful to the pink-tailed worm-lizard becoming established in its habitat.

Conclusion

The proposal is unlikely to result in a significant impact on an important population of pink-tailed worm-lizard.

Border thick-tailed gecko (*Uvidicolus sphyrurus*)

The border thick-tailed gecko is a pale fawn to brown reptile growing to 7 cm (Cogger 2000). It is a nocturnal species that shelters by day under exfoliating rocks and is most commonly found in undisturbed habitat remnants on rocky outcrops (mainly granite) and stony hills within eucalypt and cypress-pine open forest or woodland in rugged terrain between 500 – 1100 m elevations (NSW SC 2010). It is known to occur on the northern slopes and tablelands in the New England Tableland, Nandewar and Brigalow Belt South Bioregions.

The border thick-tailed gecko is known from records concentrated in granite belt between Tamworth and Stanthorpe-Warwick (NSW SC 2010). There is one outlying record from Moree area in 1990 with the nearest records to the proposal site being Mount Kaputar National Park east of Narrabri.

In this case, an important population is a population that is necessary for a species' long-term survival In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

The border thick-tailed gecko was not recorded within the proposal site despite targeted fauna surveys undertaken in accordance with the seasonal requirements for this species (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). There is one outlying record from Moree area in 1990 with the nearest records to the proposal site being Mount Kaputar National Park east of Narrabri. Given the absence of preferred habitat, microhabitats and also the lower elevations (less than 500 m) along the proposal site this species is unlikely to occur in the proposal site. Therefore an important population of this species is unlikely to occur in the proposal site.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

An important population of border thick-tailed gecko is not considered to occur in the proposal site. Therefore the proposal is considered unlikely to lead to a long-term decrease to an important population of the border thick-tailed gecko.

- **reduce the area of occupancy of an important population, or;**

The proposal site does not provide habitat for an important population of the border thick-tailed gecko. Therefore the proposal is unlikely to reduce the area of occupancy of an important population of the border thick-tailed gecko.

- **fragment an existing important population into two or more populations, or;**

The border thick-tailed gecko is not known to occur within the proposal site and is not expected to be impacted by the proposal. As a result the proposal will not fragment or isolate any known populations of this species.

- **adversely affect habitat critical to the survival of a species, or;**

The proposal site is not considered to represent habitat critical to the survival of the border thick-tailed gecko. Therefore, the proposal is unlikely to adversely affect habitat critical to the survival of the border thick-tailed gecko.

- **disrupt the breeding cycle of an important population, or;**

An important population of border thick-tailed gecko is not considered to occur in the proposal site. Therefore the proposal is considered unlikely to disrupt the breeding cycle of an important population of border thick-tailed gecko.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

It was found that habitat, microhabitat features and lower elevations (less than 500m) preferred by the border thick-tailed gecko were absent from the site. Therefore, the proposal is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for the border thick-tailed gecko to the extent that the species would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The proposal is unlikely to result in an invasive species that is harmful to the border thick-tailed gecko becoming established in its habitat.

The proposal is **unlikely** to result in a significant impact on an *important population* of the border-thick tailed gecko.

Squatter pigeon (*Geophaps scripta scripta*)

The squatter pigeon (southern) is a medium-sized, ground-dwelling pigeon, inhabiting grassy understorey of open eucalypt woodland, nearly always found near permanent water. Sandy areas dissected by gravel ridges, with open and short grass cover are preferred and they are less commonly found on heavier soils with dense grass (TSSC 2015c). In NSW, the distribution of the squatter pigeon has disappeared from the southern half of its range on the western slopes of the range (south to West Wyalong area). The squatter pigeon is now listed as CE in NSW.

In determining the presence of suitable habitat for the squatter pigeon in the proposal site, reference was made to the NSW Threatened Species Profile Database which identifies the plant community types that provide habitat for threatened fauna species. This review identified the following PCTs as providing potential habitat for this species:

- PCT 413 (BR346) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion,

- PCT PCT71 (BR127) Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and aeolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion and

- PCT135 (BR284) Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion.

In this case, an important population is a population that is necessary for a species' long-term survival In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

The squatter pigeon was not recorded in the proposal site despite extensive fauna surveys undertaken throughout the proposal site across multiple seasons (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). The TSPD lists three of the vegetation communities recorded in the proposal site as providing suitable habitat for the squatter pigeon.

Individuals and habitat within NSW, where there were no confirmed reports between 1980 and 2000, and only three confirmed reports since 2000 are considered to comprise a sub-population of the species (TSSC 2015c). Breeding has not been recorded in NSW at any time during the past 50 years, suggesting that there is little or no remaining suitable breeding habitat and the NSW population is estimated to be extremely low at <100 individuals with an extent of occurrence estimated at <1000 km2 (TSSC 2015c).

There are no known records of the squatter pigeon within 10km of the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). There have been no confirmed records of this species in NSW in the last 10 years with only a few records near the Queensland border in the last 50 years (NSW SC 2016). Given the scarcity of records found in NSW for this species, the ambiguity of its area of occupancy within NSW and the lack of sightings during the extensive fauna surveys undertaken it is considered unlikely that a portion of the NSW sub-population of squatter pigeon would occur on site. Therefore an important population of this species was not considered to occur on site.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

An important population of squatter pigeon is not considered to occur in the proposal site. The proposal will result in the removal of approximately 1.17 hectares of potential habitat from within the proposal site. The proposal is considered unlikely to lead to a long-term decrease to an *important population* of the squatter pigeon.

- **reduce the area of occupancy of an important population, or;**

The proposal site does not provide habitat for an important population of the squatter pigeon. The proposal will result in the removal of approximately 1.17 hectares of potential habitat from within the proposal site. The proposal is unlikely to reduce the area of occupancy of an important population of the squatter pigeon.

- **fragment an existing important population into two or more populations, or;**

The squatter pigeon is not known to occur within the proposal site and is not expected to be impacted by the proposal. As a result the proposal will not fragment or isolate any known occurrences of this species.

- **adversely affect habitat critical to the survival of a species, or;**

The proposal site is not considered to represent habitat critical to the survival of the squatter pigeon. Therefore, the proposal is unlikely to adversely affect habitat critical to the survival of the squatter pigeon.

- **disrupt the breeding cycle of an important population, or;**

Breeding has not been recorded in NSW at any time during the past 50 years, suggesting that there is little or no remaining suitable breeding habitat (TSSC 2015c). An important population of squatter pigeon is not considered to occur in the proposal site. The proposal is considered unlikely to disrupt the breeding cycle of an important population of squatter pigeon.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The proposal will result in the removal of approximately 1.17 hectares of potential habitat from within the proposal site. The majority of impacts will occur in cleared and non-native vegetation associated within the rail corridor. Therefore, the proposal is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for the squatter pigeon to the extent that the species would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The proposal is unlikely to result in an invasive species that is harmful to the squatter pigeon becoming established in its habitat.

- **interferes substantially with the recovery of the species.**

The proposal is unlikely to interfere substantially with the recovery of the squatter pigeon.

Conclusion

The proposal is **unlikely** to result in a significant impact on an important population of the squatter pigeon.

Painted honeyeater (*Grantiella picta*)

The painted honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations and almost all breeding, occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Important habitat is mistletoes in eucalypt forests/woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, acacia-dominated woodlands, paperbarks, casuarinas, callitris, and trees on farmland or gardens (TSSC 2015d). The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes.

In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

The painted honeyeater was not recorded in the proposal site despite extensive fauna surveys undertaken throughout the proposal site across multiple seasons (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). During winter the painted honey eater is most likely to be found in the northern extent of its range and almost all breeding for this species occurs within the inland slopes of the Great Dividing Range. There are 15 records within 10km of the proposal site (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). Habitat for this species was found to occur within the proposal site. This habitat is considered poor due to its fragmented nature and disturbance. Foraging resources for this species in the form of flowering mistletoes in the genus Amyema were also present within the site.

The conservation advice for the species (TSSC 2015d) describes the seasonal north-south movements governed principally by the fruiting of mistletoe, with which its breeding season is closely matched. Many birds move after breeding to semi-arid regions such as north-eastern South Australia, central and western Queensland, and central Northern Territory. Considering its dispersive habits, the species is considered to have a single population (Garnett et al., 2011 cited in TSSC 2015d).

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

The species was not recorded within the proposal site. The proposal will remove 22.35 hectares of potential woodland habitat for the species in the proposal site a. This potential habitat was found to be highly disturbed and restricted to small linear patches and scattered trees, mostly fragmented by agricultural lands. Therefore the proposal is considered unlikely to lead to a long-term decrease to the important population of the painted honeyeater.

- **reduce the area of occupancy of an important population, or;**

The painted honeyeater was not recorded in the proposal site despite extensive fauna surveys undertaken throughout the proposal site across multiple seasons (refer to *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a). The proposal will remove 22.35 hectares of potential woodland habitat for the species in the proposal site, however this is not considered likely to reduce the area of occupancy of the species across its range.

- **fragment an existing important population into two or more populations, or;**

The species is not known to occur in the proposal site. The proposal will remove 22.35 hectares of potential woodland habitat for the species in the proposal site. However this habitat was found to already be a highly fragmented landscape, therefore the proposal is not considered likely to fragment the population of this species into two or more.

- **adversely affect habitat critical to the survival of a species, or;**

The proposal will remove 22.35 hectares of potential woodland habitat for the species in the proposal site. The painted honeyeater was not recorded within the proposal site despite thorough fauna surveys, including targeted surveys for the species undertaken in accordance with the seasonal requirements for this species. The habitat within the site was found to be highly fragmented and prone to disturbance and therefore is not considered to be habitat critical to the survival of the species.

- **disrupt the breeding cycle of an important population, or;**

The painted honeyeater nests from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches. Breeding is not known to occur within the proposal site and the proposal is considered unlikely to disrupt the breeding cycle of the painted honeyeater population.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The species was not recorded within the proposal site. The proposal will remove 22.35 hectares of potential woodland habitat for the species in the proposal site. However the habitat within the proposal site is already substantially degraded and therefore the proposal is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for the painted honeyeater to the extent that the species would likely decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

It is unlikely that the proposal will introduce any disease that may cause the painted honeyeater to decline.

- **interferes substantially with the recovery of the species.**

It is not considered likely that the proposal will interfere with the recovery of the painted honeyeater.

Conclusion

The proposal is **unlikely** to result in a significant impact on a population of painted honeyeater.

South-eastern long-eared bat (*Nyctophilus corbeni*)

Until recently the south-eastern long-eared bat was included as a distinct form of the greater long-eared bat (*Nyctophilus timoriensis*) complex and was listed as such under the EPBC Act. In 2009 it was formally described as a separate species, *Nyctophilus corbeni* (south-eastern long-eared bat), by Parnaby (2009).

The south-eastern long-eared bat is found in southern central Queensland, central western NSW, north-western Victoria and eastern South Australia, where it is patchily distributed, with most of its range in the Murray Darling Basin (TSSC 2015e). The south-eastern long-eared bat is found in a wide range of inland woodland vegetation types. These include box / ironbark / cypress pine woodlands, Buloke woodlands, Brigalow woodland, Belah woodland, smooth-barked apple woodland, river red gum forest, black box woodland, and various types of tree mallee (TSSC 2015e). The species mainly roosts solitarily in dead trees or dead spouts with maternity colonised in dead trees including ironbarks, cypress and buloke (TSSC 2015e).

In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**

- **populations that are necessary for maintaining genetic diversity, and/or**

- **populations that are near the limit of the species range.**

The south-eastern long-eared bat has not been recorded in the proposal site. There is one record of this species on the OEH Atlas of NSW Wildlife within 10 kilometres of the proposal site, being from a State Conservation Area west of Edgeroi in 2001. Based on the scarcity of local records and small area of habitat

within the proposal site, it is unlikely that an important population of the south-eastern long-eared bat occurs within the proposal site.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

The proposal site does not provide known habitat for an important population of the south-eastern long-eared bat. Therefore the proposal is unlikely to lead to a long-term decrease to an important population of the south-eastern long-eared bat.

- **reduce the area of occupancy of an important population, or;**

The proposal site and additional assessment does not provide known habitat for an important population of the south-eastern long-eared bat. Therefore the proposal is unlikely to reduce the area of occupancy of an important population of the south-eastern long-eared bat.

- **fragment an existing important population into two or more populations, or;**

The proposal site and additional assessment does not support an important population of the south-eastern long-eared bat. The proposal site occurs within a highly fragmented landscape and therefore, the proposal is unlikely to fragment an important population of the south-eastern long-eared bat.

- **adversely affect habitat critical to the survival of a species, or;**

The proposal site and additional assessment is not considered to represent habitat critical to the survival of the south-eastern long-eared bat and therefore the proposal is unlikely to adversely affect habitat critical to the survival of the south-eastern long-eared bat.

- **disrupt the breeding cycle of an important population, or;**

The proposal site and additional assessment does not support a known population of the south-eastern long-eared bat. Therefore the proposal is considered unlikely to disrupt the breeding cycle of an important population of the south-eastern long-eared bat.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The proposal would result in the removal of potential habitat for the south-eastern long-eared bat. However, the proposal is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for the south-eastern long-eared bat to the extent that the species would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The proposal is unlikely to result in an invasive species that is harmful to the south-eastern long-eared bat becoming established in its habitat.

- **interferes substantially with the recovery of the species.**

The proposal is unlikely to interfere substantially with the recovery of the south-eastern long-eared bat.

Conclusion

The proposal is **unlikely** to result in a significant impact on an *important population* of the south-eastern long-eared bat.

Pilliga mouse (*Pseudomys pilligaensis*)

The Pilliga mouse is a small rodent known only from the type locality in Pilliga, NSW, and three other nearby sites all in the immediate surrounding area including the Pilliga Nature Reserve and the adjacent Pilliga State Forest (TSSC 2009). There is no specific habitat type with records in mixed *Eucalyptus*, *Acacia* and *Callitris* open forest. The species is found in greatest abundance post fire and rainfall, peaking approximately 20 months following the disturbance event. During non-peak population periods its distribution is patchy (TSSC 2009).

In determining the presence of suitable habitat for the pilliga mouse in the proposal site, reference was made to the NSW Threatened Species Profile Database which identifies the plant community types that provide habitat for threatened fauna species, and also the *Identification of important habitat for the Pilliga Mouse Pseudomys pilligaensis* (Paull 2014). This review identified two PCTs as providing potential habitat for the species, equating to a total of 0.11 hectares of PCT431 (NA348) which occurs within the proposal site. This PCT occurs within the Namoi catchment, close to Narrabri near the known populations of the species in the Pilliga forests.

In this case, an important population is a population that is necessary for a species' long-term survival In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

The pilliga mouse is not known to occur within the proposal site with all known records of the species occurring within the Pilliga forests. Potential habitat was identified in one vegetation community occurring within the proposal site, occupying a total of 0.11 hectares. All records identified during the assessment for the pilliga mouse are concentrated in Pilliga scrub area to the south of Narrabri, south of the proposal site. Therefore an important population of this species is not likely to occur on site as it is not expected to be a key site for breeding and dispersal or important for maintaining genetic diversity.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

An important population of pilliga mouse is not considered to occur in the proposal site and known habitat will not be impacted. Therefore the proposal is considered unlikely to lead to a long-term decrease to an important population of the pilliga mouse.

- **reduce the area of occupancy of an important population, or;**

The proposal site does not provide habitat for an important population of the pilliga mouse. Therefore the proposal is unlikely to reduce the area of occupancy of an important population of the pilliga mouse.

- **fragment an existing important population into two or more populations, or;**

The pilliga mouse is not known to occur within the proposal site and is not expected to be impacted by the proposal. As a result the proposal will not fragment or isolate any known populations of this species

- **adversely affect habitat critical to the survival of a species, or;**

The proposal site is not considered to represent habitat critical to the survival of the pilliga mouse. Therefore, the proposal is unlikely to adversely affect habitat critical to the survival of the pilliga mouse.

- **disrupt the breeding cycle of an important population, or;**

An important population of pilliga mouse is not considered to occur in the proposal site. Therefore the proposal is considered unlikely to disrupt the breeding cycle of an important population of pilliga mouse.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The proposal will remove a range of native vegetation communities within the Development Site including fragmented woodlands and derived native grassland. The majority of impacts will occur in cleared and non-native vegetation associated within the rail corridor. Therefore, the proposal is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for pilliga mouse to the extent that the species would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The proposal is unlikely to result in an invasive species that is harmful to the pilliga mouse becoming established in its habitat.

Conclusion

The proposal is **unlikely** to result in a significant impact on an *important population* of the pilliga mouse.

Koala (*Phascolarctos cinereus*)

Fifteen koalas were recorded at four locations during targeted surveys undertaken to determine the impact of the proposal on this species. Analysis of koala records from the local area indicated that prior to surveys; the nearest record of this species was from near Belata, approximately 200 metres from the proposal site. Within the proposal site potential woodland habitat is restricted to small linear patches and scattered trees, sometimes with adjoining woodland areas.

Koalas were recorded 10 December 2015, with six individuals located. Two of these were juveniles still confined to their mother. The first female and juvenile were located at Kilometre Point (KP) 695.3 (Appendix A of *ARTC Inland Rail – Narrabri to North Star Biodiversity Assessment Report* – Umwelt 2017a for location of koala records) within the proposal site. Another koala (not sexed) was located outside of the proposal site at KP 695.4. Another female with juvenile was spotted at KP 697 within the proposal site and a male koala was identified on the opposite side of the rail line within the proposal site.

On 11 December 2015, a female and juvenile were sighted at KP 706.5 crossing over Country Boundary Road near Milguy Silo. One individual (not sexed) was sighted opportunistically in riparian vegetation on the Gwydir River at KP 676.3.

Three separate unsexed individuals were spotlighted opportunistically within the proposal site during two separate spotlighting events. One individual was located at KP 704.4 within a Brigalow dominated patch, while another was identified at KP 730 on 13 December 2015. The final individual was sighted in proximity

to Moree on 16 December 2015 at KP 680.6. This individual was located approximately 50 m away from the proposal site.

Koala scats were located at two additional locations, at KP 711.6 and KP 716.8.

A further 72 records exist within 10 kilometres of the proposal site on the OEH Atlas of NSW Wildlife (OEH 2016). The four locations at which koalas were recorded within the referral area are all within 40 kilometres of one another and occur in the northern portion of the alignment, close to Moree. The majority of the records from the OEH Atlas of NSW Wildlife also occur within this northern portion of the alignment but tend to be located in larger patches of woodland habitat in reserves such as Bullala State Forest (40 Kilometres north-east of Moree).

Koala feed trees for the Western Slopes and Plains Koala Management Area (KMA) were determined from the NSW Recovery Plan (OEH 2014). Koala feed trees that occur in the proposal site include:

Primary Food Tree Species:

- river red gum (*Eucalyptus camaldulensis*)
- coolibah (*Eucalyptus coolabah*)

Secondary Food Tree Species:

- bimble box (*Eucalyptus populnea*).

Table 3 identifies the extent of koala habitat within the proposal site based on the extent of primary and secondary koala feed trees occurring within discrete vegetation communities. High quality habitat occurs in those communities that contain primary koala food trees, which are known to occur within riparian areas within the proposal site. Secondary koala food trees (*Eucalyptus populnea*) were recorded as a dominant canopy species in Bimble Box - Belah Woodland, Bimble Box - White Cypress Pine Woodland and Bimble Box Woodland. Communities within the overarching plant community type PCT-56/BVT-BR186, NA182/Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW/Moderate – Good that were not dominated by bimble box (*Eucalyptus populnea*) were excluded from the assessment as they do not provide potential koala habitat in accordance with the recovery plan. The assessment result accords with the results of koala habitat mapping prepared for the Moree Plains LGA (PB 2008) which identified riparian vegetation within the LGA as primary koala habitat (PB 2008).

Remnant vegetation associated with rivers and creeks are likely to provide important corridors for the species within the highly modified and fragmented landscape in the western slopes and plains KMA. As identified in **Table 3**, approximately 2.18 hectares of primary koala habitat will be directly impacted in the proposal site.

Table 3 also shows that approximately 13.44 hectares of moderate quality habitat for the koala that includes one secondary koala food tree species will be directly impacted within the proposal site.

Table 3 – Koala Habitat Quality in the Proposal Site and Additional Assessment Area

Koala Habitat/Vegetation Community	Area within Proposal Site (ha)
Area of Habitat containing Primary Food Trees	
PCT-39/BVT-BR130, NA129/Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion/Moderate - Good	0.09
PCT-78/BVT-BR196, NA193/River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion/Moderate – Good	2.09
Sub-total	**2.18**
Area of Habitat containing Secondary Food Trees	
PCT-56/BVT-BR186, NA182/Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW/Moderate – Good	13.44
Sub –total	**13.44**
TOTAL	**15.62**

The proposal involves works on an existing rail line and in terms of disturbance, will essentially involve minor clearing associated with rail upgrade works along the length of the 183 km corridor. As the rail line exists, the corridor is already impacted and the impact is spread out along the corridor, reducing the potential for the proposal to result in a significant change to the existing environment. Known and potential koala habitat will be impacted through the widening of the corridor. This incremental widening of the disturbed portions of the current rail alignment is not expected to adversely affect the ability of the species to traverse the corridor and access preferred or potential habitat areas or to potentially disperse across the rail corridor in a similar manner as they do now. The cumulative effect of the incremental widening results in the total area of direct disturbance being up to approximately 2.18 hectares of primary habitat and approximately 13.44 hectares of secondary habitat.

In the controlled action notification (26 September 2016) DoEE found that the proposal will significantly impact the koala based on the removal of 159 hectares of foraging habitat. No advice was provided as to what communities were considered to constitute foraging habitat for the species and it is unclear what the 159 hectares of habitat equates to in relation to the proposal. The proposal will result in the direct impact of a maximum of 15.62 hectares of koala habitat. Vegetation community associations that do not contain known food trees, based on the NSW recovery plan, or are not located within riparian corridors that have been identified as important corridors for the species are not considered to be important habitat for the species and have therefore are not proposed to be offset as part of the proposal.

Table 4 applies the Koala Habitat Assessment Tool as outlined in Table 3 of the Referral Guidelines, identifying that the proposal site provides habitat critical to the koala.

Table 4 – Koala Habitat Quality in the Proposal site and Additional Assessment Area

Koala Habitat Assessment Tool (Table 3 from DoE 2014)			Proposal site Assessment	
Attribute	**Score**	**Inland**	**Allocated Score**	**Score Justification**
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 5 years.	**+2**	**Desktop:** EPBC protected matters search tool (PMST) report identified the koala or koala habitat as 'known to occur' in the proposal site. Atlas of NSW Wildlife point buffer search identified 2 koala records within 10 km of the proposal site and none within 2 km within the last 10 years. **On-ground:** Evidence of the koala was recorded during the Umwelt surveys of the proposal site in 2015, including 15 sightings at 4 locations and scats recorded at 2 locations.
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 10 years.		
	0 (low)	None of the above.		
Vegetation composition	+2 (high)	Has forest or woodland or shrubland with emerging trees with 2 or more known koala food tree species in the canopy. **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	**+2**	**On-ground:** This proposal site contains known koala feed trees for the western slopes and plains region including bimble box (*Eucalyptus populnea*), coolibah (*Eucalyptus coolabah*) and river red gum (*E. camaldulensis*) (refer to **Table 1**).
	+1 (medium)	Has forest or woodland or shrubland with only 1 species of known koala food tree present in the canopy.		
	0 (low)	None of the above.		
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 1000 hectares.	**0**	The proposal site is within a highly fragmented region with a long history of broad scale cultivation and other agricultural activities. The proposal involves small areas of habitat clearing spread over a long rail line corridor. Scattered woodland areas occur, but are relatively uncommon across the broader landscape.
	+1 (medium)	Area is part of a contiguous landscape < 1000 hectares, but ≥ 500 hectares.		
	0 (low)	None of the above.		

Koala Habitat Assessment Tool (Table 3 from DoE 2014)			Proposal site Assessment	
Key existing threats	+2 (low)	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.	**0**	**Desktop: Two** BioNet Wildlife Atlas records note two koala road mortalities in 2004 ranging between 1km and 4 km of the proposal site on local roads (OEH 2016). **On-ground:** It is expected that any local koala populations could be substantially affected by vehicle strike associated with the Newell Highway, Gwydir Highway, local roads, and the existing railway. Additionally, the agricultural land uses in the locality would likely expose any local koala population to dog attack.
	+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 are likely to have some degree of dog or vehicle threat present.		
	0 (high)	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.		
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**	**Desktop:** Table 1 of the Draft Referral Guidelines (DoE 2014) prescribes, that for inland areas, the interim recovery objective(s) are to: *"Protect and conserve the quality and extent of habitat refuges for the persistence of the species during droughts and periods of extreme heat, especially in riparian environments and other areas with reliable soil moisture and fertility. Maintain the quality, extent and connectivity of large areas of koala habitat surrounding habitat refuges."* **On-ground:** Due to the size of the continuous landscapes, vegetation composition and level of potential threats it is uncertain as to whether the habitat is considered to be important for the recovery of the koala. Clearing of preferred/primary koala habitat will be minimised as much as possible.
	+1 (medium)	Uncertainty exists as to 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.		
TOTAL SCORE			**5**	**≥ 5 indicates habitat critical for the survival of the koala.**

In this case, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

Within the proposal site potential woodland habitat is restricted to small linear patches and scattered trees, mostly fragmented by agricultural lands but sometimes with adjoining woodland areas. Based on the Koala Habitat Assessment Tool described in the Koala Referral Guidelines (DoE 2014) (Refer to **Table 4**), koala habitat occurring within the proposal site is considered to be critical to the survival of the species. The proposal site contains records of koalas, including breeding records, however, the habitat within the proposal site alone is unlikely to be sufficient, in terms of area, to support an extensive population of the koala and is more likely to be used by transient individuals or groups moving throughout this highly fragmented landscape or a low density population that uses the habitat within the proposal site as part of a larger home range. The proposal site occurs within the western slopes and plains KMA, where the population is thought to be increasing (DECC 2008). Therefore, the population of koalas identified within the proposal site is considered to form part of an important population located within the western slopes and plains, that is characterised by large populations in particular in the Pilliga region (Kavanagh and Barrott 2001), Gunnedah (Smith 1992) and Walgett LGAs (DECC 2008).

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

The design of the proposal has sought to avoid impacts in known koala habitat, where possible. Review of koala habitat mapping for the Moree Plains LGA (PB 2008) identified riparian vegetation within the LGA as primary koala habitat and it is remnant vegetation dominated by river red gum and coolibah that is likely to provide important corridors for the species within the high modified and fragmented landscape.

The proposal would result in the loss of 15.62 hectares of koala habitat from within the proposal site, however is not likely to lead to the long-term decrease in the size of the important population.

- **reduce the area of occupancy of an important population, or;**

The proposal would reduce the area of occupancy of the koala in the proposal site by up to a total of 15.62 hectares, of which 2.18 hectares is core koala habitat dominated by preferred food trees.

- **fragment an existing important population into two or more populations, or;**

The impact of the proposal on habitat fragmentation is minor given the already highly fragmented nature of the population across the proposal site. Therefore the proposal is unlikely to fragment an existing important population of the koala into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The assessment of koala habitat within the context of the koala referral guidelines indicates that the proposal site comprises habitat critical to the survival of the species. The removal of 15.62 hectares of koala habitat, of which 2.18 hectares is considered to be core koala habitat dominated by preferred food

trees is not, however, likely to adversely affect the availability of habitat for the species within the western slopes and plains region.

- **disrupt the breeding cycle of an important population, or;**

The assessment of koala habitat within the context of the koala referral guidelines indicates that the proposal site comprises habitat critical to the survival of the species. Evidence of breeding was recorded within the proposal site, with back young recorded at two locations. The permanent removal of 15.62 hectares of koala habitat, of which 2.18 hectares is considered to be core koala habitat dominated by preferred food trees is not, however, considered likely to disrupt the breeding cycle of the species within the western slopes and plains region due to the linear nature of the proposal site.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The proposal would reduce the area of occupancy of the koala in the proposal site by 15.62 hectares, of which 2.18 hectares is core koala habitat dominated by preferred food trees. However, the proposal is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for the koala to the extent that the species would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The proposal is unlikely to result in an invasive species that is harmful to the koala becoming established in its habitat.

- **interferes substantially with the recovery of the species.**

The proposal is unlikely to interfere substantially with the recovery of the koala in the western slopes and plains region.

Conclusion

The assessment of significance concludes that the proposal is **unlikely** to result in a significant impact on an important population of the koala, however the DoEE has determined that the proposal is likely to result in a significant impact on the koala and habitat for the species will be offset in accordance with the EPBC Act Environmental Offset Policy.

Grey-headed flying-fox (*Pteropus poliocephalus*)

One grey-headed flying-fox was recorded on one occasion during targeted surveys of the proposal site. All woodland vegetation within the proposal site is expected to provide potential foraging habitat for this species. Camp sites (breeding habitat) were not identified and are not expected to occur due to a lack of preferred habitat.

According to the draft National Recovery Plan for the grey-headed flying-fox (DECC 2009), foraging habitat that meets one of the following criteria is considered critical to the survival of the species:

- productive during winter and spring, when food bottlenecks have been identified
- known to support populations of >30,000 individuals within an area of 50 kilometre radius (the maximum foraging distance of an adult)
- productive during the final weeks of gestation, and during the weeks of birth, lactation and conception

- productive during the final stages of fruit development and ripening in commercial crops affected by grey-headed flying-foxes and/or

- known to support a continuously occupied camp.

The nearest known roost camp site of the grey-headed flying-fox to the proposal site is at Blair Athol, near Inverell, approximately 120 kilometres south-east of the proposal site. A currently un-used camp site was formerly known at Barraba, approximately 75 km east of Narrabri. The proposal site does not contain known camp sites of the grey-headed flying-fox. The population estimate for the grey-headed flying-fox population at Inverell is estimated at between 16000 and 49000 individuals (National Flying-fox Monitoring Viewer, accessed March 2017). As the proposal site is not located within 50 kilometres of a population of the grey-headed flying-fox that supports more than 30,000 individuals it is not considered habitat critical or essential to the survival of this species and the proposal site does not support an important population of the species, as defined by the significant impact guidelines.

In this case, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**

- **populations that are necessary for maintaining genetic diversity, and/or**

- **populations that are near the limit of the species range.**

One grey-headed flying-fox was recorded within the proposal site. There are no records of grey-headed flying-fox on the OEH Atlas of NSW Wildlife within 10 kilometres of the proposal site. There are no camp sites or breeding habitat for this species within the proposal site and therefore, it is unlikely to be a key source population either for breeding or dispersal or comprise a population that is necessary for maintaining genetic diversity. The species is not near the limits of its known range within the proposal site. Therefore any potentially occurring population of grey-headed flying-fox within the proposal site would not be considered to be an important population.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

The proposal site does not provide habitat for an important population of the grey-headed flying-fox. Therefore the proposal is unlikely to lead to a long-term decrease to an important population of the grey-headed flying-fox.

- **reduce the area of occupancy of an important population, or;**

The proposal site does not provide habitat for an important population of the grey-headed flying-fox. Therefore the proposal is unlikely to reduce the area of occupancy of an important population of the grey-headed flying-fox.

- **fragment an existing important population into two or more populations, or;**

The proposal site does not provide habitat for an important population of the grey-headed flying-fox. The proposal site occurs within a highly fragmented landscape and therefore the proposal is unlikely to fragment an important population of the grey-headed flying-fox.

- **adversely affect habitat critical to the survival of a species, or;**

The proposal site is not considered to represent habitat critical to the survival of the grey-headed flying-fox and therefore the proposal is unlikely to adversely affect habitat critical to the survival of the grey-headed flying-fox.

- **disrupt the breeding cycle of an important population, or;**

The proposal site does not provide habitat for an important population of the grey-headed flying-fox and no camp sites were identified. Therefore the proposal is unlikely to disrupt the breeding cycle of an important population of the grey-headed flying-fox.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The proposal would result in the removal of known and potential habitat for the grey-headed flying-fox. However, the proposal is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for the grey-headed flying-fox to the extent that the species would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

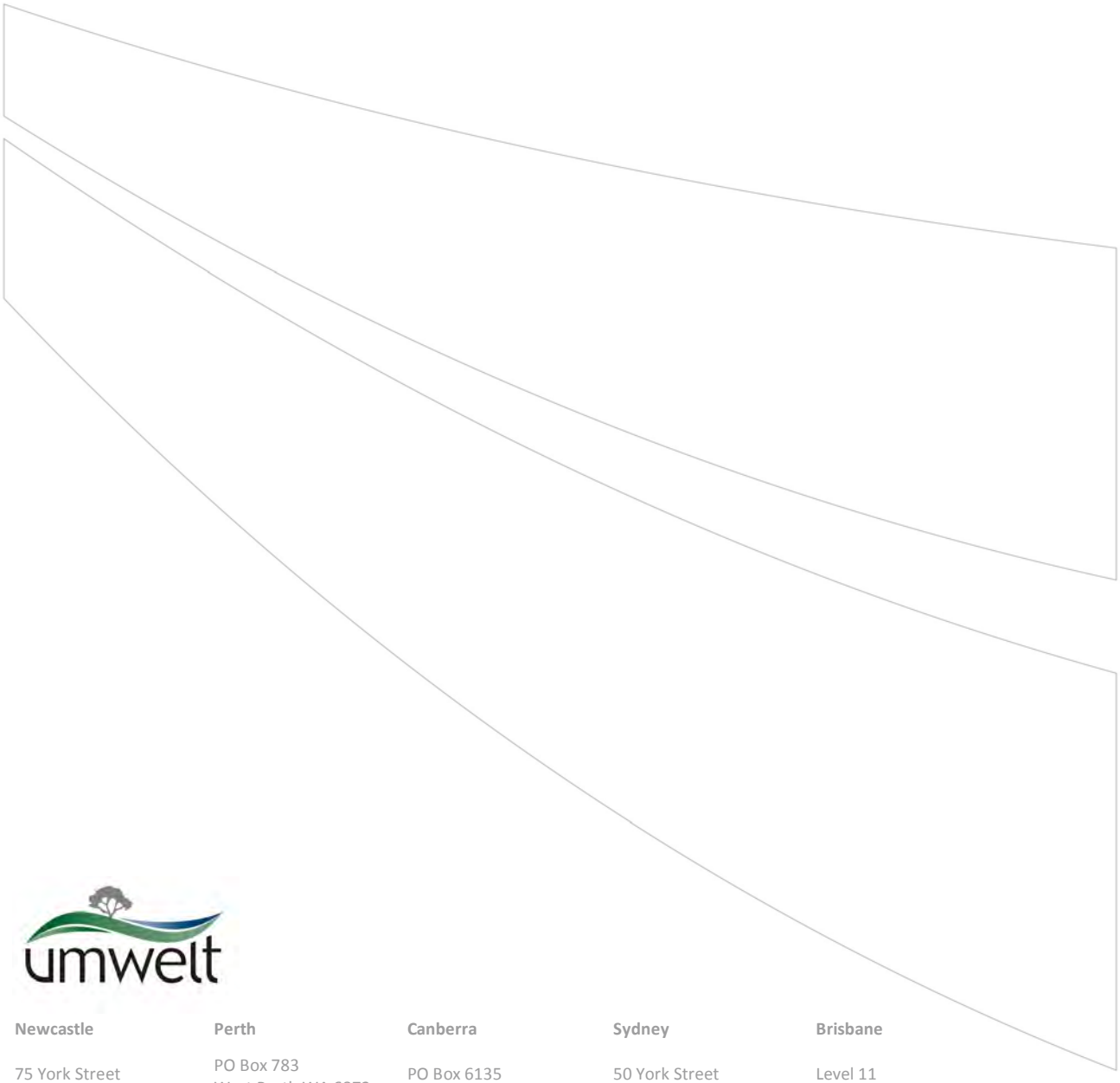
The proposal is unlikely to result in an invasive species that is harmful to the grey-headed flying-fox becoming established in its habitat.

- **interferes substantially with the recovery of the species.**

The proposal is unlikely to interfere substantially with the recovery of the grey-headed flying-fox.

Conclusion

The proposal is **unlikely** to result in a significant impact on an important population of the grey-headed flying-fox.



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