Appendix B

Supplementary MNES Report

Prepared for
Queensland Department of Transport and Main Roads
ABN: 39 407 690 291

Supplementary Matters of National Environmental Significance Report

17-Feb-2025
Logan and Gold Coast Faster Rail Project

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Supplementary Matters of National Environmental Significance Report

Client: Queensland Department of Transport and Main Roads

ABN: 39 407 690 291

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Acronym List

Acronym /Term	Explanation
ALA	Atlas of Living Australia
BOM	Bureau of Meteorology
BVG	Broad Vegetation Group
CAMBA	China-Australia Migratory Bird Agreement
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAF	Department of Agriculture and Fisheries
DAWE	Department of Agriculture, Water and the Environment (now known as DCCEEW)
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DESI	Department of Environment, Science and Innovation (Queensland)
DIWA	Directory of Important Wetlands of Australia
DNRME	Department of Natural Resources, Mines and Energy (Queensland)
DoR	Department of Resources (Queensland)
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities (now known as DCCEEW)
EDR	Environmental Design Report (EDR)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPBC Offset Policy	*Environment Protection and Biodiversity Conservation Act 1999* Environmental Offsets Policy
GBRMP	Great Barrier Reef Marine Park
GSI	Government Supported Infrastructure
HES	High Ecological Significance
JAMBA	Japan-Australia Migratory Bird Agreement
KHA	Koala Habitat Area
KPA	Koala Priority Area
LGA	Local Government Area
LIKT	Locally Important Koala Tree
MLES	Matters of Local Environmental Significance
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NC Act	Queensland *Nature Conservation Act 1992*
NJKHT	Non-juvenile Koala Habitat Tree
OAMP	Offset Area Management Plan
OEMP	Overarching Environmental Mitigation Plan
PD	Preliminary Documentation
QSpatial	Queensland Spatial Catalogue
RE	Regional Ecosystem

Acronym /Term	Explanation
RMAR	Rail maintenance access roads
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
SAT	Spot Assessment Technique
SPRAT	Species Profile and Threats Database
TEC	Threatened Ecological Communities
VM Act	Queensland *Vegetation Management Act 1999*
WONS	Weeds of National Significance

Executive Summary

The Queensland Department of Transport and Main Roads (TMR) is proposing to duplicate the existing rail corridor between Kuraby and Beenleigh Station from two to four tracks, including associated station and rail system upgrades, to support growing population and rail patronage demand between Brisbane, Logan and the Gold Coast (the 'Logan and Gold Coast Faster Rail Project', herein referred to as the 'proposed action'). The 'Impact area' is the area where direct impacts will occur and covers 194.45 hectares (ha). The Impact area is located within the Brisbane City Council and Logan City Council local government areas (LGAs), approximately 16 km south-east of the Brisbane central business district (CBD).

AECOM (Australia) Pty Ltd (AECOM) has been engaged by TMR to undertake an assessment of Matters of National Environmental Significance (MNES) and prepare a Supplementary MNES Report (this report) for the proposed action. This report will support the Preliminary Documentation (PD) submission for assessment of the proposed action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The proposed action was referred to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) on 17 December 2022 and was determined to be a Controlled Action on 11 April 2023 to be assessed by PD due to the following controlling provisions:

- Listed threatened species and communities (section 18 & 18A).

Targeted field surveys

Extensive targeted flora and fauna surveys were undertaken across areas within and adjacent to the Impact area, focussing on assessing the presence and habitat quality for EPBC Act listed threatened species and communities (Appendix B Figure 2 and Appendix B Figure 3). Targeted surveys were completed across thirty-seven (37) field survey events over the winter, summer and spring months of 2023 and 2024, comprising:

- General habitat assessments
- BioCondition assessments within remnant and high value regrowth vegetation and modified BioCondition assessments within non-remnant vegetation
- Targeted threatened flora surveys in accordance with the *Flora Survey Guidelines- Protected Plants, guidelines* (Department of Environment, Science and Innovation, 2020)
- MNES habitat quality assessments, in accordance with *Guide to determining terrestrial habitat quality: A toolkit for assessing land-based offsets under the Queensland Environmental Offsets Policy Version 1.2 April 2017* (Department of Environment and Heritage Protection, 2017)
- Active ground searches
- Scat and sign searches
- Spotlighting and call playback
- Acoustic monitoring recorders
- Infrared drone surveys
- Camera trap surveys
- Angling and snorkelling surveys
- eDNA sampling
- Fyke netting
- Bird surveys (general, woodland, and wetland, flushing)
- Flying fox roost searches and flyout counts.

In total, field survey effort included:

188 tertiary and quaternary sites

BioCondition assessments across 59 sites within and adjacent to the Impact area

35 targeted threatened flora surveys involving 144 person hours

Results

Mapped vegetation communities generally aligned with ground truthed vegetation communities. The majority of changes occurred in vegetation that was mapped as non-remnant and was ground truthed as remnant or high value regrowth vegetation.

- Approximately 1.30 ha[1] (inclusive of approximately 1.12 ha of Class B3, and approximately 0.17 ha of Class C1) of Threatened Ecological Community Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions (subtropical floodplain eucalypt TEC) (Endangered, EPBC Act) occurs within the Impact area.
- The following threatened flora, fauna and migratory species were observed within or directly adjacent to the Impact area:
  - Angle-stemmed myrtle (*Gossia gonoclada),* listed as Endangered under the EPBC Act was observed directly adjacent to the Impact area
  - Glossy ibis (*Plegadis falcinellus*), listed as Migratory under the EPBC Act observed within the Impact area
  - Grey-headed flying-fox (*Pteropus poliocephalus*), listed as Vulnerable under the EPBC Act was observed within and adjacent to the Impact area
  - Koala (*Phascolarctos cinereus*), listed as Endangered under the EPBC Act observed directly adjacent the Impact area
  - Latham's snipe (*Gallinago hardwickii*), listed as Migratory under the EPBC Act observed within the Impact area
  - Macadamia (*Macadamia integrifolia*), listed as Vulnerable under the EPBC Act observed within the Impact area
  - Spectacled monarch (*Symposiachrus trivirgatus*) listed as Migratory under the EPBC Act observed within the Impact area.
- In addition, potential habitat for the following listed threatened fauna was assessed to occur within the Impact area:
  - Australian painted snipe (*Rostratula australis*), listed as Endangered under the EPBC Act
  - Greater glider (southern and central) (*Petauroides volans*), listed as Endangered under the EPBC Act
  - Mary River cod (*Maccullochella mariensis),* listed as Endangered under the EPBC Act
  - Regent honeyeater (*Anthochaera Phrygia*), listed as Critically Endangered under the EPBC Act
  - South-eastern glossy black cockatoo (*Calyptorhynchus lathami lathami*), listed as Vulnerable under the EPBC Act
  - Spotted-tailed quoll (southern sub-species) (*Dasyurus maculatus maculatus*), listed as Endangered under the EPBC Act
  - Swift parrot (*Lathamus discolor),* listed as Critically Endangered under the EPBC Act

[1] An inaccuracy of 0.01 may occur, associated with rounding to two values.

- White-throated needletail (*Hirundapus caudacutus*), listed as Vulnerable and Migratory under the EPBC Act
- Yellow-bellied glider (south-eastern) (*Petaurus australis australis*), listed as Vulnerable under the EPBC Act.

Significant impact assessment

In accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance* (the Significant Impact Guidelines) (Department of the Environment, 2013) a significant impact assessment was undertaken to assess the nature, likelihood, consequence and extent of potential impacts to conservation significant species and communities identified with a potential risk as a result of the proposed action. A high level of conservatism in mapping threatened fauna habitat and assessing significance of impacts has been undertaken, also considering the fact the Impact area is within a highly disturbed, urbanised and fragmented landscape.

Whilst TMR is committed to reducing potential impacts to MNES through avoidance and mitigation measures, significant impacts are considered likely for the following species:

- Koala – up to 27.48 ha of breeding/foraging, and 80.27 ha of dispersal habitat
- South-eastern glossy black cockatoo – up to 18.91 ha of breeding, 7.13 ha of breeding and foraging, 2.19 ha of foraging and 13.51 ha of dispersal habitat
- Grey-headed flying fox – up to 0.54 ha of breeding/roosting and 42.60 ha of foraging/dispersal habitat directly impacted and 2.20 ha indirectly impacted

The significant impact assessment result indicates a significant impact to potential habitat for swift parrot and regent honeyeater is unlikely based on conservative assessment of habitat critical to survival of the species, and based on an assessment against *EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance* (DCCEEW, 2013). This is because both species only sporadically forage in south-east Queensland when food resources in Victoria and New South Wales are scarce, there have been infrequent records in the past two decades in the south-east Queensland region, and the proposed action's removal of relatively thin areas of marginal habitat, with the retention of habitat in the immediate surrounds is unlikely to significantly impact these highly mobile and wide-ranging species.

With the above said, due to the presence of 42.28 ha of potential foraging and dispersal habitat within the Impact area considered habitat critical to the survival of the species, DCCEEW considers the proposed action may have a significant impact on the swift parrot and regent honeyeater.

While the Proponent remains of the view that such an impact is unlikely, to ensure DCCEEW's response is adequately addressed, the Proponent has considered these species as if the proposed action will have a significant impact. This commitment is reflected within all relevant documents within the revised Preliminary Documentation.

Landscape connectivity modelling

To assess the proposed action's impact to fauna connectivity, a landscape connectivity model was used which is outlined in detail in Appendix G and summarised within this report. The landscape connectivity model (Appendix G) utilised an Omniscape model and Circuitscape algorithms to identify diffuse, channelled, and impeded movement patterns for target MNES koala, greater glider (southern and central) and yellow-bellied glider (south-eastern) (gliders). These species were selected for connectivity modelling, since they have the potential to be most at risk of connectivity impacts as a result of the proposed action due to terrestrial or arboreal mobility or high site fidelity and/or were assessed to have a significant impact as a result of the proposed action (see Section 7.3 of this report). The landscape modelling method was found to be effective in providing spatial and temporal analysis of fauna movement and ecological connectivity for linear infrastructure projects. Results of the modelling include (Appendix G):

- Current koala and glider movement opportunities generally align with mapped biodiversity corridors (Section 3.9) and ground truthed fauna movement corridors (Appendix B Figure 11)
- As a result of the proposed action and proposed fauna connectivity infrastructure such as proposed culverts, several areas of diffuse koala movement occurs

- As a result of the proposed action and proposed fauna connectivity infrastructure, the following areas show potential impedance (restrictions) koala movement within the Impact area:
  - Acacia Forest Park
  - Gould Adams Park/Nealdon Park
  - Logan River in Loganlea
  - Edens Landing Station.
- As a result of the proposed action and proposed fauna connectivity infrastructure, the following areas are unlikely to show significant changes to koala movement from existing conditions to future conditions (i.e. with the proposed action in place):
  - Kuraby
  - Woodridge
  - Logan Central
  - Holmview Road Reserve, near Holmview Station
  - Beenleigh Station
  - Kingston Road, Kingston
  - Loganlea Road, Loganlea
  - Bethania (except for St Jude's Bethania Gardens, near Federation Drive)
- As a result of the proposed action, diffuse glider movement is unlikely to be maintained within the Impact area
- As a result of the proposed action, the following areas show potential impedance (restrictions) to glider movement within the Impact area:
  - Kuraby State School
  - Acacia Forest Park
  - Anzac Park
  - Gould Adams Park/Nealdon Park
  - Edens Landing Station
  - Trinity College – Beenleigh
- As a result of the proposed action and proposed fauna connectivity infrastructure, the following areas are unlikely to show significant changes to glider movement from existing conditions to proposed future conditions (i.e. with the proposed action in place):
  - Woodridge
  - Logan Central
  - Bethania
  - Holmview Road Reserve, near Holmview Station
  - Beenleigh Station
- Areas identified during landscape connectivity modelling show potential impedance to koala and glider movement are proposed to be mitigated with proposed fauna connectivity infrastructure to be considered as part of Detailed Design for the proposed action. Further details are provided as part of pre-construction (design) management measures (Section 6.2 of this report).

Mitigation Measures

A range of mitigation measures has been applied to reduce impacts on vegetation communities, flora and fauna species and are outlined in the Overarching Environmental Mitigation Plan (OEMP).

Despite proposed avoidance and mitigation measures, significant impacts are expected to occur to koala, south-eastern glossy black cockatoo, grey-headed flying fox, regent honeyeater and swift parrot.

To address the proposed action's offset requirements, Offset Area Management Plans (OAMPs) have been developed to outline TMR's approach for offsets that will be delivered to counterbalance the significant impacts from the proposed action and demonstrate compliance under the EPBC Act and EPBC Act Environmental Offsets Policy. TMR will continue to progress offset requirements with consideration of conservation outcomes throughout the design and procurement phase.

1.0 Introduction

The Queensland Department of Transport and Main Roads (TMR) is proposing to duplicate the existing rail corridor between Kuraby and Beenleigh Station from two to four tracks, including associated station and rail system upgrades, to support growing population and rail patronage demand between Brisbane, Logan and the Gold Coast. The 'Logan and Gold Coast Faster Rail Project is herein referred to as the 'proposed action'.

This report supports the Preliminary Documentation (PD) submission for assessment of proposed action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The report provides an assessment of the proposed action's potential impact on Matters of National Environmental Significance (MNES), and further information requested by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW).

1.1 Summary of the proposed action

1.1.1 Purpose of the proposed action

The Gold Coast rail line connects Gold Coast City and Logan City with the Brisbane Central Business District (CBD) and Brisbane Airport. The rail line is subject to strong growth in passenger demand, driven by population growth in the Brisbane to Gold Coast corridor. The existing environment is highly modified by existing rail operations and highly constrained by urban development.

The Kuraby to Beenleigh section currently operates express and all-stops services on the Beenleigh and Gold Coast rail line over approximately 18.7 kilometres (km) of double track railway between Kuraby Station in the north and Beenleigh Station in the south. During peak periods, express services from the Gold Coast to Brisbane must share a single track with all-stops trains between Kuraby and Beenleigh, while contra-peak services use the other track creating a bottleneck and inhibiting capacity from the Gold Coast.

To support growing population and rail patronage demand between Brisbane, Logan and the Gold Coast, the number of Beenleigh and Gold Coast train services will need to double over the next 20 years. The rail line between Kuraby and Beenleigh is a key capacity bottleneck on the rail corridor. The Queensland Government, together with the Australian Government, has committed towards increasing the number of tracks between Kuraby and Beenleigh from two to four tracks, with modernised rail systems, station upgrades and level crossing removals. Additional tracks will require a wider rail corridor and track straightening in some areas.

The proposed action remains a high priority for the Queensland Government to improve rail services between some of south-east Queensland's fastest growing cities and deliver integrated transport outcomes for local communities. It is also a significant and key infrastructure investment in readiness for the Brisbane 2032 Olympic and Paralympic Games.

1.1.2 Description of the proposed action

The State of Queensland, represented by the Department of Transport and Main Roads in Queensland (TMR), is proposing to duplicate the existing rail corridor between Kuraby and Beenleigh Stations from two to four tracks, including associated station and rail system upgrades (the proposed action).

The proposed action will increase the number of tracks between Kuraby and Beenleigh from two to four, with modernised rail systems. This requires widening of the existing rail corridor to accommodate new and supporting infrastructure such as overhead lines, as well as upgraded train stations and road network improvements.

The proposed action is limited to construction only, with the Delivery phase of the proposed action expected to occur from 2025 to 2030. The assessment provided in the PD relates to construction impacts of the proposed action, giving consideration to the impacts facilitated by the operation of the railway upon completion of the proposed action.

Key features of the proposed action include:

- Duplication of 18.7 km of rail corridor and upgrades to associated rail systems between Kuraby and Beenleigh Stations resulting in an increase from two tracks to four tracks.

- Eight station upgrades including a station relocation (Trinder Park Station) to improve accessibility, safety and amenity, including platform straightening, new pedestrian bridges with lifts and improve bus stop, park 'n' ride and kiss 'n' ride facilities.
- Removal of existing rail level crossings at Trinder Park (Railway Parade), Holmview (Spanns Road) and Beenleigh (Holmview Road).
- Adjacent local road network alterations associated with the railway duplication.
- Dedicated active transport along the corridor.
- Extension of the cattle siding at Holmview Station.
- Dedicated rail maintenance access road adjacent to the rail corridor.

1.1.3 Proposed action activities

The proposed construction activities, including temporary construction compounds and laydown areas, are confined to the Impact area (Figure 1) and include:

- Site preparation works, including clearing and grubbing, earthworks, and establishment of temporary construction compounds and laydowns
- Public Utility Plant (PUP) relocation work
- Construction of new tracks, including bridges and associated drainage works
- Roadworks (including minor road realignments resulting from track widening); and
- Station rebuilds (including upgrade and relocation of stations).

1.2 Report Structure

To provide an assessment of potential impacts on MNES, this report has been structured to provide additional information to supplement the information provided in the proposed action's EPBC Act referral on 17 December 2022. A summary of this report structure and content is provided in Table 1.

Table 1 Report structure

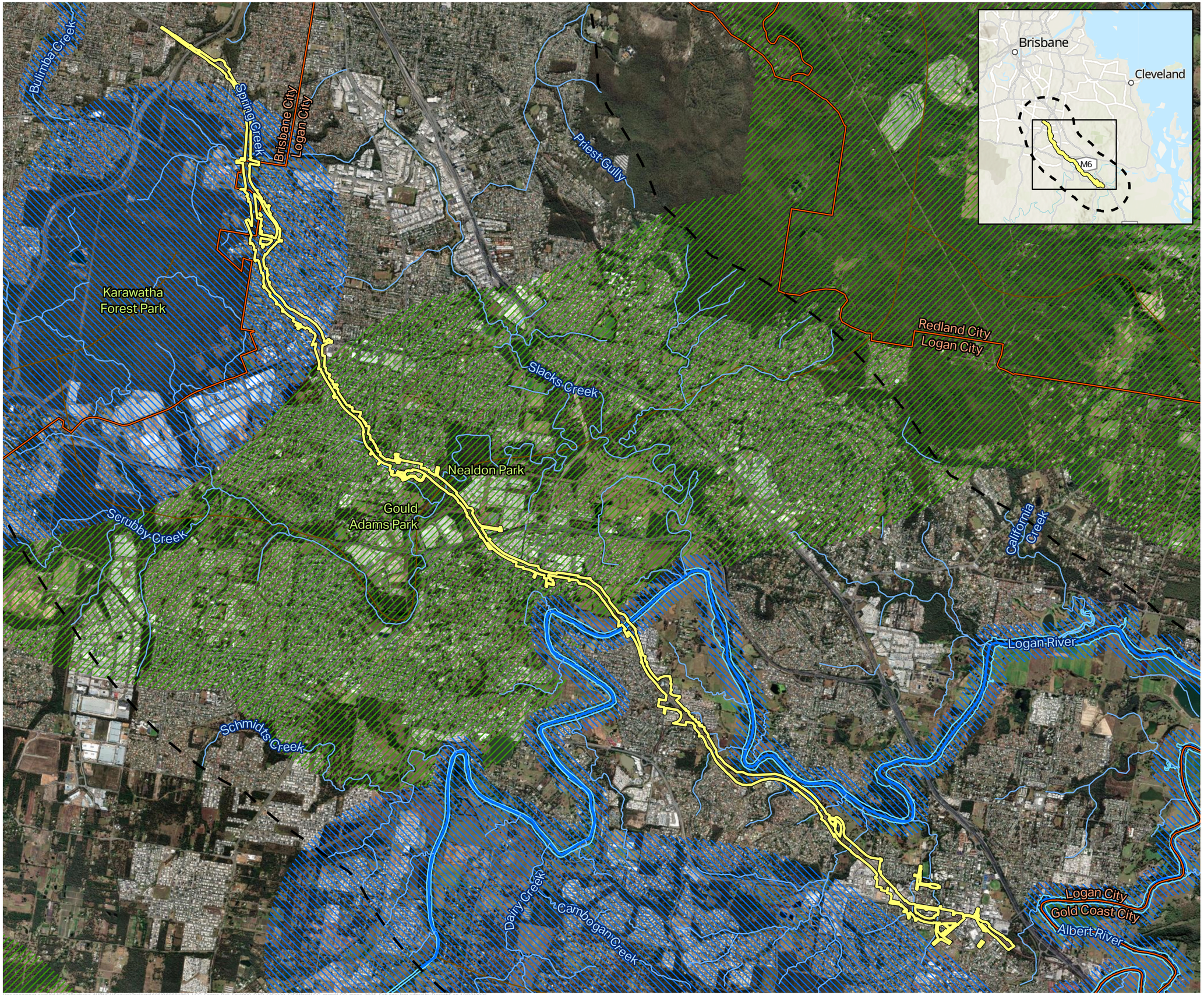
Section	Description
Section 1.0	Details the proposed action, including the scope of works, background and proposed activities.
Section 2.0	Describes the methodology and approach taken to the assessment of potential impacts to MNES. Summarises the legislative context, including Commonwealth and State matters considered in the assessment.
Section 3.0	Describes ecological values of the study area.
Section 4.0	Describes the likelihood of occurrence of MNES.
Section 5.0	Presents the assessment of direct and indirect impacts of the proposed action.
Section 6.0	Details the project-specific mitigation measures proposed to avoid and reduce potential impacts on MNES as a result of the proposed action.
Section 7.0	MNES risk assessment, summary of significant impact assessment results and offset requirements
Section 8.0	Conclusions
Section 9.0	Lists the references considered in the assessment.

1.3 Terminology

The terminology provided in Table 2 is used throughout this document to describe the proposed action:

Table 2 Terminology used throughout this document.

Desktop search	Purpose
Proposed action	The duplication of the existing rail corridor between Kuraby and Beenleigh Station from two to four tracks, including associated station and rail system upgrades (see Section 1.1).
Impact area	Area where direct impacts will occur which includes vegetation clearing to facilitate the proposed action (Figure 1). The impact area covers an area of 194.45 ha and encompasses a matrix of native and non-native vegetation in various conditions, including urban and peri-urban areas, supporting diverse land uses such as residential, rural residential and commercial precincts. The proposed action is intersected by the Logan River along with a number of other named and unnamed waterways, such as Scrubby Creek. Targeted field surveys were undertaken within and adjacent to the Impact area.
Buffer zones	Areas located outside the Impact area used to assess potential indirect impacts for relevant MNES (that is, grey-headed flying-fox, greater glider, yellow-bellied glider and Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions Threatened Ecological Community), and where TMR commits to monitoring, mitigation and management measures throughout the construction of the proposed action.
Indirect impact area	Areas where indirect impacts have the potential to occur for relevant MNES, and will be included in offset acquittal.
Study area	A 5 km buffer around the approximate centre point of the Impact area as shown in Figure 1. The study area represents the extent of the desktop searches. The study area traverses both the Logan City and Brisbane City Local Government Areas (LGA) (Figure 1)
Conservation significant species and communities	Species listed as critically endangered, endangered, vulnerable or migratory under the EPBC Act.
Introduced flora	Introduced flora species listed as Weed of National Significance (WoNS) under the EPBC Act or listed as prohibited or restricted matter under the Queensland *Biosecurity Act 2014.*
Introduced fauna	Introduced fauna species listed as feral animals under the EPBC Act or listed as prohibited or restricted under the *Biosecurity Act 2014.*



AECOM

N

0 2,000 m

- Study area
- Impact area
- Watercourse (major)
- Watercourse (minor)
- LGA boundaries

Mapped biodiversity corridor

- Riparian centrelines
- Terrestrial centrelines
- Regional
- State

Figure 1 Proposed action Impact area

Project: Logan and Gold Coast Faster Rail
Report: Preliminary Documentation - Supplementary MNES Report
Client: Department of Transport and Main Roads
Project Number: 60681907
Date: 12/02/2025

2.0 Assessment method

2.1 Aims and objectives

The aim of this Supplementary MNES Report (this report) is to address DCCEEW's decision notice and request for information (RFI) received on 4 May 2023, incorporating extensive baseline data to describe habitat, inform impact assessment and demonstrate effective avoidance, minimisation, mitigation, management and monitoring. Compared to the December 2022 referral, results within this report integrates new information based on the revised Impact area (Section 6.1), increased targeted field survey program (Section 2.5), and refined vegetation and habitat mapping (Appendix B and Appendix D).

To achieve this aim, the scope of the assessment includes:

- A desktop assessment to characterise and identify potential flora and fauna species and their habitat that may be present in the study area
- Ecological field assessments to:
    - document condition, extent and value of vegetation communities, habitat types and other ecological values within the Impact area
    - target potentially occurring Threatened Ecological Communities (TECs), flora and fauna listed under the EPBC Act
    - identify habitat resources for known and potentially occurring threatened flora and fauna species
- Likelihood of occurrence assessment to confirm known, likely or potentially present MNES within the Impact area
- Describe potential impacts of the proposed action on ecological values and agreed mitigation measures to avoid or mitigate adverse impacts of the proposed action
- An assessment to determine whether the proposed action is likely to have a significant impact on any MNES protected by the EPBC Act in accordance with the EPBC Act Policy Statement 1.1 '*Significant Impact Guidelines: Matters of National Environmental Significance*' (Department of the Environment, 2013)
- Identify potential offsets required under the EPBC Act.

Mitigation measures for the proposed action are provided according to the hierarchy of mitigation, which is (in order of preference) to: avoid, minimise, mitigate, remediate and offset potential impacts to MNES. Based on the outcomes of the assessment, avoidance, mitigation and management measures are proposed to reduce impacts to MNES as a result of the proposed action. An Overarching Environmental Mitigation Plan (OEMP) provided as part of the PD submission outlines consolidated mitigations for all known or potentially occurring conservation significant species and communities. The intent of the OEMP is to take place of post-approval management plans and provide consolidated mitigations for all relevant staff and contractors during further stages of the proposed action.

2.2 Desktop assessment

A desktop assessment was undertaken to characterise and identify ecological values that may be supported in the study area. The desktop assessment included a review of literature, and searches of publicly available datasets and online mapping. Desktop searches were initially undertaken in February 2021 and were repeated in December 2022, September 2023 and January 2024 to account for changes in the listing status of threatened species and TECs. In accordance with Section 158A of the EPBC Act, MNES will be assessed in accordance with their EPBC Act status at the time of the controlled action decision (i.e. 11 April 2023).

The following information sources were reviewed as part of this assessment:

- The **Protected Matters Search Tool (PMST)** (administered by the Department of Climate Change, Energy, the Environment and Water (DCCEEW)) completed on January 2024 and March

2024 was used to identify MNES within 5 km of the Impact area (i.e. study area) (DCCEEW, 2023) (see Appendix A for PMST extract)

- The **Wildlife Online database** (administered by the Queensland Department of Environment, Science and Innovation (DESI) was used to identify flora and fauna species records within the study area (DESI, 2020)
- The **Atlas of Living Australia (ALA)** database (hosted by the Commonwealth Scientific and Industrial Research Organisation (CSIRO)) to identify locations of previously recorded threatened flora and fauna records within the study area (Australian Government, 2023)
- **DCCEEW's National Flying fox Monitoring Viewer** (administered by DCCEEW) to identify known flying fox camps within the study area (DCCEEW,2023)
- DESI certified **Biodiversity Planning Assessment (BPA)** mapping to identify significant wildlife corridors and areas of state, regional and local biodiversity significance
- **Directory of Important Wetlands in Australia (DIWA)** (administered by DCCEEW) to identify information on Australia's important wetlands within the study area (DCCEW, 2005)
- The **Queensland Spatial Catalogue (Qspatial)** (administered by the Queensland Government (2022) was reviewed to inform vegetation and habitat type assessment for potential MNES within the study area, including:
    - **Matters of state environmental significance – Regulated vegetation – essential habitat** (DESI, published 22 November 2023) to determine if vegetation has been identified as essential habitat for a conservation significant species of wildlife listed under the provisions of the *Nature Conservation Act 1992* (NC Act)
    - **South East Queensland Koala Conservation Strategy 2020-2025** (DESI, published 22 November 2023) to identify core koala habitat areas and priority koala areas
    - **Matters of state environmental significance – High ecological significance wetlands** (DESI, published 6 July 2023) to identify High ecological significance (HES) wetlands within the study area that meet this classification under the State Planning Policy (SPP) (2017)
    - **Wetland mapping** and classification to identify non-regulatory wetlands, as defined under the VM Act (DESI, 2020).
    - **Vegetation management regulated vegetation management map – version 7.00** (DESI, published 22 November 2023) and **Vegetation management regional ecosystem (RE) map – version 12.02 (**DESI, published July 2023) to determine the nature and extent of vegetation (DoR, 2023)
    - **Watercourse identification map – watercourses** (Department of Regional Development, Manufacturing and Water, published 1 November 2023) to identify watercourses, as defined under the Department of Natural Resources, Mines and Energy (DNRME)
    - **Queensland waterways for waterway barrier works** (Department of Agriculture and Fisheries, 2016) to determine the waterways with a risk of impact to fish passage from waterway barrier works (regulated under the *Fisheries Act 1994*), as defined by the Queensland Department of Agriculture and Fisheries (DAF) (DAF, 2020)
    - The **WildNet** database (administered by DESI) to identify flora and fauna species (DESI, 2023)
    - **Flora Survey Trigger Map for Clearing Protected Plants in Queensland – Version 10.0** (DESI, published 6 September 2023) to identify high-risk areas for protected plants (DESI, 2020)
    - **Historical aerial imagery** for the Logan area (Q Imagery, 2020)
    - **Matters of state environmental significance – Queensland series** (DESI, published 8 September 2021) to identify ecological values

- **Land use mapping - 1999 to 2017 – Queensland** (DESI, published 7 September 2023) to view recent land uses of Queensland, and
- **Regional geology 1978 - Moreton Region** (DESI, published 1 January 2014) to view regional geology datasets.

2.3 Relevant legislative and policy background

The following relevant environmental Commonwealth, State (Queensland) and local (Brisbane City Council and Logan City Council) environmental legislation (outlined in Section 2.3.1 to 2.3.3) and supporting guidance documents (outlined in Section 2.3.4) were reviewed and used to support assessments, discussions and conclusions within this report.

2.3.1 Commonwealth

2.3.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act identifies 'nationally significant' animals, plants, habitats and places as MNES to be protected. The Impact area intersects locations with potential to support habitat for MNES. To assess potential impacts of land use changes and new developments, a significant impact assessment informed by desktop and field investigations was undertaken against the EPBC Act significant impact guidelines, which indicates the proposed action is likely to have a significant impact on MNES.

The EPBC Act recognises Weeds of National Significance (WONS), which threaten natural landscapes, waterways and coastal areas by displacing native species, contributing to land degradation and reducing farm and forestry productivity. Threat abatement plans are considered to identify research, management, and other actions necessary to reduce the impact of a listed key threatening process on native species and ecological communities to assist the long-term survival of affected native species or ecological communities in the wild as outlined in the EPBC Act Environmental Offsets Policy (EPBC Offset Policy)

The EPBC Act Environmental Offsets Policy (Department of Sustainability Environment Water Population and Communities, 2012) outlines the approach for the use of environmental offsets under the EPBC Act.

Offsets compensate for the significant impacts of an action on the environment, after avoidance and mitigation measures are taken. The suitability of a proposed offset is considered as part of the decision to approve or not approve a proposed action under the EPBC Act. The EPBC Offset Policy provides guidance on how suitable offsets are determined.

2.3.2 State legislation

2.3.2.1 Planning Act 2016 (Planning Act)

The *Planning Act 2016* and associated Planning Regulation 2017 (Planning Reg) is Queensland's principal planning and development legislation. It provides a framework for integrated and coordinated assessment of development activities to ensure impacts are managed in a way that is sustainable.

The Planning Act and the Planning Reg regulate development[2] approvals and assessments within Queensland, including (but not limited to) those triggered under the Queensland *Vegetation Management Act 1999* and Queensland *Fisheries Act 1994*. According to the Planning Act and the Planning Reg, a development is either accepted development, prohibited development, exempt development or assessable development.

The Planning Act also administers the Nature Conservation (Koala) Conservation Plan 2017 (Koala Plan), and the Planning Reg regulates vegetation clearing within areas mapped as a Koala Priority Area[3] or Koala habitat[4].

[2] Carrying out building work; or plumbing or drainage work; or operational work; or reconfiguring a lot; or making a material change of use of premises (Schedule 2 Dictionary, Queensland *Planning Act 2016*).
[3] An area that has the highest likelihood of achieving conservation outcomes for koalas and is allocated to strategically focus long-term management and monitoring effort (Section 7a, Nature Conservation (Koala) Conservation Plan 2017*).*
[4] An area allocated to avoid impacts on koala habitat to ensure the long-term persistence of koala populations in the wild (Section 7b, Nature Conservation (Koala) Conservation Plan 2017*).*

2.3.2.2 Self-assessment Guideline Nature Conservation Assessment and management of potential impacts on koala habitat arising from state government supported infrastructure projects

The purpose of this guideline is to assist Government entities and consultants working on behalf of Government entities in understanding the intent of the self-assessable State Government Supported Infrastructure – Koala Conservation Policy (SI Policy). This guideline provides advice on how infrastructure development projects may self-assess and report on their compliance with the requirements of the SI Policy and policies and legislation related to the protection of koalas and their habitat.
The SI Policy seeks to ensure that the delivery of government-supported transport infrastructure development avoids, minimises, mitigates and offsets impacts to Koala Habitat Areas (KHA), particularly within Koala Priority Areas (KPA). The SI Policy (2023) replaces the SI Policy (2017) and DES/TMR Memorandum of Understanding for Koala Conservation (June 2010).

Public sector entities delivering State Government Supported Infrastructure (GSI) such as the proposed action are exempt from assessment against koala habitat protection provisions in the Planning Reg. To better align the requirements and self-assessment criteria applied to GSI in South East Queensland, the SI Policy was updated by the Department of Environment, Science and Innovation (DESI) in April 2023 as Action 1.4 of the *South East Queensland Koala Conservation Strategy 2020 – 2025,* with amendments made to the Koala Plan, Planning Reg and *Environmental Offsets Regulation 2014* as part of the *Nature Conservation and Other Legislation (Koala Protection) Amendment Regulation 2020*.

The SI Policy aims to determine the liability of a projects' such as this proposed action (including whether the project is actually liable) for Non-juvenile Koala Habitat Tree (NJKHT) offsets and which GSI offsets ratios would apply (2023).

2.3.2.3 Vegetation Management Act 1999 (VM Act)

The VM Act establishes a vegetation management framework for the clearing of regulated vegetation in a way that conserves remnant vegetation identified as a regional ecosystem (RE).

The proposed action is expected to impact mapped REs within a remnant and high value regrowth status, as well as other regulated vegetation such as vegetation within 100 m to a wetland. As State Government Supported Transport Infrastructure, the proposed action is exempt from requiring a development approval for clearing of regulated vegetation for the construction or maintenance of government supported transport infrastructure as provided under Schedule 21 of the *Planning Regulation 2017*.

In Queensland, EPBC Act listed TECs can be broadly defined based on the RE framework (in conjunction with other conditional criteria), with TECs often corresponding to one or many REs.

2.3.2.0 Nature Conservation Act 1992 (NC Act)

The purpose of the NC Act is to conserve biodiversity by creating and managing protected areas, managing and protecting native wildlife, and managing the spread of non-native wildlife. The Nature Conservation (Plants) Regulation 2020 and Nature Conservation (Animals) Regulation 2020 lists species that are classed as threatened in Qld. The following threatened species conservation classes are defined in the NC Act: Extinct; Extinct in the Wild; Critically Endangered; Endangered; Vulnerable and Near Threatened.

2.3.2.1 Fisheries Act 1994 (Fisheries Act)

The Fisheries Act and the *Fisheries Regulation 1995* govern both commercial and recreational fishing activities and provide for the management, use, development and protection of fisheries resources and fish habitats, and the management of aquaculture activities. The proposed action will intersect and traverse mapped fish passage waterways. Proposed bridge and culvert works will include structures with potential to meet criteria for permanent waterway barriers within fisheries waterways. Ecological investigations will identify where existing infrastructure is deficient, where new infrastructure is required and guide environmental design responses for infrastructure within areas where fish passage is required to support procurement of development approvals and/or compliance with Accepted Development Requirements for Waterway Barrier Works.

2.3.2.2 Biosecurity Act 2014 (Biosecurity Act)

The Biosecurity Act provides management measures to protect agricultural and tourism industries and the environment from pests, diseases and contaminants. The Biosecurity Act includes the General Biosecurity Obligation (GBO); which means everyone must take reasonable steps to prevent or minimise biosecurity risks. Invasive plants and animals are also categorised under the Biosecurity Act as either a 'Prohibited Matter' or a 'Restricted Matter'. Specific weeds, pests and pathogens that are potential threats to MNES will be managed in conjunction with the Biosecurity Act through the OEMP.

2.3.2.3 Environment Protection Act 1994 (EP Act)

The EP Act provides the key legislative framework for the protection of the environment in Queensland. Section 319 of the EP Act imposes a 'general environmental duty', which specifies that a person must not undertake any activity that may harm the environment without taking reasonable and practical measures to prevent or minimise the harm. Environmental Authorities are also administered under the EP Act. The proposed action will comply with the general environmental duty, particularly when undertaking activities with the potential to cause environmental harm.

2.3.2.4 Water Act 2000 (Water Act)

Under the Water Act, a water licence must be acquired if a proposed action does not meet the exemption requirements for constructing authorities for the take of water without a water entitlement in accordance with *OSW/2020/5467 Exemption requirements for constructing authorities for the take of water without a water entitlement OSW/2020/5467 Version 4.01*. If an exemption is relevant pre-work notification must be provided 10 business days before taking any water.

2.3.2.5 Queensland Environmental Offsets Framework (EO Act)

The environmental offsets framework in Queensland includes the EO Act, the *Environmental Offsets Regulation 2014* (EO Regulation) and the *Queensland Environmental Offsets Policy* (EO Policy). An environmental offset condition may be imposed under various conditions if the proposed action will or is likely to have a significant residual impact on a Matters of State Environmental Significance (MSES).

Provisions exist under the Offsets Act to avoid the duplication of offsets conditions between Commonwealth and Queensland requirements. Under these provisions:

- The Queensland Government cannot impose an offset condition for a prescribed environmental matter if the same and/or substantially the same impact and/or matter has been subject to assessment under the EPBC Act, regardless of whether an offset condition was imposed by the Commonwealth or not; and
- When considering whether to apply an offset condition, a Queensland Government agency must consider whether a relevant offset condition that has already been imposed is for a substantially the same impact and/or matter.

Acquired development approvals and associated conditions will be included in the construction contract documents and adopted by the Construction Contractor in their EMP(C).

2.3.3 Local legislation

TMR and its contractors are exempt from complying with local laws including the *Local Government Act 2009* (LG Act) and local Planning Schemes. This means TMR is not required to comply with the LG Act, or any local laws written by local governments (such as the local planning scheme or Brisbane City Council's *Natural Assets Local Law 2003*), in accordance with the *Acts Interpretation Act 1954.* The following sections outline the due diligence assessment process for the proposed action.

2.3.3.1 Logan Planning Scheme 2015 V9 (Logan Planning Scheme)

The Logan Planning Scheme assesses new development and guides how land in the Logan LGA is used and developed over the next 20 years. The Logan City Council SC6.2.3 *Planning Scheme Policy 3– Environmental management*, found in the Planning Scheme Policy Index of the Logan Planning Scheme, outlines information requirements for the preparation and submission of ecological assessments reports as well as environmental offset standards for Matters of Local Environmental Significance.

2.3.3.2 Brisbane City Plan 2014 (Brisbane City Plan)

The Brisbane City Plan is used to assess new development and guide how land in Brisbane is used and developed over the next 20 years. The Brisbane City Council SC6.3 Biodiversity Areas Planning Scheme Policy, found in the Planning Scheme Policy Index of the Brisbane City Plan, outlines conditions for ecological assessments and ecological assessment reports, tree survey plans or vegetation management plans, outcomes for the Biodiversity areas overlay code, Wetlands overlay code and the Subdivision code and outcomes for the protection, management and restoration of a network of biodiversity areas as depicted in the Biodiversity areas overlay map.

2.3.4 Supporting guidance documents

Assessments, discussions and conclusions for EPBC Act conservation significant flora, fauna and communities within this report have been based on the best available information, including the following relevant conservation advices, recovery plans, threat abatement plans, and other guidance documents:

- Birdlife Australia (2024), *Birdlife Data Zone.*
- Conservation Advice for *Anthochaera phrygia* (regent honeyeater) (Department of the Environment, 2015)
- Conservation Advice for *Calyptorhynchus lathami lathami* (south-eastern glossy black-Cockatoo) (Department of Climate Change Energy the Environment and Water, 2022)
- Conservation Advice for *Dasyurus maculatus maculatus* (southeastern mainland population) (Spotted-tailed Quoll) (Department of Climate Change Energy the Environment and Water, 2023)
- Conservation Advice for *Gossia gonoclada* (angle-stemmed myrtle) (Threatened Species Scientific Committee, 2016)
- Conservation Advice for *Lathamus discolor* (swift parrot) (Threatened Species Scientific Committee, 2016)
- Conservation Advice for *Macadamia integrifolia* (macadamia nut) (Department of the Environment Water Heritage and the Arts, 2008)
- Conservation Advice for *Petauroides volans* (greater glider (southern and central)) Department of Climate Change Energy the Environment and Water, 2022)
- Conservation Advice for *Petaurus australis australis* (yellow-bellied glider (south-eastern)) (Department of Agriculture, Water and the Environment, 2022)
- Conservation Advice for *Phascolarctos cinereus* (koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (Department of Agriculture Water and the Environment, 2022)
- Conservation Advice for *Gallinago hardwickii* (Latham's snipe) (Department of Climate Change Energy the Environment and Water, 2024)
- Conservation Advice for the Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions (Department of Climate Change Energy the Environment and Water, 2022)
- EPBC Act Policy Statement 3.21: *Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (Department of the Environment and Energy, 2017)
- EPBC Act referral guideline for management actions in Grey-headed and Spectacled flying fox camps (Department of the Environment, 2015)
- EPBC Act referral guideline for the endangered koala (Department of Climate Change Energy the Environment and Water, 2023)
- Fauna Sensitive Transport Infrastructure Delivery Manual Volume 2 (Department of Transport and Main Roads, 2024)

- National light pollution guidelines for wildlife (Department of Climate Change Energy the Environment and Water, 2023)
- National recovery plan for the grey-headed flying fox (Department of Agriculture, Water and Environment, 2021)
- National Recovery Plan for the angle-stemmed Myrtle (*Austromyrtus gonoclada*) (Austromyrtus gonoclada Recovery Team, 2001)
- National recovery plan for the grey-headed flying fox (Department of Agriculture, Water and Environment, 2021)
- National Recovery Plan for the koala (*Phascolarctos cinereus)* (combined populations of Queensland, New South Wales and the Australian Capital Territory) (Department of Agriculture Water and the Environment, 2022)
- National Recovery Plan for the regent honeyeater (*Anthochaera phrygia*) (Department of the Environment, 2016)
- National Recovery Plan for the swift parrot (*Lathamus discolor*) (Department of Climate Change, Energy, the Environment and Water, 2024)
- Queensland Government, South East Queensland—selected regional ecosystems (Queensland Government, 2024)
- *Referral guideline for 14 birds listed as migratory species under the EPBC Act* (Department of the Environment, 2015)
- Threat abatement plan for predation by feral cats (The Commonwealth of Australia, 2015)
- Threat abatement plan for predation by the European red fox (Department of the Environment Water Heritage and the Arts, 2008)
- TMR Koala-sensitive Design Guideline (Department of Environment and Science, 2019)
- Youngentob, Marsh and Skewes (2021), A review of koala habitat and assessment criteria and methods.

2.4 Previous ecological assessments

After the Business Case phase of the proposed action in 2020/2021, two ecological studies were undertaken broadly across areas within and adjacent to the Impact area. These studies were reviewed to gain an understanding of the ecological values across the area as well as the methods utilised to determine possible presence of the conservation significant fauna and flora values. The methods and key findings from each study are summarised below.

To note, design refinements have occurred for the proposed action since targeted ecological assessments were undertaken for the Detailed Business Case in 2021.

2.4.1 Gold Coast Line (Kuraby to Beenleigh) Capacity Improvement Project– Business Case, Ecology Assessment Report (GHD, 2021)

The report aimed to identify and describe the existing terrestrial ecology values of the proposed action. Due to access restrictions, targeted surveys were limited to publicly accessible locations only (Table 3).

Table 3 Summary of GHD Ecology Assessment Report (2021)

Aspect	Information
Dates	Field surveys were completed over three days in February 2021.
Assessment Area	“Project Area, Study Corridor and Subsequent study area” as per the Project’s spatial data from 6 May 2021 (defined as areas not previously assessed in the *Review of Environmental Factors* (REF) by GHD Aurecon, 2021), where: • Project Area = The Project Area includes the future railway corridor (that is, to be directly impacted by rail infrastructure) required to accommodate assets comprising PE 1

Aspect	Information
	(Preliminary evaluation: Option 1 as referred to in WSP 2019a), not including additional land needed to facilitate construction. This comprises a width of 20 m either side of the existing rail corridor centre line. • Study Corridor = The Study corridor is defined by the centre line of the existing rail corridor together with a 100 m buffer either side (200 m wide in total) between Ch 21,350 m and Ch 41,300 m together with an isolated 1,150 m^2 of land at Coopers Plains. The Study corridor referenced throughout this document aligns with the Study corridor defined during the PE phase within the Environmental Scoping Report (ESR) (WSP, 2019a). • Subsequent study area = Environmental investigations completed by WSP in 2019 as part of the REF were limited by land access restrictions. In order to further understand the ecological values of the Study corridor, subsequent ecological investigations have been undertaken in 2021 by GHD. These ecological investigations have been undertaken across areas not previously assessed and are located within the Study corridor.
Inclusions	• TEC assessment • RE verification • Targeted and opportunistic flora surveys • Habitat assessment surveys undertaken at 53 sites • Targeted searches for conservation significant species • Spot Assessment Technique (SAT) searches undertaken at 6 sites • Fixed point bird census surveys conducted across 6 sites • Active searches for reptiles and frogs within suitable habitat, targeting tusked frog *(Adelotus brevis*) and wallum froglet *(Crinia tinnula),* and • Opportunistic searches for wildlife and traces.
Findings	• Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and Southeast Queensland TEC considered to have high potential of occurrence. However, assessment confirmed vegetation communities did not meet the key characteristics or condition threshold • Three conservation significant species were confirmed present in the subsequent study area - Six (6) Macadamia nut (*Macadamia integrifolia*) individuals (vulnerable under the EPBC Act) which AECOM considers unlikely to be ‘in the wild’, since the plants are being actively managed as amenity vegetation and GHD’s habitat descriptions include that "the vegetation present within the Subsequent study areas does not meet the described habitats for this species with the community present described as open forest with some sections having a closed canopy” and “individuals were recorded as being regularly mown around with herbicide treatment to the ground layer directly surrounding the base”. These results have been considered within the risk assessment (Section 7.0) and Significant Impact Assessment (Appendix F) of this report - Scrub turpentine (*Rhodamnia rubescens*), confirmed by GHD to ‘not be in the wild’ - Glossy black cockatoo (*Calyptorhynchus lathami*) (vulnerable under the EPBC Act) • Vegetation clearing works likely to result in a significant impact to koala *(Phascolarctos cinereus)* • Vegetation clearing works has the potential to result in a significant impact to grey headed flying fox *(Pteropus poliocephalus)* and glossy black cockatoo (*Calyptorhynchus lathami)* • Seven conservation significant species were likely to occur within the subsequent study area

Aspect	Information
	- Slender milk vine *(Marsdenia coronata)*, Vulnerable under the NC Act - Swamp tea-tree *(Melaleuca irbyana*), Endangered under the NC Act - Angle stemmed myrtle *(Gossia gonoclada*), Vulnerable under the NC Act - A forb (*Coleus habrophyllus),* Endangered under the EPBC Act and NC Act - Koala *(Phascolarctos cinereus),* Endangered under the EPBC Act and NC Act - Grey-headed flying fox *(Pteropus poliocephalus*), Vulnerable under the EPBC Act - Wallum froglet *(Crinia tinnula),* Vulnerable under the NC Act

2.4.2 Logan and Gold Coast Faster Rail Project – Supplementary Ecological Assessment (Ausecology, 2022)

Terrestrial field surveys were undertaken for the proposed action to investigate the presence of, and potential impacts on relevant MNES, MSES and Matters of Local Environmental Significance (MLES). Due to access restrictions, targeted surveys were limited to publicly accessible locations and State-owned land (Table 4).

Table 4 Summary of Ausecology Assessment Report (2022)

Aspect	Information
Dates	Field surveys were undertaken between the 13 July 2022 and 8 August 2022.
Assessment Area	"Project Area" as per the Project's spatial data from 29 November 2022 (defined as areas not previously assessed in the Business Case, Ecology Assessment Report by GHD (2021)), where: • Project Area = Area to be directly impacted by rail infrastructure with no buffer.
Inclusions	• TEC assessment • RE verification • Habitat assessment surveys undertaken at 20 sites • Nocturnal fauna spotlighting surveys undertaken over four nights employing a random meander transect approach. Surveys focused on 'high-risk' habitat areas targeting koala (*Phascolarctos cinereus)*, greater glider *(Petauroides volans),* powerful owl *(Ninox strenua),* grey-headed flying fox *(Pteropus poliocephalus)* and yellow-bellied glider (south-eastern) *(Petaurus australis australis)* • Opportunistic searches for threatened flora and fauna species.
Findings	• Lowland Rainforest of Subtropical Australia TEC had the potential of occurring in the Impact area. However, assessment confirmed vegetation communities did not meet the key characteristics or condition threshold • Grey-headed flying fox *(Pteropus poliocephalus)* listed as Vulnerable under the EPBC Act was observed during field surveys • No koala *(Phascolarctos cinereus)* or Greater glider (southern and central) *(Petauroides Volans)* were observed during field surveys, however habitat was confirmed present for these species. • Three flying fox roosts were identified during field surveys, two of which occur within 1m of the Project Area. Further assessments of roosts (i.e. in breeding season) were recommended to determine legislation status

Aspect	Information
	• Suitable habitat was confirmed as present for MSES tusked frog *(Adelotus brevis).* Further targeted surveys recommended to determine the presence of MSES tusked frog or wallum froglet *(Crinia tinnula)* • The area is mapped under protected plant flora survey trigger mapping; therefore, a protected plant survey will be required once the design footprint is finalised, and within 12 months of anticipated clearing.

2.5 Field surveys

Compared to the December 2022 referral, results within this report integrates new information based on the revised Impact area (Section 6.1), increased targeted field survey program (Section 2.5), and refined vegetation and habitat mapping (Appendix B and Appendix D).

The targeted field surveys were completed across areas within and adjacent to the Impact area across thirty-seven (37) field survey events over the winter, summer and spring months of 2023 into 2024 (Table 5). Field survey weather conditions have been extracted from the Bureau of Meteorology (BOM), Logan Central (27.64 ºS, 153.11 ºE) weather station (No.040854) (BOM, 2023). The broad purpose of each field survey and weather conditions are detailed in Table 5, Table 8 and Table 9.

Table 5 Field surveys undertaken for the proposed action

Field survey	Survey length (days)	Monthly Total Rainfall (mm)	Monthly Mean Temperature (°C)	
			Min	Max
July 2023				
Mary River cod survey	3	18.6	9.2	22.6
Woodland bird survey (for regent honeyeater, swift parrot, and glossy black cockatoo)	1			
August 2023				
BioCondition and habitat quality assessments (remnant and non-remnant)	18	21.1	10.5	24.6
Woodland bird survey (for regent honeyeater, swift parrot, and glossy black cockatoo)	5			
Fauna spotlighting (for koala, spotted-tailed quoll, greater glider (southern and central), yellow-bellied glider and Long-nosed potoroo)	2			
September 2023				
BioCondition and habitat quality assessments (remnant and non-remnant)	2	31.7	12.0	26.0
Woodland bird survey (for regent honeyeater, swift parrot, and glossy black cockatoo)	7			
Fauna spotlighting (for koala, spotted-tailed quoll, greater glider (southern and central), yellow-bellied glider and long-nosed potoroo)	2			
Targeted flora survey (for Plunkett mallee and swamp tea tree)	2			
October 2023				
Targeted flora survey (for native guava, *coleus habrophyllus,* scrub turpentine, shiny-leaved condoo, and angle-stemmed myrtle)	4	13.5	15.2	27.6
Targeted flora survey (for Plunkett mallee and swamp tea-tree)	2			
Frog and tadpole surveys (for tusked frog and wallum froglet)	3			
Shorebird surveys (greater sand-plover, lesser sand-plover and bar-tailed godwit)	2			
Long-nosed potoroo indicator survey	1			
Fauna spotlighting (for koala, spotted-tailed quoll, greater glider (southern and central), yellow-bellied glider and long-nosed potoroo)	3			
Woodland bird survey (for painted honeyeater)	2			
BioCondition and habitat quality assessments (remnant and non-remnant)	8			
Wetland bird survey (Australasian bittern, Australian painted snipe, Latham's snipe)	1			
Targeted marine flora survey (for Coastal Swamp Oak and Coastal Swamp Sclerophyll Forest)	4			
Infrared thermal drone survey (for koala and flying fox)	3			
November 2023				
BioCondition and habitat quality assessments (remnant and non-remnant)	6	84.0	16.7	28.7
Woodland bird survey (for painted honeyeater)	2			
Wetland bird survey (Australasian bittern, Australian painted snipe, Latham's snipe)	3			

Field survey	Survey length (days)	Monthly Total Rainfall (mm)	Monthly Mean Temperature (°C)	
			Min	Max
Targeted marine flora survey (for Coastal Swamp Oak and Coastal Swamp Sclerophyll Forest)	1			
BioCondition and Habitat Quality (corridor survey)	3			
Targeted flying fox surveys	1			
Frog and tadpole surveys (for tusked frog and wallum froglet)	4			
Fauna camera and AudioMoth deployment	2			
December 2023				
Targeted flora (for tall knotweed, three-leaved Bosistoa, hairy joint grass, macadamia nut, slender milk vine, quassia, and austral toadflax)	6	85.0	19.4	31.7
Fauna spotlighting (for koala, spotted-tailed quoll, greater glider (southern and central), yellow-bellied glider and long-nosed potoroo)				
Targeted flying fox surveys	2			
BioCondition and habitat quality assessments (remnant and non-remnant)				
Frog and tadpole surveys (for tusked frog and wallum froglet)	3			
Wetland bird survey (Australasian bittern, Australian painted snipe, Latham's snipe)	2			
January 2024				
Lungfish survey	1	130.0	21.4	32.0
Targeted flying fox surveys	1			
BioCondition and habitat quality assessments (remnant and non-remnant)	1			
August 2024				
Habitat Quality, and Targeted flora surveys for Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	5	41.9	9.7	22.9

The methods employed during the above field surveys are discussed in Section 2.5.1 and Section 2.5.2.

2.5.1 Flora methods

2.5.1.1 Vegetation community assessment

The extent, classification and condition of ground truthed vegetation communities across areas within and adjacent to the Impact area was validated in accordance with the *Methodology for Surveying and Mapping Regional Ecosystem and Vegetation Communities in Queensland* (Neldner *et al.*, 2022). Vegetation supporting MNES habitat, and which occurs adjacent and outside the Impact area was assessed as part of the targeted field survey program for the proposed action (Appendix B Figure 2).

This included traversing the Impact area undertaking tertiary and quaternary level assessments. As per the Queensland Herbarium methodology (Neldner *et al.*, 2022) tertiary level site assessments were undertaken within a 10 m by 50 m quadrat, collecting the following information:

- Vegetation structure, species composition and percentage cover for each structural layer
- Aspect and slope
- Soil type
- Landform
- Disturbance type and severity
- RE and remnant status.

Quaternary-level sites were utilised to verify vegetation units and confirm dominant characteristic species. Structural analysis included recording the height class and life form of the dominant species within the mid and canopy strata as per (Neldner et al., 2022).

RE classification was determined based on the vegetation, soil and landform characteristics identified in the field, geological mapping for the region and the Regional Ecosystem description Database (REDD) (Queensland Herbarium, 2023). Condition status for woody vegetation was evaluated utilising the definitions of remnant vegetation under the VM Act.

For the purposes of this assessment, vegetation was mapped into three categories:

- Remnant: woody vegetation that has not been cleared or vegetation that has been cleared but where the dominant canopy has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy
- High-value regrowth (HVR): areas previously cleared or disturbed (e.g. by wildfire) over 15 years ago and containing woody vegetation floristically and structurally consistent with the RE but typically less than 70% of the height and less than 50% density of the RE.
- Regrowth or non-remnant: areas previously cleared or otherwise significantly disturbed.
- Across the field surveys a total of 188 tertiary and quaternary sites were assessed within the Impact area and components of the study are, as shown in Appendix B Figure 2.

2.5.1.2 BioCondition assessments

The BioCondition assessment framework was employed to assess vegetation condition and biodiversity value within areas within and adjacent to the Impact area. Remnant and high value regrowth vegetation was assessed in accordance with Queensland Government's '*BioCondition A Condition Assessment Framework for Terrestrial Biodiversity in Queensland Assessment Manual version 2.2*' (Eyre *et al.*, 2015). Non-remnant vegetation was assessed using a modified BioCondition to capture habitat value. Both methods are described in the following sections.

BioCondition is a vegetation condition assessment framework that provides a measure of the capacity of a terrestrial ecosystem to maintain biodiversity values (Eyre *et al.*, 2015) It is a site-based, quantitative and repeatable procedure that provides a numeric score to reflect functional, through to dysfunctional, vegetation condition states for biodiversity. The framework is underpinned by three key components:

- A suite of assessable vegetation attributes, such as canopy cover
- A clear definition of the reference state from which the benchmarks for the assessable attributes are set
- A scoring system that provides a condition metric that is comparable between and within ecosystems over space and time.

Assessment of landscape-level condition attributes relative to that site are calculated remotely in GIS and can also be included in the BioCondition score.

BioCondition benchmarks provide an objective comparison of vegetation condition states within and between regional ecosystems, which are derived from field data collected from reference or best-on-offer sites in the landscape during optimal seasonal conditions, as far as practicable. Benchmarks have been developed by the Queensland Herbarium and are available for select regional ecosystems. Where benchmarks are currently not available, a method for deriving benchmarks using reference sites is available (Eyre, Kelly and Neldner, 2017).

2.5.1.3 BioCondition assessments for remnant and high value regrowth vegetation

BioCondition assessments were undertaken to measure vegetation condition and biodiversity value in ground truthed remnant and high value regrowth vegetation, in accordance with Queensland Government's '*BioCondition A Condition Assessment Framework for Terrestrial Biodiversity in Queensland Assessment Manual version 2.2*' (Eyre et al., 2015). Within each BioCondition assessment site, habitat quality assessments for MNES that are listed threatened species were also undertaken to support offset requirements for the proposed action (refer to Section 2.5.2.1). BioCondition assessments were undertaken across a total of 59 sites across areas within and adjacent to the Impact area (Appendix B Figure 2).

Attributes collected at each BioCondition assessment plot and their relative weightings that contribute to the overall BioCondition scores are outlined below in Table 6.

Table 6 BioCondition attributes and weighting for deriving the final BioCondition score

Survey extent	Vegetation attributes	Weighting (%)
100 x 50 m plot	• Large trees (Eucalypts and non-Eucalypts) • Tree canopy height • Recruitment of dominant canopy species	15 5 5
100 m plot transect	• Tree canopy cover (%) • Shrub canopy cover (%)	5 5
50 x 20 m plot	• Coarse woody debris (m)	5
50 x 10 m plot	• Native tree, shrub, grass and forb species richness • Non-native plant cover (%)	20 10
1 x 1 m quadrats	• Native perennial grass (%) • Organic litter cover (%)	5 5
Landscape scale attributes (fragmented landscapes)	• Size of patch • Connectivity • Context	10 5 5

2.5.1.4 Modified BioCondition assessments for non-remnant vegetation

Modified BioCondition assessments to rapidly measure vegetation condition and biodiversity value were undertaken in ground truthed non-remnant vegetation where habitat values were present, with reference to the *BioCondition A Condition Assessment Framework for Terrestrial Biodiversity in Queensland Assessment Manual version 2.2* (Eyre *et al.*, 2015). At each BioCondition site, the assessment 'plot' consisted of the area containing habitat values within the Impact area (e.g. 0.2 ha or entire Lot 14 on RP136016). Modified BioCondition assessments were undertaken across a total of 291 sites across areas within and adjacent to the Impact area (Appendix B Figure 2). Within each modified BioCondition assessment site, habitat quality assessments for MNES that are listed threatened species were also undertaken to support offset requirements for the proposed action (refer Section 2.5.2.1).

Attributes collected at each modified BioCondition assessment plot and their relative weightings that contribute to the overall BioCondition scores are outlined below in Table 7 below.

Table 7 Modified BioCondition attributes and weighting for deriving the final BioCondition score.

Survey extent	Vegetation attributes	Weighting (%)
	• Large trees (Eucalypts and non-Eucalypts) • Tree canopy height • Recruitment of dominant canopy species • Tree canopy cover (%) • Shrub canopy cover (%) • Coarse woody debris (m) • Native tree, shrub, grass and forb species richness • Non-native plant cover (%) • Native perennial grass (%) • Organic litter cover (%)	15 5 5 5 5 5 20 10 5 5
Landscape scale attributes (fragmented landscapes)	• Size of patch • Connectivity • Context	10 5 5

2.5.1.5 Threatened ecological community assessments

In locations where indicator vegetation types (RE) were ground truthed for a TEC, BioCondition Assessment data was used to identify potential TEC presence and condition class using the key diagnostic characteristics and condition classes, categories and thresholds, as per each TEC's Approved Conservation Advice or Listing Advice as available on the Species Profile and Threats (SPRAT) database.

For areas containing indicator vegetation types for the Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions TEC, vegetation was assessed against the TEC's condition criteria, in accordance with the *Approved Conservation Advice for the Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions* (DCCEEW, 2022). Due to the size of identified TEC patches, representative plots (100 m x 50 m) were established and condition criteria assessed. Specific condition criteria assessed for the Subtropical floodplain eucalypt TEC included:

- Density of large native trees [> 45 cm diameter at breast height (DBH)] and very large native trees (> 60 cm DBH) within the plot (100 m x 50 m)
- Total native perennial cover (graminoids, forbs, grasses, shrubs, low trees, juvenile canopy species, resprouting or suckering of the lower portions of canopy trees, and cryptograms) within the plot (100 m x 50 m)
- Native groundcover species and species richness (grasses, forbs, ferns and sedges) within a 20 m x 20 m subplot at the centre of the larger plot
- Exotic cover and species
- Evidence of arboreal fauna (i.e. scratches, scat etc); and
- Patch size (ha) and contiguity.

Data collected at each plot was then averaged for the patch and condition classes assigned. Any vegetation communities failing to meet the associated diagnostic features and condition requirements for were excluded from the TEC.

2.5.1.6 Targeted threatened flora surveys

Targeted searches for threatened flora species identified in the desktop assessment were undertaken in areas of potentially suitable habitat confirmed during vegetation community assessments across areas within and adjacent to the Impact area. Targeted threatened flora surveys were undertaken in accordance with *Flora Survey Guidelines- Protected Plants, Nature Conservation Act 1992* which involved timed meander searches that included walking across areas within and adjacent to the Impact area, visiting the full range of potential habitats and searching for threatened flora species. Additionally, the Queensland flora survey trigger map was utilised in the desktop assessment to determine high-risk areas identified on the protected plant searches. A total of thirty-five (35) targeted threatened flora surveys totalling 144 person hours were undertaken across areas within and adjacent to the Impact area.

Targeted surveys followed recommended survey effort to coincide with optimal flowering and fruiting of species during the spring and summer months as described in Table 5 and sampling locations of targeted flora species are depicted in Appendix B Figure 2.

2.5.1.7 Specimen ID

Specimens of plant taxa that could not be identified in the field were collected, pressed and dried in accordance with the requirements of the Queensland Herbarium (Brown, 2021). Dried specimens were then identified through reference books and keys through comparison with known species.

2.5.1.8 Nomenclature

Taxonomic nomenclature used for the description of floral species is according to '*Census of the Queensland Flora and Fungi 2022'* (Queensland Herbarium, 2022). Exotic native species are assigned in text by an asterisk (*).

2.5.2 Fauna methods

2.5.2.1 MNES habitat quality assessments

MNES habitat quality assessments were undertaken in accordance with the *'Guide to determining terrestrial habitat quality under the Queensland Offsets Policy (Version 1.2)'* (Department of Environment and Heritage Protection, 2017).Habitat quality assessments were undertaken across a total of 1087 sites across areas within and adjacent to the Impact area. MNES habitat which occurs adjacent and outside the Impact area was assessed as part of the targeted field survey program for the proposed action (Appendix B Figure 3).

2.5.2.2 Fauna surveys

The adopted methodology for the vertebrate fauna species followed recommendations outlined in Queensland survey guidelines, *Terrestrial Fauna Survey Guidelines for Queensland, Version 4* (Eyre *et al.*, 2022). Fauna surveys were conducted within representative locations of all fauna habitat types (refer to Section 3.6 of this report).

Detailed information regarding each method and associated survey effort are outlined below in Table 8, with sampling locations depicted Appendix B Figure 2 and Appendix B Figure 3.

Table 8 Fauna survey techniques (adapted from Eyre et al., 2022)

Methods	Target species	Description	Survey effort	
			Sites	Trap nights/hours
Habitat assessment	All MNES species including reptiles, mammals, amphibians, and birds	Habitat assessments were undertaken within areas of representative habitat, capturing variation in condition and vegetation types. The relative abundance of key habitat attributes was recorded at each location, including hollow bearing trees or stags, coarse woody debris, surface rocks, soil cracks and leaf litter.	1,087 sites	408 person hours
Active searches	Long nosed potoroo, reptiles, mammals, amphibians, and birds	Active diurnal searches were undertaken within suitable microhabitat across the broad range of habitat types for amphibians and reptiles including targeted active searches for long nosed potoroo. This included scanning the trees and ground searching beneath microhabitat such as rocks, leaf litter and fallen timber.	364 sites, including 9 sites targeted for long nosed potoroo	16 person hours for targeted long nosed potoroo
Scat and sign search	Koala, long nose potoroo and other mammals, reptiles, amphibians, and birds	Searches included looking for signs of animal activity, including tracks, scats, scratches, bones, fur, feathers, nests, foraging holes and diggings. Scat and sign searches were completed at habitat assessment sites across areas within and adjacent to the Impact area.	364 sites	408 person hours
Spotlighting and Call Playback	Koala, spotted tail quoll, Yellow-bellied glider, Greater glider (southern and central)	Roaming/meandering nocturnal searches were completed across areas within and adjacent to the Impact area. Spotlighting was undertaken on foot using head torches and hand-held spotlights within suitable/representative habitat. During spotlighting events, threatened species calls were played for koala and Yellow-bellied glider, with ecologists listening for at least 10 minutes for a return call from nearby individuals.	Call play back: 5 sites Spotlighting: 12 sites	80 person hours spotlighting and 6 person-hours call playback over 9 nights
Acoustic Monitoring Recorders	Koala, Yellow-bellied glider, powerful owl, Swift parrot, Regent honeyeater, Painted honeyeater, Australasian bittern, Australian painted snipe, glossy black cockatoo, and general bird species.	Eight AudioMoth (EFM32 Gecko processor) acoustic monitoring devices were deployed across 6 sites for 14 days across areas within and adjacent to the Impact area. AudioMoth devices were set to capture audible and ultrasonic frequencies for 2-hour periods during dawn, midday and dusk. AudioMoth devices were strategically placed within foraging sites such as remnant vegetation and adjacent to wetlands in representative potential, likely and known habitat.	6 sites	14 days with a total of 115 trap nights
Camera traps	Long nosed Potoroo, spotted tail quoll, koala, Yellow-bellied	Eighteen camera traps were deployed for 14 days in strategic positions across 6 sites including fauna corridors and watering points such as wetlands and creek lines to record visitation by nocturnal and crepuscular animals. Camera traps comprised of baited set-ups	6 sites	14 days with a total of 252 trap nights

Methods	Target species	Description	Survey effort	
			Sites	Trap nights/hours
	glider and general terrestrial ground and arboreal fauna.	using peanut butter, honey, rolled oats and sardines as an attractant. Photographs were analysed by an ecologist to determine the identity of species captured.		
Bird surveys (general, woodland, and wetland, flushing)	Australasian bittern, Australian painted snipe, painted honey eater, regent honey eater, swift parrot, glossy black cockatoo	Roaming/meandering bird surveys using both visual and auditory identification. Surveys commenced at dawn and continued throughout the day and were completed during all surveys. Targeted active birding census was also completed at wetland and woodland sites where accessible.	27 sites	Woodland birds- 224 person hours Wetland birds- 112 person hours Shore birds – 32 person hours Total – 368 person hours
Infrared drone surveys	Koala, grey headed flying fox, Greater glider (southern and central) and Yellow-bellied glider	Nocturnal Infrared thermal drone (DJI Matrice 300 quadcopter with thermal/optical camera and GL-60 zoom spotlight) surveys were carried out over 3 mornings between 25th-27th of October 2023. Flights commenced at 12 am and were completed by 5.30 am. Surveys were undertaken in ten survey polygons associated with fauna corridors, remnant vegetation and in locations where indirect evidence (scratches and scats) of koala presence and flying fox roosts were observed during other survey methods.	10 sites	48 hours
Roost search and nocturnal fly out count	Grey headed flying fox	Roost searches were undertaken during the day across areas within and adjacent to the Impact area to determine presence of flying fox roosts via visual and auditory identification. Strategic flyout counts to determine roost numbers were undertaken at dusk on 4 separate survey events (November, December 2023 and January 2024) in areas where flying fox roosts had been identified.	4 sites	48 person hours
Angling, snorkelling and eDNA	Mary River cod	A total of seven sites were assessed for Mary River cod from the 27 July to 30 July 2023. At each site angling methods included fishing with a rod and reel using live and dead bait as well as cod specific lures. 21 eDNA water samples were collected following sampling protocols developed by EnviroDNA. At each site, triplicates were taken, using a Smith-Root™ eDNA Sampler (Smith-Root Inc, Vancouver WA, US), by passing up to 3 L of water for each replicate through a 5.0 µm Smith-Root self-preserving filter. Visual observations and a targeted habitat assessment were also undertaken at each site.	7 sites	48 person hours and 21 eDNA samples
Fyke netting and eDNA	Australian lungfish	Surveys were undertaken within two dams (northern and southern) of the Logan River Tree Farm on the 10th of January 2024. 18 eDNA water samples were taken from six sites, 6	2 sites	16 person hours and 18

Methods	Target species	Description	Survey effort	
			Sites	Trap nights/hours
		within the northern dam and 12 within the southern dam. Samples were collected using a Smith-Root eDNA sampler with 5 µm Smith-Root self-preserving filters following Smith-Root protocol. Approximately two litres were processed per filter. Samples were collected from areas of likely fish habitat (amongst macrophytes, boulders, etc.) when possible. Filtration was undertaken on-site to reduce DNA degradation during transport of whole water. Three fyke nets were deployed in the southern dam. Fyke nets were set in the afternoon and cleared the following morning.		eDNA samples
Incidental Observations	Reptiles, mammals, amphibians and birds	All fauna observed incidentally within or in close proximity to areas within and adjacent to the Impact area were recorded.	-	2304 person hours

2.5.2.3 Targeted threatened and migratory fauna surveys

The desktop assessment identified a number of conservation significant fauna species with the potential to occur within the study area. These species were the subject of targeted survey effort across areas within and adjacent to the Impact area and are identified in Table 9, along with relevant guideline survey effort and survey effort employed for each species.

Where practical, the survey guidelines have been met as detailed in Table 9. Where survey guidelines have only been partially met, effort is still considered sufficient due to the adoption of other techniques such as habitat assessments where presence of suitable habitat resources has been used as a surrogate for presence.

Targeted fauna survey methods were developed based on the following Commonwealth species survey guidelines and other fauna survey methodologies:

- Survey Guidelines for Australia's Threatened Mammals (Department of Sustainability, Environment, Water, Population and Communities, 2011)
- Survey Guidelines for Australia's Threatened Birds (Department of the Environment Water Heritage and the Arts, 2010)
- Survey Guidelines for Australia's Threatened Bats (Department of the Environment Water Heritage and the Arts, 2010)
- Survey Guidelines for Australia's Threatened Fish (Department of Sustainability Environment Water Population and Communities, 2011)
- Industry guidelines for avoiding, assessing, and mitigating impacts on EPBC Act listed migratory shorebird species (Department of the Environment and Energy, 2017)
- Referral guideline for 14 birds listed as migratory species under the EPBC Act (DCEEW, 2015)
- Queensland Government's Terrestrial Fauna Survey Guidelines (Version 4) (Eyre et al., 2022) and
- Species-specific survey guidelines, where available.

The range of survey techniques and effort employed for the target species would have also been suitable at detecting presence of species not listed in Table 9. DCCEEW has advised assessments for migratory species are not required, as the controlled action decision for the proposed action did not include listed migratory species as a controlling provision. As such, field observations migratory species will be provided, however will not undergo impact assessment within this report.

Table 9 Survey effort undertaken per conservation significant species

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
Birds				
South-eastern glossy black cockatoo *(Calyptorhynchus lathami lathami)*	*Survey guidelines for Australia's threatened birds* (Department of the Environment Water Heritage and the Arts, 2010) *Targeted species survey guidelines* (Queensland Government, 2020)	**Survey techniques** While there are no standard survey techniques for the species, recommended survey methods include: • Undertake targeted diurnal area searches in appropriate habitats. - Search area for sightings, calls or signs of feeding or nests. - Searches conducted over plots of 1-3 ha, for 10-20 minutes. **Seasonal considerations** Present throughout the year in many regions and surveys for this species can be conducted at any time of the year. The peak breeding season occurs from March to August in South East Qld.	• 13 survey days across July, August and September 2023, with a total of 144 person hours for diurnal surveys (both indirect and direct evidence) • 6 AudioMoth acoustic recorders were deployed across 6 sites for 14 days during December 2023 targeting calls from south-eastern glossy black cockatoo • Habitat assessments were conducted for the species across areas within and adjacent to the Impact area during September, October, November 2023 and January 2024, totalling 408 person -hours over 1087 sites • Hollows assessment was undertaken within the Impact area via visual assessment from the ground over four days within representative sites within each Assessment Unit (AU) containing mapped breeding habitat. Hollows were not assessed within mapped dispersal habitat since this is primarily located within disturbed non-remnant vegetation and unlikely to contain suitable hollows. • The method to assess number of suitable glossy black-cockatoo nesting trees comprised number of eucalypts (living or dead) with DBH over 40cm	**Requirements met** The survey effort exceeds the recommended survey effort for the species. Key survey techniques including targeted diurnal searches in woodland and nest (active hollows) searches were undertaken as per the survey guidelines, to determine utilisation and areas of potential habitat for the species. Hours spent undertaking diurnal surveys are above the required effort and occurred over 13 days including during breeding season. Habitat assessments were also conducted across a range of habitat types (including urban parklands). To supplement the search effort AudioMoth acoustic recorders were utilised to provide a robust assessment for the detection of south-eastern glossy black cockatoos across areas within and adjacent to the Impact area

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
			and containing at least one hollow which meet the following characteristics: - Are a minimum of 8m above the ground - Located on branches with a diameter exceeding 30 centimetres - Branch or stem inclination of no more than 45 degrees from vertical - Entrance diameter greater than 15 centimetres • To calculate total number of suitable hollows per AU at the impact site, average number of hollows observed per ha within each Assessment Unit was extrapolated via total area. Results of Glossy Black Cockatoo hollows assessment at the impact site are provided within Appendix G Hollow Assessment within the Benobble Offset Area Management Plan (OAMP), according to AU, RE and condition.	
Regent honeyeater (*Anthochaera phrygia)* and Painted honeyeater (*Grantiella picta)*	*Survey guidelines for Australia's threatened birds* (Department of the Environment Water Heritage and the Arts, 2010)	**Survey techniques** Whilst there are no standard survey techniques for the Painted honeyeater, survey guidelines for the Regent honeyeater have been adopted for both species. Survey guidelines recommend the following survey method and effort for the Regent honeyeater:	• Over 11 survey days in July, August, September, October and November 2023, with a total of 160 person hours for area searches in suitable habitat • 6 AudioMoth acoustic recorders were deployed across 6 sites for 14 days during December 2023 targeting calls from regent and Painted honeyeaters.	**Requirements met** The survey effort exceeds the recommended survey effort for the species. Area searches as per the survey guidelines were employed to detect species presence. Hours spent undertaking area searches are above the required effort and

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
		• Area searches in suitable habitat, preferably in the morning but other times may also be appropriate. Detection by call when birds are most vocal outside the breeding season and physical sighting are recommended. For area searches a 20-hour search for 10 days is recommended. • Targeted searches of woodland with heavily flowering trees are useful especially around waterpoints such as dams and creek lines. 20-hour period survey for 5 days is suitable survey effort for targeted searches. **Seasonal considerations** Highly mobile species and capable travelling large distances. Their movement mainly depends on season and flowering of a small number of *Eucalyptus* species.	• Targeted habitat assessments were conducted for the species across areas within and adjacent to the Impact area during September, October, November 2023 and January 2024, totalling 408 person hours over 1087 sites.	occurred over 11 days. Habitat assessments were also conducted across a range of habitat types (including urban parklands) to account for flowering trees. To supplement the search effort AudioMoth acoustic recorders were utilised to provide a robust assessment for the detection of both painted and Regent honeyeaters across areas within and adjacent to the Impact area.
Swift parrot (*Lathamus discolor)*	*Survey guidelines for Australia's threatened birds* (Department of the Environment Water Heritage and the Arts, 2010)	**Survey techniques** The survey guidelines for Australia's threatened birds recommends the following survey method and effort for the Swift parrot: • Area searches or transect surveys of suitable habitat, preferably during early morning and afternoon when birds are most active and vocal to physically sight the species or detect their call. Survey effort to be 20 hours over 8 days.	• Over 11 survey days in July, August, September, October and November 2023, with a total of 160 person hours of area searches in suitable habitat • 6 AudioMoth acoustic recorders were deployed across 6 sites for 13 days during December 2023 targeting calls from Swift parrot • Targeted habitat assessments were conducted for the species across areas within and adjacent to the Impact area during September,	**Requirements met** The survey effort exceeds the recommended survey effort for the species. Area searches were employed as per the survey guidelines to detect species presence. Hours spent undertaking area searches are above the required effort and occurred over 11 days. Habitat assessments were also conducted across a range of habitat types (including

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
		• Slow-moving vehicle transects in expansive areas, to detect loud distinctive 'clinking call; that can be heard over noise of engine. • Targeted surveys at heavily flowering Eucalyptus patches. 20-hour period survey for 8 days is suitable survey effort. **Seasonal considerations** The movements of the Swift parrot are poorly known. There are no seasonal considerations for targeted surveys for this species.	October, November 2023 and January 2024, totalling 408 person -hours over 1087 sites.	urban parklands) to account for flowering trees. To supplement the search effort AudioMoth acoustic recorders have been utilised to provide a robust assessment for the detection of the Swift parrot across areas within and adjacent to the Impact area. Given the species does not breed in Australia and the proposed action is located on the northern extent of the species distribution, survey effort is considered sufficient.
Australasian bittern (*Botaurus poiciloptilus)*	*Survey guidelines for Australia's threatened birds* (Department of the Environment Water Heritage and the Arts, 2010)	**Survey techniques** While there are no standard survey techniques for the species, recommended survey methods for wetland birds include; • Observation of targeted foraging habitat within wetlands in the early morning or early evening. Detection by sightings and unsolicited calls. • Area searches in suitable habitat for sightings, nests, indicative footprints and feathers **Seasonal considerations** There are no seasonal considerations for targeted surveys for this species.	• Over 6 survey days in October, November and December 2023, with a total of 112 person hours of targeted dawn bird surveys and area searches within wetland habitat • 2 AudioMoth acoustic recorders were deployed across 2 sites for 14 days during December 2023 targeting calls from Australasian bitterns. • Targeted habitat assessments were conducted for the species across areas within and adjacent to the Impact area during September, October, November 2023 and January 2024, totalling 408 person -hours over 1087 sites.	**Requirements met** The survey effort exceeds the recommended survey effort for the species. Key survey techniques of birding at dawn were undertaken as per the survey guidelines to detect species presence. Habitat assessments were also conducted across a range of habitat types to capture manmade dams and watercourses within an urban environment. To supplement the search effort AudioMoth acoustic recorders have been utilised to provide a robust assessment for the detection of the Australasian bittern across areas within and adjacent to the Impact area

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
Greater sand plover *(Charadrius leschenaultia)* and Lesser sand plover *(Charadrius mongolus)*	*Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (Department of the Environment and Energy, 2017)	**Survey techniques** The survey guidelines recommend the following methods and survey effort for each of the 37 migratory shorebirds that migrate annually to Australia, including the greater and Lesser sand plover: • Bird surveys in suitable habitat: - 1 x survey in December - 2 x surveys in January - 1 x survey in February Surveys should be conducted during the day and consist of area searches or line transects in suitable habitat (i.e. wetland or other waterbodies and their surrounding vegetation (Department of Agriculture Water and the Environment, 2022). **Seasonal considerations** As per the SPRAT description of migration times to Australia, surveys should be undertaken in the Austral summer. The species generally arrives between August – October, with maximum numbers occurring by December and remain constant until late February	• Over 6 survey days (including spring low tide and neap low tide) in October, November and December 2023 for non-tidal areas, with a total of 112 person hours undertook targeted dawn bird surveys and area searches (flushing) within wetland habitat. • 2 AudioMoth acoustic recorders were deployed across 2 sites for 14 days during December 2023 targeting calls from greater and lesser sand plover. Habitat assessments were conducted for the species across areas within and adjacent to the Impact area during September, October, November 2023 and January 2024, totalling 408 person -hours over 1087 sites.	**Requirements partially met however effort considered sufficient** Potential habitat for this species is limited within the Impact area. While birding and area searches were completed at these locations, bird surveys were not completed during the correct seasonal timeframe (January and February). However, as per the SPRAT recommendations, birding was undertaken when the species is expected to occur in Australia (non-breeding season). To supplement bird survey effort, AudioMoth acoustic detectors were deployed for 14 days during December 2023 in areas of potential habitat and additional habitat assessments undertaken in January 2024. Areas within and adjacent to the Impact area do not contain core habitat for this species given its disturbed state within a modified (urban) environment. Based on this and the linear nature of the Impact area, survey effort is considered sufficient.
White-throated needletail (*Hirundapus caudacutus*)	Referral guideline for 14 birds listed as migratory species under the EPBC Act	**Survey techniques** Observations should be made as late as possible in the evening of birds coming into roost in tall trees along ridge tops. Survey effort not specified.	• Over 11 survey days in July, August, September, October and November 2023, with a total of 160 person hours for area searches in suitable habitat	**Requirements met** The survey effort exceeds the recommended survey effort for the species. Birding surveys met the

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
	(Department of the Environment, 2015)	**Seasonal considerations** Surveys should be conducted October to March	• Targeted habitat assessments were conducted for the species across areas within and adjacent to the Impact area during September, October, November 2023 and January 2024, totalling 408 person -hours over 1087 sites.	seasonal requirements for the species.
Australian painted snipe *(Rostratula australis)*	*Survey guidelines for Australia's threatened birds* (Department of the Environment Water Heritage and the Arts, 2010)	**Survey techniques** The survey guidelines for Australia's threatened birds recommends the following survey method and effort for the Australian painted snipe: • Area searches or transects through suitable wetlands (for sites less than 50 ha when wetland holds water but is not flooded): 10 hours over 3 days. • Targeted stationary observations at dawn and dusk within suitable wetland: 10 hours over 5 days. • Spotlight shortly after dusk: Survey effort not specified. This species is difficult to detect even when present. **Seasonal considerations** The movements of the Australian painted snipe are poorly known, and it may be a migratory species. There are no seasonal considerations for targeted surveys for this species.	• Over 6 survey days in October, November and December 2023, with a total of 112 person hours doing targeted dawn bird surveys and area searches (flushing) within wetland habitat • 2 AudioMoth acoustic recorders were deployed across 2 sites for 14 days during December 2023 targeting calls from Australian painted snipe. • Targeted habitat assessments were conducted for the species across areas within and adjacent to the Impact area during September, October, November 2023 and January 2024, totalling 408 person -hours over 1087 sites.	**Requirements met** The survey effort exceeds the recommended survey effort for the species. Key survey techniques of birding at dawn were undertaken as per the survey guidelines to detect species presence. Hours spent undertaking area searches, including flushing are more than the required effort and occurred over 6 days. Habitat assessments were also conducted across a range of habitat types to capture manmade dams and watercourses within an urban environment. To supplement the search effort AudioMoth acoustic recorders have been utilised to provide a robust assessment for the detection of the Australian painted snipe across areas within and adjacent to the Impact area.
Latham's snipe *(Gallinago hardwickii)*	*Survey guidelines for Australia's threatened birds*	**Survey techniques** In the absence of species-specific survey guidelines, survey methods identified by	• Over 6 survey days (including spring low tide and neap low tide) in October, November and December 2023 for	**Requirements met** The survey effort exceeds the recommended survey effort for the

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
	(Department of the Environment Water Heritage and the Arts, 2010)	*Survey guidelines for Australia's threatened birds* as being suitable for the Latham's snipe included: • Area searches or transects through suitable wetlands (for sites less than 50 ha when wetland holds water but is not flooded): 10 hours over 3 days. • Targeted stationary observations at dawn and dusk within suitable wetland: 10 hours over 5 days. • Spotlight shortly after dusk: Survey effort not specified. **Seasonal considerations** There are no seasonal considerations for this species	non-tidal areas, with a total of 112 person hours doing targeted dawn bird surveys and area searches (flushing) within wetland habitat. • 2 AudioMoth acoustic recorders were deployed across 2 sites for 14 days during December 2023 targeting calls from Latham's snipe • Habitat assessments were conducted for the species across areas within and adjacent to the Impact area during September, October, November 2023 and January 2024, totalling 408 person -hours over 1087 sites.	species. Birding at dawn was undertaken as per the survey guidelines to detect species presence. Hours spent undertaking area searches, including flushing are more than the required effort and occurred over 6 days. Habitat assessments were also conducted across a range of habitat types to capture manmade dams and watercourses within an urban environment. To supplement the search effort AudioMoth acoustic recorders have been utilised to provide a robust assessment for the detection of the Latham's snipe across areas within and adjacent to the Impact area
Bar-tailed godwit (*Limosa lapponica*)	*Industry guidelines for avoiding, assessing, and mitigating impacts on EPBC Act listed migratory shorebird species* (Department of the Environment and Energy, 2017)	**Survey techniques** The survey guidelines recommend the following methods and survey effort for each of the 37 migratory shorebirds that migrate annually to Australia, including the Bar-tailed godwit: • Bird surveys in suitable habitat: - 1 x survey in December - 2 x surveys in January - 1 x survey in February Surveys should be conducted during the day and consist of area searches or line transects in suitable habitat (i.e. wetland or other waterbodies and their surrounding vegetation (Department of the Environment and Energy, 2017)	• Over 6 survey days (including spring low tide and neap low tide) in October, November and December 2023 for non-tidal areas, with a total of 112 person hours undertook targeted dawn bird surveys and area searches (flushing) within wetland habitat. • 2 AudioMoth acoustic recorders were deployed across 2 sites for 14 days during December 2023 targeting calls from Bar-tailed godwit • Habitat assessments were conducted for the species across areas within and adjacent to the Impact area during September, October, November 2023	**Requirements partially met however effort considered sufficient** Potential habitat for this species is limited within the Impact area. While birding and area searches was completed at these locations, bird surveys were not completed during the correct seasonal timeframe (January and February). However, as per the SPRAT recommendations, birding was undertaken when the species is expected to occur in Australia (August-April). To supplement bird survey effort, AudioMoth acoustic

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
		Seasonal considerations As per the SPRAT description of the Bar-tailed godwit migration times to Australia, surveys should be conducted between August-April	and January 2024, totalling 408 person -hours over 1087 sites.	detectors were deployed for 14 days during December 2023 in areas of potential habitat and additional habitat assessments undertaken in January 2024. Areas within and adjacent to the Impact area does not contain core habitat for this species given its disturbed state within a modified (urban) environment. Based on this and the linear nature of the Impact area, survey effort is considered sufficient.
Mammals				
Koala (*Phascolarctos cinereus)*	Species-specific guidelines for survey for the koala are not currently available. *A review of koala habitat assessment criteria and methods* (Youngentob, Marsh and Skewes, 2021) outlined in the referral guidance for the endangered koala were utilised in the absence of species-specific guidelines.	**Survey techniques** There is no single technique or widely accepted method to survey koalas, due to the high level of variation in environmental variables across the koalas' range. All of the commonly used methods have strengths and limitations. • Most indirect survey techniques are better suited to determining activity levels or occupancy rather than for estimating abundance or density. • Direct observation techniques suited to determining the presence of a population and can also provide estimates of koala density or abundance. **Seasonal considerations**	• Infrared thermal drone surveys were carried out over 3 nights in October 2023, flying between the hours of 12-5.30 am. Surveys were undertaken across ten sites of approximately 163 hectares of bushland habitat, parks and reserves across areas within and adjacent to the Impact area. • Targeted placement of 15 cameras undertaken in December 2023 in locations of identified potential habitat, deployed for 14 nights, for a total of 210 trap nights. • A total of 80 person hours of spotlighting 6 person- hours of call playback and was undertaken in August (winter), September, October (spring) and December (summer) 2023. Surveys involved members of the survey team spread 20-30 m apart	**Requirements met** A combination of traditional techniques such as spotlighting and modern techniques such as infrared thermal drone surveys and AudioMoth acoustic recorders have been utilised to provide a robust assessment for the detection of koalas across areas within and adjacent to the Impact area. Surveys have been conducted during breeding season when activity is high.

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
		Direct observation surveys should be undertaken between August and January when koala activity is generally at a peak.	from each other, systematically searching trees for the reflected eye shine. • 6 AudioMoth acoustic recorders were deployed across 6 sites for 14 days during December 2023 targeting bellowing calls from male koalas • Targeted habitat assessments were conducted for the species across areas within and adjacent to the Impact area during September, October, November 2023 and January 2024, totalling 408 person -hours over 1087 sites. • 1087 sites were searched for evidence of koala scat or scratches	
Grey-headed flying fox *(Pteropus poliocephalus)*	*Survey Guidelines for Australia's Threatened Bats* (Department of the Environment Water Heritage and the Arts, 2010)	**Survey techniques** The survey guidelines for Australia's threatened bats recommends the following survey method and effort for the grey-headed flying fox: • Undertake desktop assessment for the location of known camps. • Diurnal field surveys to identify camps. Aerial survey for camps from a light aircraft is effective to sight species. • Surveys of vegetation communities and food plants. Field surveys to be conducted by a botanist to confirm the presence of suitable trees which species relies for food and habitat. • Dusk surveys by conducting a walking transects (100 m apart)	• Desktop assessment of the DCCEEW's National flying fox monitoring viewer was reviewed to identify known flying fox camps surrounding areas across areas within and adjacent to the Impact area. • Diurnal roost searches were undertaken whilst conducting habitat assessments to identify camps across areas within and adjacent to the Impact area. • Once species presence was confirmed targeted surveys to determine roost numbers and species percent were undertaken at 4 sites, totalling 48 person hours on November 27th, December 5th and 19th 2023 and January 17th, 2024.	**Requirements met** The survey effort exceeds the recommended survey effort for the species. Searches for roost sites were completed as part of the habitat assessments during every field survey. During November, December 2023 and January 2024 ecologists targeted identified roosts to determine grey-headed flying fox abundance and percent in comparison of other flying fox species (i.e. black flying fox). Additionally, fly out counts and innovative methods such as infrared thermal drone surveys facilitated the surveying of broad landscapes providing greater

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
		looking for feeding and flying bats. Smell can also provide a sign of their presence. **Seasonal considerations** Grey-headed Flying fox presence will depend on food resources. The time and location of flowering and fruiting of diet plants varies among seasons and years. In particular, drought years can have a strong influence on *Eucalyptus* sp flowering period, and this will impact species abundance.	• Fly out counts were undertaken on dusk in known roosts that contained grey-headed flying fox to determine flyout direction. • Infrared thermal drone surveys were carried out over 3 nights in Oct 2023, flying between the hours of 12-5.30 am. Surveys were undertaken across ten sites of approximately 163 hectares of bushland habitat, parks and reserves across areas within and adjacent to the Impact area.	detection probabilities than ground-based surveys and aided in confirming extent and location of camps.
Spotted-tailed quoll (southern sub species) (*Dasyurus maculatus maculatus*)	*Survey guidelines for Australia's threatened mammals* (Department of Sustainability, Environment, Water, Population and Communities, 2011).	**Survey techniques** The survey guidelines for *Australia's threatened mammals* recommends a range of survey methods to detect the spotted-tailed quoll • An initial reconnaissance survey at any time of the year utilising: - Diurnal searches for potential habitat resources. - Camera traps targeted to habitat critical to the survival of the species, and scat searches. - Transects of 10 camera traps spaced at least 100 m intervals for four nights is recommended. - Supplementary methods including latrine searches, detection dogs and / or hair tubes in conjunction with camera traps	• A total of 80 person- hours of spotlighting was undertaken in August (winter), September, October (spring) and December (summer) 2023. Surveys involved members of the survey team spread 20-30 m apart from each other, systematically searching habitat features for reflected eye shine. • Targeted placement of 15 cameras undertaken in December 2023 in locations of identified potential habitat, baited using sardines, for 14 nights, for a total of 210 trap nights. • Targeted habitat assessments were conducted for the species across areas within and adjacent to the Impact area during September, October, November 2023 and January 2024, totalling 408 person -hours over 1087 sites.	**Requirements met** A combination of the key survey techniques were employed as recommended by the survey guidelines to determine utilisation in areas of potential habitat. A reconnaissance survey was undertaken with 15 camera traps deployed for 14 nights, for a total of 210 trap nights. Due to no visual evidence of individuals on the camera traps targeted surveys (i.e. trapping) was not undertaken. However, spotlighting and targeted habitat assessments were undertaken to compliment camera trap survey effort.

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
		• Targeted survey (if impacting habitat critical to the survival) including: - Wire cage traps or Elliot traps (medium or large); or - A more refined camera trap survey **Seasonal considerations** Camera traps can be used at any time of the year, however preferably when individuals are likely to be active and more detectable. Targeted cage or Elliot trapping programs should be undertaken between early September and mid-November to avoid disturbance to females with pouch young.		
Greater glider (southern and central) *(Petauroides volans)* and Yellow-bellied glider (south-eastern) *(Petaurus australis australis)*	Species-specific guidelines for survey for the greater and Yellow-bellied glider are not currently available. *Survey guidelines for Australia's threatened mammals* (Department of Sustainability, Environment, Water, Population and Communities, 2011) were utilised in the absence of	**Survey techniques** In the absence of species-specific survey guidelines, survey methods identified by DSEWPC (2011) as being suitable for arboreal mammals include: • Diurnal searches for the presence of potentially suitable habitat resources for nest or den sites as well as signs of the species' presence, such as scratches on tree trunks and scats beneath trees • Stag watching to distinguish arboreal species emerging from tree hollows or nests at dusk • Call detection and/or call playback surveys for vocal species, in addition to playback of the calls of owl	• A total of 80 person hours of spotlighting was undertaken in August (winter), September, October (spring) and December (summer) 2023. Surveys involved members of the survey team spread 20-30 m apart from each other, systematically searching trees for the reflected eye shine. • 6 person-hours of call playback was undertaken throughout field surveys to ascertain the presence of predator owls, and the Yellow-bellied glider which may also influence the presence/abundance of Greater glider (southern and central) • Targeted habitat assessments were conducted for the species across	**Requirements met** The primary method for detecting Greater glider (southern and central) (spotlighting) was conducted in August (winter), September, October (spring) and December (summer) 2023. Spotlighting was undertaken on foot within locations of identified potential habitat. Methods for Yellow-bellied glider consisted of spotlighting and call playback. Additionally, innovative methods such as infrared thermal drone surveys facilitated the surveying of broad landscapes providing greater detection probabilities than ground-based

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
	species-specific guidelines.	predators that are known to induce a call response • Arboreal Elliott B or cage trapping surveys to determine the presence, and to distinguish between similar arboreal species. • Spotlighting along a walked or driven transect is the most effective method to obtain estimates of nocturnal arboreal mammal incidence and abundance in wooded habitats (Eyre et al. 2018) • Where reasonable and practicable, survey effort should target habitat known to be suitable for listed species. **Seasonal considerations** The Greater glider (southern and central) is known to have high site fidelity with relatively small home ranges. There are no seasonal considerations for this species.	areas within and adjacent to the Impact area during September, October, November 2023 and January 2024, totalling 408 person -hours over 1087 sites. • Infrared thermal drone surveys were conducted over 3 nights in Oct 2023, flying between the hours of 12-5.30 am. Surveys were undertaken across ten sites of approximately 163 hectares of bushland habitat, parks and reserves across areas within and adjacent to the Impact area • 6 AudioMoth acoustic recorders were deployed across 6 sites for 14 days during December 2023 targeting Yellow-bellied glider calls • Of the 18 camera traps deployed, 3 were targeted to capture potential Yellow-bellied gliders sap feeding on eucalypt species. Placement of cameras was undertaken in December 2023 in locations of identified potential habitat, for 14 nights, for a total of 42 trap nights.	surveys. In combination with the deployment of AudioMoths and camera traps provided a robust survey effort. Recommended survey effort for the greater and Yellow-bellied glider is not specified, however effort undertaken, and data collected during the pre-wet and post-wet season surveys is considered suitable for detecting both species given the highly fragmented and linear nature of areas within and adjacent to the Impact area
Long-nosed potoroo *(Potorous tridactylus tridactylus)*	*Survey guidelines for Australia's threatened mammals* (Department of Sustainability, Environment, Water, Population and Communities,	**Survey techniques** The following survey techniques are recommended to detect the presence of the Long-nosed potoroo in areas up to 5 ha in size. • Diurnal searches for potentially suitable habitat resources (i.e. dense understorey). Suggested survey effort for a 5-ha area is two hours for	A total of 9 sites were assessed for Long-nosed potoroo. This included: • Targeted placement of 15 cameras undertaken in December 2023 in locations of identified potential habitat, baited using peanut butter and rolled oats, for 14 nights, for a total of 210 trap nights.	**Requirements partially met however effort considered sufficient** A combination of key survey techniques was employed as recommended by the survey guidelines to determine utilisation in areas of habitat critical to the species. Camera traps and active

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
	2011).	every 1 ha, with searches for potential habitat resources carried out in conjunction with the survey for signs of fauna activity • Diurnal searches for signs of activity (i.e. diggings). • Collection of predator scats, owl casts or remains, targeting predatory bird and mammal nests and dens. • Baited camera traps using universal bait (peanut butter and rolled oats) with added truffle or walnut oil. **Seasonal considerations** There are no seasonal considerations for this species.	• Scat and sign searches undertaken across 377 sites • 16 hours of active diurnal searches completed in December 2023 across 9 sites of representative habitat • Targeted habitat assessments were conducted for the species across areas within and adjacent to the Impact area during September, October, November 2023 and January 2024, totalling 408 person -hours over 1087 sites.	searches were completed in areas of representative habitat across areas within and adjacent to the Impact area during December 2023. Potential habitat across areas within and adjacent to the Impact area limited. While active searches were undertaken in all areas considered suitable habitat, sites were patchy and small in size. Therefore, suggested survey effort of 2 hours per ha was not met. However, surveys were undertaken until potential habitat sites was exhausted and, therefore, survey effort is considered sufficient.
Fish				
Mary River cod *(Maccullochella peelii mariensis)*	*Survey guidelines for Australia's threatened fish* (Department of Sustainability Environment Water Population and Communities, 2011)	**Survey techniques** A combination of the following survey techniques are recommended to detect the presence of Mary River cod: • Angling surveys utilising barbless hooks. Surveys should be undertaken in suitable habitat at dawn or dusk • Electrofishing during the day • Visual observation via snorkelling **Seasonal considerations** Surveys should be avoided during the spawning season (between August and October). Angling methods are	A total of seven sites were assessed for Mary River cod from the 27th to 30th of July 2023. This included: • Habitat assessments - recorded using the Qld AUSRIVAS River Bioassessment field sheet, with scores calculated for all sites based on AUSRIVAS categories and given an aquatic habitat condition rating. • Angling - active fishing with rod and reel using live and dead bait and cod specific (barbless hook) lures. At each site active angling occurred for two	**Requirements met** Angling, habitat and visual assessment (snorkelling) and eDNA detection methods were conducted at 7 sites across areas across areas within and adjacent to the Impact area. The recently developed eDNA sampling technique is known to provide higher returns relevant to cryptic or low abundance species such as Mary River cod. A combination of traditional techniques such as angling and modern techniques such as eDNA

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
		considered more effective in spring and summer when fish are more active.	hours by two scientists, a total of four hours effort per site and grand total of 28 hours of survey effort. • Visual surveys (snorkelling) carried out during habitat assessments, where water clarity permitted inspections under log and undercut banks were also undertaken via snorkel. • eDNA- 21 water samples were collected by following sampling protocols developed by EnviroDNA. At each site, triplicates were taken, using a Smith-Root™ eDNA Sampler (Smith-Root Inc, Vancouver WA, US), by passing up to 3 L of water for each replicate through a 5.0 µm Smith-Root self-preserving filter.	have been utilised to provide a robust assessment for the detection of Mary River cod. The winter (late July) period for which surveys were undertaken was advantageous as: • Sites were largely located in downstream extents of their respective catchment, when Mary River cod move to these areas in winter • Surveys overlapped with Mary River cod spawning period. Furthermore, surveys did not occur during spawning (August/September) as to not interrupt any Mary River cod during this period.
Australian lungfish *(Neoceratodus forsteri)*	*Survey guidelines for Australia's threatened fish* (Department of Sustainability Environment Water Population and Communities, 2011)	**Survey techniques** A combination of the following survey techniques are recommended to detect the presence of Lungfish: • Electrofishing is generally the most effective method for Australian lungfish and should be undertaken during the day • Angling surveys utilising barbless hooks. Surveys should be undertaken in suitable habitat around midnight when maximum activity is present **Seasonal considerations**	Surveys were undertaken within 1 site, the Logan River Tree Farm dam over 1 night on the 10th of January 2024. This included: • 18 eDNA water samples were taken from six sites, 6 within the northern dam and 12 within the southern dam. Samples were collected using a Smith-Root eDNA sampler with 5 µm Smith-Root self-preserving filters following Smith-Root protocol. Approximately two litres were processed per filter. Filtration was undertaken on-site to reduce DNA degradation during transport of whole water	**Requirement partially met, however effort considered sufficient** Whilst survey techniques varied to recommended guidelines, targeted habitat assessment, eDNA sampling, spotlighting and fyke netting was employed in the Logan River Tree farm dam. The recently developed eDNA sampling techniques is known to provide higher returns relevant to cryptic or low abundance species such as Australian lungfish.

Species	Survey guidelines	Survey guideline method effort and timing	Actual survey method, effort and timing	Requirements met against recognised guidelines
		Australian lungfish spawn between August and December and should be avoided so that breeding is not affected. Angling methods considered more effective in spring and summer when species is more active.	• 3 fyke nets deployed in the southern section of the dam and left overnight, with fyke net retrieval occurring on the morning of the 11th of January 2024. • Spotlighting of both the northern and southern dams conducted from dusk (approx. 6 pm) until 8 pm on January the 10th 2024 • Habitat likelihood assessment was undertaken for both the northern and southern section of the dam.	Here a combination of traditional techniques such as netting and modern techniques such as eDNA have been utilised to provide a robust assessment for the detection of Australian lungfish Habitat features (e.g., sites for breeding, feeding, and sheltering) required to support lungfish were absent, with anecdotal evidence of saline intrusion from historic dam dredging. Based on this, survey effort is considered sufficient.

2.6 Impact assessment

MNES known, likely or having potential to occur within the Impact area were subject to a two-step process to assess the potential for significant impacts. The purpose of the two-step approach was to focus in on MNES values relevant to the proposed action's potential impacts and determine significant impacts using a condensed screening assessment and then, if recommended, significant impact assessments in accordance with *EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance* (Department of the Environment, 2013).

The screening assessment involved reviewing the consequences of proposed action impacts and the likelihood of the consequence occurring. The findings of this indicated the MNES' vulnerability to potential significant impacts, and whether further assessment via the significant impact assessment process was completed to determine potential significant impacts.

2.6.1 Screening assessment

To determine the proposed action's anticipated nature, likelihood, consequence and extent of potential impacts as a result of the proposed action were assessed against three consequence levels which contained multiple criteria (Table 10) to determine the likelihood, the potential for species presence was assessed (Table 11). These scores were then reviewed against the outcome matrix to identify the associated level of risk to the MNES (Table 12).

The context of the specific MNES values' ecology such as community or species' distribution, habitat preferences including breeding habitat and movement patterns was considered. For MNES with referral guidance documents, any terminology, area thresholds and recommendations detailed within were considered foremost. Knowledge gaps and known threats were also reviewed. To assign a consequence level of one or two, all criteria associated with that level must be met, otherwise a level three is automatically assigned. Only one of the criteria in consequence level three needs to be met for that level to be assigned.

MNES that are evaluated via the outcome matrix with a 'potential risk' outcome (orange) (i.e. consequence level of 3 and possible likelihood) triggered further assessment whilst MNES with a 'low risk' outcome (green) were not recommended for further assessment (Table 13). The risk assessment framework, including likelihood and consequence criteria for specific MNES is outlined below in Table 10, Table 11 and Table 12.

Table 10 Screening framework: consequence criteria

Consequences	Criteria	
	Threatened species and communities	**Migratory species**
1	• No impacts to threatened species populations, ecological communities, habitat extent and habitat quality; **and** • No increase in threatening processes to threatened species and ecological communities; **and** • Threatened species and ecological communities' recovery or persistence is unaffected.	• No impacts to migratory species habitat extent and habitat quality; **and** • No increase in threatening processes to migratory species; **and** • Area of habitat within the Impact area is not nationally or internationally significant **and** • Migratory species recovery or persistence is unaffected.
2	• Impacts to threatened species, ecological communities and associated habitats are of a low magnitude or are short-term; **and** • Increased threatening processes to threatened species and ecological communities can effectively be mitigated by well characterised management measures; **and** • In a regional context, reduction in available habitat is inconsequential; **and** • Species specific referral guidance (if available) indicates a low risk.	• Impact area is below species-specific clearing thresholds (if available); **and** • No impacts to areas supporting an ecologically significant proportion of a population; **and** • Impacts to migratory species important habitat are of a low magnitude or are short-term; **and** • Increased threatening processes to migratory species can effectively be mitigated by well characterised management measures; **and** • In a regional context, reduction in available habitat is inconsequential.
3	• Species has been confirmed within the Impact area or in adjacent properties; however, uncertainty on population density, population dynamics and or habitat utilisation occurs; **or** • Population numbers and habitat utilisation within the Impact area may vary temporally and spatially due to dependence on climatic conditions i.e. rainfall events recharging wetlands. Therefore, full extent of potential impacts on threatened species is uncertain; **or** • Impacts to threatened species, ecological communities and associated habitats are of a moderate or high magnitude or are longer-term; **or** • Increased threatening processes to threatened species and ecological communities require more intensive, longer-term management or intervening measures to mitigate impacts; **or** • Receiving environment is more sensitive to impacts or the consequence of the impact is uncertain; **or** • In a regional context, reduction in available habitat is notable; **or** • Species specific referral guidance (if available) indicates a moderate or high risk.	• Multiple individuals were recorded using habitat within the Impact area. • Close to or above species-specific clearing thresholds (if available); **or** • Impacts to areas supporting or close to supporting an ecologically significant proportion of a population; **or** • Impacts to migratory species important habitat are of a moderate or high magnitude or are longer-term; **or** • Increased threatening processes to migratory species require more intensive, longer-term management or intervening measures to mitigate impacts; **or** • Receiving environment is more sensitive to impacts or the consequence of the impact is uncertain; **or** • In a regional context, reduction in available habitat is notable.

Table 11 Screening framework: likelihood criteria

Likelihood level	Descriptor
Highly unlikely	• May only occur in exceptional circumstances • No previous incidence of occurring
Unlikely	• Very low chance of occurring • One rare previous incidence of occurring
Possible	• Might occur in some circumstances • Few previous incidences of occurring

Table 12 Screening framework: outcome matrix

Likelihood	Consequence		
	1	**2**	**3**
Highly unlikely	Low risk – no further assessment recommended	Low risk – no further assessment recommended	Low risk – no further assessment recommended
Unlikely	Low risk – no further assessment recommended	Low risk – no further assessment recommended	Low risk – no further assessment recommended
Possible	Low risk – no further assessment recommended	Low risk – no further assessment recommended	Potential risk – further assessment recommended

2.6.2 Significant Impact Assessment

Significant impact assessments were undertaken for all MNES evaluated with a 'potential risk' outcome (orange), as per abovementioned outcomes from Table 12.

The *EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance* (Department of the Environment, 2013) provides the framework to assess the potential impacts on MNES and determine significance and severity of impacts. As per this guideline, this assessment has determined impacts on MNES by utilising the broadest scope of the proposed action, and considers both direct and indirect impacts, as well as the measures proposed to avoid and reduce impacts.

The significant impact criteria utilised in the assessment are outlined in Table 13 below**,** tailored to the conservation status or type of each MNES.

Table 13 Significant impact assessment criteria and key definitions

Criteria	Key definitions
Critically endangered and endangered species and ecological communities	
An action is likely to have a significant impact on a Critically Endangered or Endangered species if there is a real chance or possibility that it will: • Lead to a long-term decrease in the size of a population • Reduce the area of occupancy of the species. • Fragment an existing population into two or more populations • Adversely affect **habitat critical to the survival of a species** • Disrupt the breeding cycle of a population. • Modify, Destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	'**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.

Criteria	Key definitions
• Result in invasive species that are harmful to a Critically Endangered or Endangered species becoming established in the Endangered or Critically Endangered species' habitat. • Introduce disease that may cause the species to decline; or • Interfere with the recovery of the species.	
Vulnerable species and ecological communities	
An action is likely to have a significant impact on a Vulnerable species if there is a real chance or possibility that it will: • Lead to a long-term decrease in the size of an important population of a species. • Reduce the area of occupancy of an important population. • Fragment an existing important population into two or more populations. • Adversely affect habitat critical to the survival of a species. • Disrupt the breeding cycle of an important population. • Modify, Destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. • Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species' habitat. • Introduce disease that may cause the species to decline; or • Interfere substantially with the recovery of the species.	• 'Habitat critical to the survival of a species' as defined above. • An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • 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.
Migratory species	
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will: • Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), Destroy or isolate an area of important habitat for a migratory species • Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or • Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	An area of **'important habitat'** for a migratory species is: • Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or • Habitat that is of critical importance to the species at particular life-cycle stages, and/or • Habitat utilised by a migratory species which is at the limit of the species range, and/or • Habitat within an area where the species is declining. • Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an 'ecologically significant proportion' of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species-specific behavioural patterns (for example, site fidelity and dispersal rates).

2.7 Limitations

2.7.1 Land access

2.7.1.1 Residential dwellings

The data presented in this report is limited by access to residential dwellings. All residential dwellings were initially assessed using a combination of aerial imagery via NearMaps and viewing via public easements to identify the presence of native vegetation prior to targeted field surveys. Where access to residential dwellings was restricted but considered necessary (i.e. containing native vegetation), notifications were sent to the landowner to gain access. Where access to residential dwellings was restricted, denied and/or low or no habitat values were present, MNES habitat assessments were undertaken from public easements and a representative site photograph taken. This field survey approach was considered adequate because the low and/or no habitat value areas were able to be assessed sufficiently via detailed NearMaps aerial imagery and via public easement.

2.7.1.2 Rough-sleeper camps

Rough-sleeper camps were located across areas within and adjacent to the Impact area, specifically Hugh Muntz Park, Nealdon Park and Kiewa Park, near Edens Landing Station. For safety and privacy reasons, a 50 m exclusion zone was applied around the perimeter of rough-sleeper camp locations and excluded from field surveys. Despite exclusion zones put in places, the field surveys approach was considered adequate because areas were able to be assessed sufficiently from a 50 m distance and via detailed NearMaps aerial imagery.

2.7.1.3 Detectability

The general limitations to ecology assessment conducted across areas within and adjacent to the Impact area includes the following:

- Fauna species with large home ranges may not be present
- The difficulty in detecting certain species during the survey period (e.g. cryptic species and species present in low densities)
- Biological factors such as sex, age-class, and breeding biology which may influence species' habitat use and detectability during different times of year.

For those species not detected and with records nearby, habitat assessments were undertaken to determine the habitat value support such species. The absence of a species was not assumed because it was not detected.

Thermal drone surveys represent a snapshot of koala presence at a moment in time, and the results do not account for seasonal variations in the movements (e.g. breeding season dispersal) and koala occupancy. Population density and distribution will vary over time in response to anthropogenic and natural environmental influences such as bushfire and extreme weather events.

Field survey data collection to inform mapping was conducted using a hand-held iPad unit with aerial imagery. The accuracy of the iPad is generally <5 m and considered appropriate for the purpose of this assessment.

2.7.2 Likelihood of occurrence assessment

A likelihood of occurrence assessment was undertaken for species listed under the EPBC Act and identified during the desktop review (Appendix C). Where reasonable and practicable, desktop assessments and targeted ecology field surveys were undertaken for species identified with the potential to occur within the Impact area. The methodology was applied again after field surveys to determine the likelihood of occurrence once site-based information became available.

The likelihood of occurrence for TECs in Appendix C was assessed according to the following categories:

- **Known**: Vegetation meets key diagnostic characteristics and condition thresholds according to each TEC's Conservation Advice or Listing Advice, and indicator REs are present.

- **Not present**: Vegetation does not meet key diagnostic characteristics or condition thresholds according to each TEC's Conservation Advice or Listing Advice, and indicator REs are not present.

The likelihood of occurrence for conservation significant flora and fauna species in Appendix C was assessed according to the following categories:

- **Known**: Species was positively observed during the field surveys; or previous, reliable records occur within the study area
- **Likely**: Species was not observed during the field surveys, however there are records within the study area and suitable habitat exists in the Impact area
- **Potential**: Species was not observed during the field surveys, however records occur in the study area and habitat in the Impact area is marginal or degraded
- **Unlikely**: Habitat in the Impact area might be suitable or marginal; however, species was not observed during the field surveys, and no records of the species exist within the study area.

During the initial desktop review of available literature and previous ecological assessments and the likelihood of occurrence assessment, the following species were considered 'potential to occur':

- Australasian bittern (*Botaurus poiciloptilus)*
- Australian lungfish (*Neoceratodus forsteri*)
- Bar-tailed godwit (*Limosa lapponica baueri*)
- Coleus (*Coleus habrophyllus)*
- Greater plover (*Charadrius leschenaultia)*
- Lesser sand plover *(Charadrius mongolus).*
- Long-nosed potoroo (*Potorous tridactylus tridactylus*)
- Painted honeyeater (*Grantiella picta*).

However, the likelihood of occurrence assessment was updated with ground truthed vegetation and habitat data following the completion of ecology field surveys and determined the aforementioned species as 'unlikely to occur' due to:

- Habitat for *Coleus habrophyllus* did not occur within the Impact area
- Suitable terrestrial and/or inter-tidal habitat within the Impact area was sporadic, largely absent, or highly disturbed
- Species are typically found along the Queensland coastline
- Marginal habitat that occurs within the Impact area is unlikely to be preferential to migrating individuals
- And/or no reliable records for the species occur nearby.

The survey effort for these species is documented in Section 2.5.1.6 and Section 2.5.2.3, however, they are not considered further in the assessment.

A detailed likelihood of occurrence assessment is available in Appendix C and includes justification of the assessment outcome per MNES values

2.8 Vegetation and MNES habitat mapping

Following completion of the field survey and the likelihood of occurrence assessment, mapping for vegetation, fauna habitat types and relevant conservation significant flora, fauna and species area was undertaken. MNES habitat does not solely occur within the Impact area. MNES habitat assessed as part of the targeted field survey program within the Impact area and which occurs adjacent and outside the Impact area was mapped.

Where available, information from publicly available databases were used as a basis to develop habitat mapping, including relevant species recovery plans (where available), referral guidelines, approved conservation advice, the SPRAT database, management plans and peer-reviewed journal articles. Habitat assessments collected during the field surveys, species records (previous and survey records), and proposed action's vegetation mapping was used to map the potential habitat for each relevant MNES. The habitat requirements, assumptions and GIS approach are detailed in Appendix C.The extent and boundaries of vegetation, fauna habitat types and MNES habitat was determined using field verified information and visual interpretation of canopy cover using Nearmap imagery (2 November 2023) and cadastre.

A level of conservatism has been applied throughout the habitat mapping whereby a 'habitat' approach (instead of individual feature approach) has generally been adopted for the impact assessment. In some instances, an individual feature approach has been taken where supported by survey data. The 'habitat' approach includes large areas of fragmented landscape where pre-existing barriers (i.e. rail infrastructure, highways and public access roads) and high levels of disturbance (i.e. noise, light and weed infestations) are present.

As such, areas that have been exposed to increased development, are highly fragmented from the broader landscape and existing movement barriers such as noise walls and fauna fencing are present have been excluded from koala habitat classification mapping.

AECOM have undertaken a detailed assessment of the Impact area, regarding koala movement patterns, habitat utilisation and considering the broader landscape within areas where these structures are present.

On this basis, sixteen (16) locations within the Impact area have been identified that are not considered to meet the definition of habitat for koala, based on the landscape context, movement patterns, dispersal pathways, barriers to movement and/or connectivity. The approach to exclude these areas from habitat classification was discussed with DCCEEW, and a letter sent 27 October 2023 (Appendix H) and 19 December 2024. Areas not considered to meet the definition of habitat for koala include (north to south of the Impact area):

- Kuraby – Beenleigh Road/Gateway Motorway
- Kuraby – St Patrick Avenue to Allingham Street
- Kuraby – Kuraby Station
- Woodridge – Barkala Street to Trinder Crossing
- Woodridge – North Road to Carmody Street
- Karawatha – Moon Circuit
- Kingston Road - Kingston
- Logan – McDonalds Logan central to Kingston, Mayes Avenue
- Loganlea - M6/Railway Parade
- Loganlea Road - Loganlea
- Meadowbrook – Logan Motorway to Armstrong Road
- Beenleigh – Spanns Road to Logan River Road
- Beenleigh – Spanns Road West

- Beenleigh – Spanns Road East
- Beenleigh – Logan River Road to James Street
- Beenleigh – Kent Street to Intercity Circuit.

As per discussions with DCCEEW, the remaining assessments, habitat mapping and Significant Impact Assessments were based on the abovementioned sixteen (16) locations not considered to meet the definition of habitat for koala and therefore not included further in the impact assessment.

3.0 Ecological values

3.1 Regional context

3.1.1 Bioregion and subregion

The proposed action is located within the Southeast Queensland bioregion. This bioregion encompasses 62,484.20 km^2 and approximately 3.60 percent of Queensland (Queensland Government, 2024). The Southeast Queensland bioregion is located within the MacPherson-Macleay Overlap, where tropical and temperate zone converge. As such, the bioregion supports a high diversity of flora, fauna and ecological communities (Society for Ecological Restoration, 2018).

The proposed action traverses two subregions including the Moreton basin and Burringbar-Conondale Ranges. The Moreton basin and Burringbar-Conondale Ranges bioregion are generally characterised by low hills and broad alluvial valleys with Triassic-Jurassic sandstone origin, volcanics and alluvium, dominated by eucalypt woodlands/open forests and *Acacia harpophylla* open forest and semi-evergreen vine thickets (Sattler and Williams, 1999).

3.1.2 Surface geology and land zones

The Department of Resources (DoR) Moreton region surfaces geological mapping (Department of Resources, 2024) identifies the study area contains ten (10) different geology units described below in Table 14 and displayed in Appendix B Figure 4.

Table 14 Major surface geology units mapped within the study area

Unit Name	Map Symbology	Age	Lithology summary	Dominant Rock Type	General location in study area
Brisbane Tuff	Rif	Late Triassic	Rhyolitic tuff, ignimbrite, agglomerate, conglomerate, sandstone, shale	Sedimentary rock	North
Ipswich coal measures	Ri	Late Triassic	Shale, conglomerate, sandstone, coal, siltstone, basalt, tuff	Sedimentary rock	Central
MG-Q	Q	Quaternary	Estuarine, flood plain, tidal delta deposits	Miscellaneous unconsolidated sediments	South east
MG-TQa	TQa	Tertiary-Quaternary	Pliocene-Pleistocene flood plain, river terrace remnants	Alluvium	Central
MG-Tv	Tv	Tertiary	Basalt, agglomerate, rhyolite, trachyte	Mixed mafites and felsites (mainly volcanics)	Scattered
Marburg Subgroup	Jbm	Early Jurassic-mid Jurassic	Lithofeldspathic labile and sublabile sandstone, siltstone, shale, minor coal, ferruginous oolite marker	Arenite-mudrock	Scattered
Neranleigh-Fernvale beds	DCf	Devonian - Carboniferous	Mudstone, shale, arenite, chert, jasper, basic metavolcanics, pillow lava, conglomerate	Sedimentary rock	Scattered
Oxley Group	To	Paleocene-eocene	Claystone, sandstone, shale, basalt,	Mixed sedimentary	North and central

Unit Name	Map Symbology	Age	Lithology summary	Dominant Rock Type	General location in study area
			conglomerate, siltstone, limestone	rocks and mafites	
Qa-QLD	Qa	Quaternary	Clay, silt, sand and gravel; flood-plain alluvium.	Alluvium	Scattered
Woogaroo subgroup	RJbw	Late Triassic – early Jurassic	Quartzose sandstone, siltstone, shale conglomerate, coal	Sedimentary rock	North

Land zones are categories that describe the major geologies, the associated landforms and geomorphic processes in Queensland, and are a critical component of the RE classification scheme. Land zones have been delineated across the study area based on the available surface geology mapping. Five (5) land zones (Table 15) have been identified and are broadly consistent with the surface geology mapping. Definitions are consistent with Wilson and Taylor (2012).
It is important to note that coarse grained quartzose sedimentary rocks may be associated with outcropping fine grained sedimentary rocks. In Southeast Queensland, the ortho-quartzite (sedimentary quartzite) beds in the Myrtle Creek Sandstones form prominent hills and cliffs but are only a minor component of the predominant sub-labile lithology. Therefore, the composite Land Zone 9/10 in the Southeast Queensland Bioregion replaces Land Zones 9 and 10 (Wilson and Taylor, 2012).

Table 15 Land zones and associated surface geologies present within the study area.

Land Zone	Description
3	Recent Quaternary alluvial systems, including closed depressions, paleo-estuarine deposits currently under freshwater influence, inland lakes and associated wave-built lunettes. Excludes colluvial deposits such as talus slopes and pediments. Includes a diverse range of soils, predominantly Vertosols and Sodosols; also with Dermosols, Kurosols, Chromosols, Kandosols, Tenosols, Rudosols and Hydrosols; and Organosols in high rainfall areas.
5	Tertiary-early Quaternary extensive, uniform near level or gently undulating plains with sandy or loamy soils. Includes dissected remnants of these surfaces. Also includes plains with sandy or loamy soils of uncertain origin, and plateau remnants with moderate to deep soils usually overlying duricrust. Excludes recent Quaternary alluvial systems (land zone 3), exposed duricrust (land zone 7), and soils derived from underlying bedrock (land zones 8 to 12). Soils are usually Tenosols and Kandosols, also minor deep sandy surfaced Sodosols and Chromosols. There may be a duricrust at depth.
9	Fine grained sedimentary rocks, generally with little or no deformation and usually forming undulating landscapes. Siltstones, mudstones, shales, calcareous sediments, and labile sandstones are typical rock types although minor interbedded volcanics may occur. Includes a diverse range of fine textured soils of moderate to high fertility, predominantly Vertosols, Sodosols, and Chromosols.
10	Medium to coarse grained sedimentary rocks, with little or no deformation, forming plateaus, benches and scarps. Includes siliceous (quartzose) sandstones, conglomerates and minor interbedded volcanics, and springs associated with these rocks. Excludes overlying Cainozoic sand deposits (Land Zone 5). Soils are predominantly shallow Rudosols and Tenosols of low fertility, but include sandy surfaced Kandosols, Kurosols, Sodosols and Chromosols.
11	Metamorphosed rocks, forming ranges, hills and lowlands. Primarily lower Permian and older sedimentary formations which are generally moderately to strongly deformed. Includes low- to high-grade and contact metamorphics such as phyllites, slates, gneisses of indeterminate origin and serpentinite, and interbedded volcanics. Soils are mainly shallow, gravelly Rudosols and

Land Zone	Description
	Tenosols, with Sodosols and Chromosols on lower slopes and gently undulating areas. Soils are typically of low to moderate fertility.

3.1.3 Climate

The climate of the region is sub-tropical, characterised by warm humid summers and mild dry winters. The nearest BOM station to the study area is located in Logan Central (station number 040854). As described in Table 5 the lowest minimum daily temperatures were recorded in July reaching 7.2 ^{o}C. Maximum daily temperatures reached 34.3 ^{o}C during the September and December survey period.

Annual mean rainfall is 1,093.20 mm. Recorded rainfall data over the 2023 survey period from July-December indicated that the field surveys have occurred during prolonged dry conditions, with recorded rainfall leading up to and during summer months well below average; expected mean rainfall conditions measuring between 6.5-82.5 mm.

3.2 Land use

The proposed action area boundary overlaps Brisbane City Council and Logan City Council LGAs, within the existing railway corridor. The existing railway corridor is zoned SP3 special purpose (transport infrastructure) under the *Brisbane City Plan 2014* and zoned community facilities under the *Logan Planning Scheme 2015.* The wider area is predominantly zoned as:

- Low density and medium density residential
- Low impact and medium impact industry
- Neighbourhood centre
- Sport and recreation
- Rural
- Emerging community
- Centre
- Environmental management and conservation
- Recreation and open space
- Mixed use.

According to Queensland Government's *Land use mapping - 1999 to 2017 – Queensland* (2022) data, the primary land use within the Impact area is characterised as '*Urban footprint'* land use (Appendix B Figure 5).

Overall, the Impact area is located within a highly fragmented urbanised environment with substantial areas of urban infrastructure (Appendix B Figure 5). This includes existing roads, railways, residential and industrial development. Historical broad scale clearing for agricultural purposes is also evident across the study area. Natural areas occur primarily as roadside vegetation, parklands and scattered trees. Aside from the natural areas, significant environmental features occur within Acacia Forest Park associated with Karawatha Forest Park, including Gould Adams and Nealdon Park.

3.3 Vegetation communities

DoR RE mapping (Version 11.0, March 2024) and previous ecological reporting was reviewed as part of the desktop assessment, with findings summarised below:

- Under the VM Act desktop assessment, twenty-four (24) REs are recorded within the Impact area. Of these nine (8) are listed as Endangered (12.3.3d, 12.3.3, 12.3.16, 12.5.2a, 12.5.3, 12.5.3a, 12.9-10.12 & 12.11.27), five (5) listed Of Concern (12.9-10.7a, 12.3.8, 12.3.11b, 12.11.14 and 12.3.11) and the remaining listed as Least Concern (Appendix B Figure 6).

- Field verified REs undertaken by GHD (within the ‘subsequent study area’ as outlined in Section 2.4.1) included fourteen (14) different REs (RE 12.3.3, 12.3.11,12.3.6, 12.3.7, 12.3.20, 12.3.8, 12.3.11, 12.3.7, 12.5.3a, 12.9-10.4, 12.3.5, 12.9-10.7a, 12.9-10.17d, 12.11.14)

Within the remnant and high value regrowth vegetation, nine (9) different vegetation communities (REs) were ground truthed, as shown in Table 16 below and Appendix B Figure 8.

Table 16 below also includes the RE’s Broad Vegetation Group[5] (1: 1 million resolution) (BVG) and VM Act Class under Queensland frameworks.

Mapped vegetation communities generally aligned with ground truthed vegetation communities. The majority of changes occurred in vegetation that was mapped as non-remnant and was ground truthed as remnant or high value regrowth vegetation. The extent, condition and dominant species of ground truthed vegetation communities are described in Table 17.

[5] Describes the structural and habitat formation of vegetation communities within Queensland.

Table 16 Ground truthed REs within the Impact area

Vegetation community	BVG	REs	Condition	Area (ha)
Aquatic vegetation usually fringed with *Eucalyptus tereticornis* on closed depressions on alluvial plains.	34d	12.3.7d	Remnant	**0.06**
Corymbia citriodora subsp. variegata or *Corymbia henryi* woodland to open forest	10b	12.11.5	Remnant	**0.98**
			HVR	
			Regrowth	
		12.9-10.19a	Remnant	**0.00**
		12.9-10.17b	Remnant	**0.40**
Eucalyptus crebra, E. tereticornis, Corymbia intermedia grassy woodland on metamorphics	13c	12.11.14	Remnant	**0.32**
Eucalyptus moluccana woodland on margins of Quaternary alluvial plains	13d	12.3.3d	Remnant	**0.49**
			HVR	
Eucalyptus racemosa subsp. *racemosa and Corymbia intermedia* and/or *Eucalyptus seeana* woodland on remnant tertiary surfaces	9g	12.5.3	Remnant	**0.67**
		12.5.3a	HVR	**0.33**
		12.9-10.17c	Remnant	**3.86**
		12.11.27	Remnant	**0.09**
Eucalyptus siderophloia, E. propinqua open forest	9a	12.11.3	Remnant	**1.37**
		12.9-10.17d	Remnant	**2.73**
Eucalyptus tereticornis, *Casuarina cunninghamiana* subsp. *cunninghamiana* +/- *Melaleuca* spp. fringing woodland	16a	12.3.7	Remnant	**4.19**
			Regrowth	
Eucalyptus tereticornis and mixed woodland to open forest on alluvium	16c	12.3.3	Remnant	**1.01**
		12.3.11	Remnant	**2.88**
			HVR	
			Regrowth	
Melaleuca quinquenervia, Eucalyptus and spp. and *Casuarina glauca* open forest on coastal alluvial plains	22a	12.3.6	Remnant	**2.53**
			Regrowth	
Non-remnant vegetation				
Artificial wetlands	-	-	Low value vegetation	**0.28**
Developed vegetated areas	-	-	Low value vegetation	**18.67**
Low mixed regrowth	-	-	Low value vegetation	**0.23**
Parklands	-	-	Low value vegetation	**9.57**
Recent revegetation areas	-	-	Low value vegetation	**0.43**
Urban buildings, roads rail corridor and stations	-	-	Low value to no vegetation	**142.71**
Water	-	-	Water	**0.65**
Total				**194.45**[6]

[6] An inaccuracy of 0.01 may occur, associated with rounding to two values.

Table 17 Ground truthed vegetation communities within the Impact area

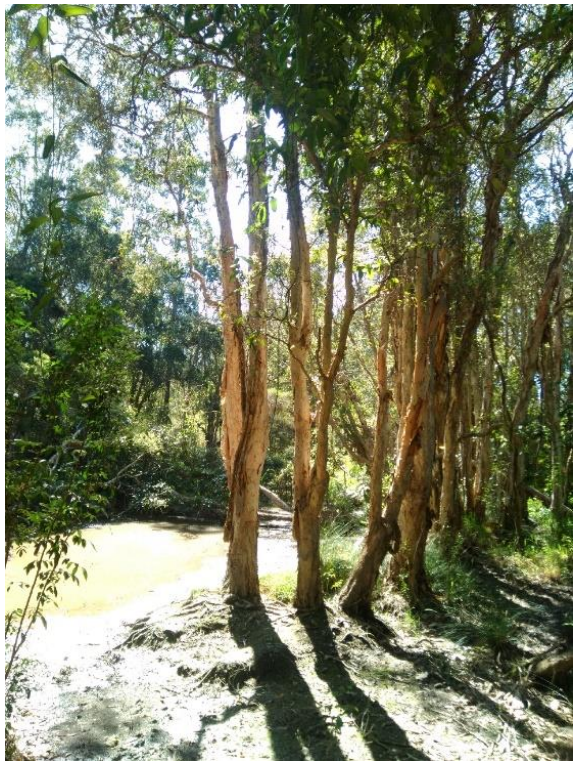
Vegetation community	Description	Image
Spotted gum (*Corymbia citriodora subsp. variegata)* or large-leaved spotted gum (*Corymbia henryi*) woodland to open forest on sedimentary or metamorphic rocks	Woodland to open forest, with mid-dense (30-70%) canopy dominated by *Corymbia citriodora subsp*. v*ariegata, Eucalyptus tereticornis, Corymbia tessellaris* and/or *Corymbia henryi* (T1: 17m), up to 7.2 m is present. The shrub layer is very sparse approximately 2 m tall and is largely absent. Where present, shrub species included *Cupaniopsis anacardioides, Alphitonia excelsa, Acacia disparrima, Mimosaceae spp.,* and *Jagera pseudorhus.* In some location exotic species such as *Pinus elliottii* and *Megathyrsus maximus* dominated. The ground layer predominantly contains native species such as *Themeda triandra, Entolasia stricta* and *Eragrostis.* Analogous with REs 12.11.5, 12.9-10.19a and 12.9-10.17b.	

Vegetation community	Description	Image
Narrow-leaved ironbark (*Eucalyptus crebra*), forest red gum (*E. tereticornis*), pink bloodwood (*Corymbia intermedia*) grassy woodland on metamorphics	*Eucalyptus crebra* dominated grassy woodland on metamorphics. The canopy is mid- dense (60%) and has an average height of 18 m. T1 is dominated by *Eucalyptus. tereticornis, Eucalyptus crebra, Corymbia intermedia* and *Grevillea robusta.* The sub-canopy is sparse (12%) up to 5m tall. A very sparse shrub layer (6%) is present and contains *Acacia disparrima* and *Alphitonia excelsa*. The ground layer is dense with 55% of perennial grass cover including *Eragrostis* sp. and *Sporobolus* sp. The community is dominated with native species with 5% of non-native species cover of *Bidens pilosa*. Analogous with RE 12.11.14	

Vegetation community	Description	Image
Grey box (*Eucalyptus moluccana*) woodland on Quaternary alluvial plains	Open woodland of *Eucalyptus moluccana* up to 30 m tall on alluvial plains. The canopy ranges from sparse to mid-dense (30-70% cover) dominated by *Eucalyptus moluccana.* Other T1 species include *Eucalyptus tereticornis, Lophostemon suaveolens, Eucalyptus siderophloia, Eucalyptus propinqua and Angophora leiocarpa.* Analogous with RE 12.3.3d **Indicator vegetation for TEC:** Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	

Vegetation community	Description	Image
Forest red gum (*Eucalyptus tereticornis*), river sheoak (*Casuarina cunninghamiana* subsp. *cunninghamiana*) +/- paperbarks (*Melaleuca* spp). fringing woodland	Eucalyptus woodland dominated by *Eucalyptus tereticornis*, *Casuarina cunninghamiana* subsp. *cunninghamiana* +/- *Melaleuca* spp, distributed across margins of Quaternary alluvial plains. Open woodland with mid-dense canopy (30-70%). Canopy dominated by *Eucalyptus tereticornis* and *Casuarina cunninghamiana* up 30 m tall, with scattered *Corymbia tessellaris* in some locations. Subcanopy layers are 16 m and 10 m tall respectively, with highly disturbed shrub layer of exotic Chinese celtis (**Celtis sinensis).* Analogous with RE 12.3.7	

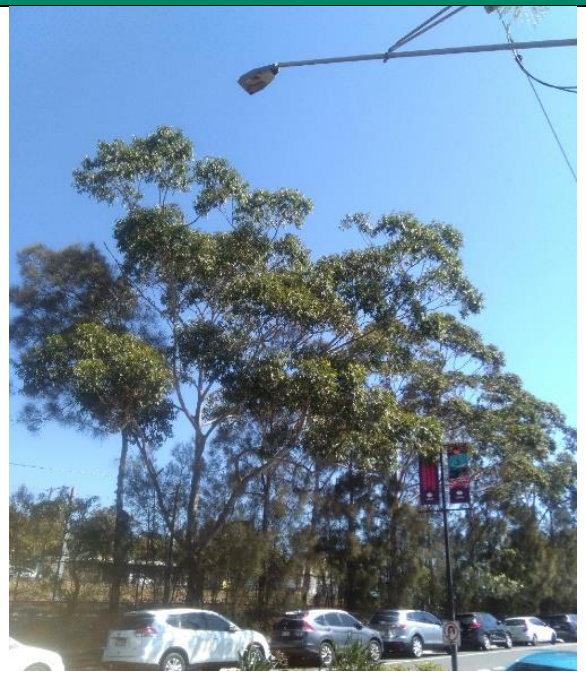
Vegetation community	Description	Image
Forest red gum (*Eucalyptus tereticornis*) and mixed woodland to open forest on alluvium	Eucalyptus open forest distributed along alluvial floodplains. Canopy is 17 m height dominated *by Eucalyptus tereticornis, Corymbia citriodora*, and *Acacia leiocalyx*. Sub canopy is 4 m tall dominated. Highly disturbed community with non-native species including *Cynodon dactylon* recorded in the ground layer. Analogous with RE 12.3.3 and 12.3.11 **RE 12.3.3 indicator vegetation for TEC:** Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	

Vegetation community	Description	Image
Broad-leaved paperbark (*Melaleuca quinquenervia*), gum tree (*Eucalyptus and spp.*) and swamp she-oak (*Casuarina glauca*) open forest on coastal alluvial plains	This community was confined to low level areas occurring alongside a non-perennial watercourse associated with the Logan-Albert drainage basin. *Melaleuca quinquenervia* and *Melaleuca linariifolia* dominated the canopy with sporadic occurrence of slash pine. The canopy is 16.2 m tall dominated by *Melaleuca quinquenervia, Melaleuca linariifolia, Melaleuca bracteata, Eucalyptus carnea and Acacia disparrima* species. The sub-canopy and shrub layer are largely absent. Subcanopy is 5 m height. Analogous with RE 12.3.6	
Swamps with sedges on alluvial plains including sedge subspecies, bulrush, spike rushes	Swamps with canopy dominated by *Neolitsea dealbata* and *Ficus macrophylla.* Subcanopy and shrub layer is generally absent. Ground layer dominated by riparian-associated sedges and forbs *Cyperus spp., Schoenoplectus spp., Eleocharis spp.* and *Persicaria spp.* Analogous with RE 12.3.8	N/A

Vegetation community	Description	Image
Aquatic vegetation usually fringed with forest red gum (*Eucalyptus tereticornis*) on closed depressions on alluvial plains.	Aquatic community largely fringed with *Eucalyptus tereticornis* woodland. Emergent layer is 27 m height dominated with *Eucalyptus tereticornis* species. Canopy and sub canopy are 3 m to 15m n height respectively dominated with *Melaleuca quinquenervia* species. Approximately 20% of plant cover are non-native and comprised of easter cassia (**Senna pendula)*, buffalo grass (**Urochloa mutica)* and *Ageratum houstonianum* spp. Analogous with RE 12.3.7d	

Vegetation community	Description	Image
Grey ironbark (*Eucalyptus siderophloia*), grey gum (*E. propinqua*) open forest on metamorphics	A mixed Eucalyptus open forest. The canopy is 19.2m height dominated by *Eucalyptus siderophloia, Eucalyptus propinqua, Eucalyptus tereticornis* and *Eucalyptus acmenoides* species. Shrub layer is 5.5 m tall predominantly consisting of *Alphitonia excelsa.* Analogous with RE 12.11.3 and 12.9-10.17d	

Vegetation community	Description	Image
Inland scribbly gum, Bugbane (*Eucalyptus racemosa* subsp. r*acemosa*) *and* pink bloodwood (*Corymbia intermedia*) and/or narrow-leaved red gum (*Eucalyptus seeana*) woodland on remnant tertiary surfaces	A mixed Eucalyptus and Acacia mature regrowth community. The canopy ranges between 9-25 m dominated by *Eucalyptus racemosa, Corymbia intermedia, Eucalyptus seeana* species. The height of the subcanopy ranges between 4 to 14m, with native grass generally comprising of *Aristida spp.* Analogous with RE 12.5.3, 12.5.3.a, 12.9-10.17c and 12.11.27	

Vegetation community	Description	Image
Developed vegetated areas	This vegetation community is generally located adjacent public roads and rail corridors, but also included residential backyards. Canopy structure was either sparse or non-existent. *Eucalyptus, Corymbia, Lophostemon* and *Allocasuarina* spp are sporadically scattered throughout. **Known habitat for conservation significant flora within developed areas (vegetated):** macadamia nut and scrub turpentine	

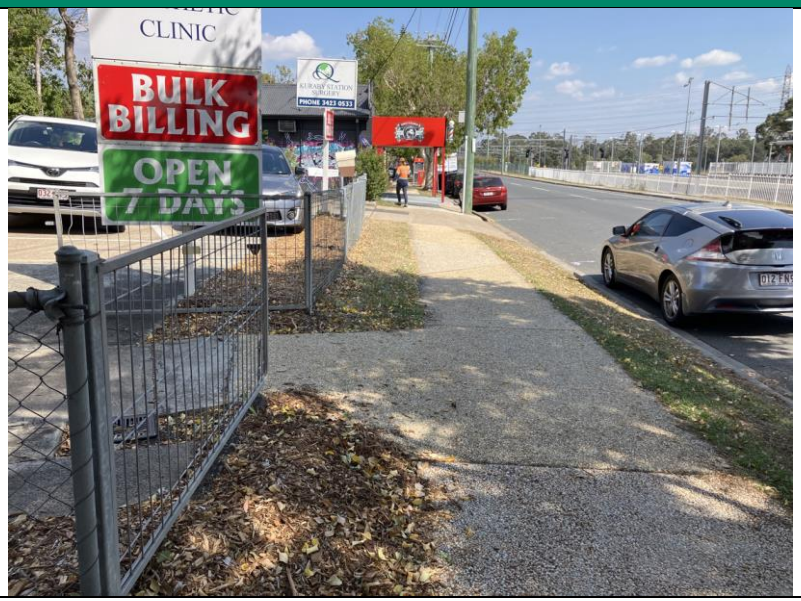
Vegetation community	Description	Image
Parklands	These areas comprised of manicured lawns, with landscaped vegetation of native and exotic shrub and grass species. Scattered mature trees such as *Eucalyptus* spp and/or exotic species also occurred and are likely planted for public amenities.	

Vegetation community	Description	Image
Low mixed regrowth and recent revegetation areas	This vegetation community is most likely due to historic vegetation clearing that was undertaken for linear infrastructure and road construction. The vegetation structure is highly disturbed, with a canopy layer containing both native and invasive flora species, a shrub layer containing native species and a ground layer containing both native and invasive species. The very sparse shrub layer is dominated by regenerating *Eucalypt* spp. and *Acacia* spp. The dense ground layer is dominated by the grasses Paspalum (**Paspalum sp*), Guinea grass (**Megathyrsus maximus*) and Blady grass (*Imperata cylindrica*), as well as occasional Mat rush (*Lomandra sp*).	

* Denotes exotic species.

Vegetation community	Description	Image
Artificial wetlands	These areas support large man-made wetlands, likely for agricultural purposes. Majority of the area is dominated by Cumbungi (**Typha latifolia)* and/or Paspalum (**Paspalum sp*), Guinea grass (**Megathyrsus maximus*) and Blady grass (**Imperata cylindrica*).	

* Denotes exotic species.

Vegetation community	Description	Image
Urban buildings, roads rail corridor and stations	These areas support public roads, rail corridors, stations, and industrial and urban development.	

Vegetation community	Description	Image
Water	Waterbodies, creeks and lakes	

3.4 Native species diversity

The field survey identified the presence of three hundred and thirty-four (334) flora taxa representing eighty-four (84) families. Families represented by four or more genera comprised *Myrtaceae* (60 species), *Leguminosae* (31 species), *Poaceae* (43 species), *Asteraceae* (14 species) and *Laximaceae* (8 species).

Field surveys also identified one hundred and sixty-one (161) fauna species, comprising one hundred and fourteen (114) birds, seventeen (17) mammals, eight (8) reptiles, and twenty-two (22) amphibian and fish species.

The full species list is provided in Appendix E MNES flora and fauna species identified during field surveys are discussed in Section 4.0.

3.5 Introduced flora species

A total of one hundred and thirty-three (133) introduced flora species were recorded within the study area during the field surveys including six of Weeds of National Significance (WONS). These species have been identified as being centrally important among all levels of government, organisations, and individuals with weed management responsibilities. WONS includes:

- Alligator weed *(*Alternanthera philoxeroides)*
- Climbing Asparagus fern *(*Asparagus aethiopicus)*
- Cat's claw creeper *(*Dolichandra unguis-cati)*
- Common lantana *(*Lantana camara)*
- Common Prickly Pear *(*Opuntia stricta)*
- Fire weed (**Senecio madagascariensis)*

3.6 Fauna habitat types

The proposed action is located within an urban environment and supports a mosaic of residential areas, disturbed and undisturbed vegetation, parklands, roads, railways and industrial land. Table 18 below and Appendix B Figure 9 summarises the ground truthed fauna habitat types within the Impact area.

The following dominant fauna habitat types occur within the Impact area:

- The predominant vegetation within the Impact area is highly disturbed and fragmented vegetation occurring in developed areas (that is, residential areas, rail corridor and stations, roads and industrial areas), parkland and sporting fields (Table 18 and Appendix B Figure 9). These areas have experienced prolonged disturbances from development from roads and railways, industrial uses and urban development. Due to its disturbed nature, this fauna habitat type primarily provide habitat and movement pathways for a range of least concern fauna, however also provides potential habitat and movement pathways for conservation significant fauna which are either highly mobile, and/or have large home ranges and/or generalist habitat preferences, such as koala (*Phascolarctos cinereus*), greater glider (southern and central) (*Petauroides volans*), yellow-bellied glider (south-eastern) (*Petaurus australis australis*), grey-headed flying fox (*Pteropus poliocephalus*), swift parrot (*Lathamus discolor*) and south-eastern glossy black cockatoo (*Calyptorhynchus lathami lathami*).
- Despite the high degree of disturbance and urban modification within the Impact area, areas of open Eucalypt woodland in remnant and high value regrowth condition occurs, generally located at Karawatha Forest, Acacia Forest Park, Nealdon Park, Gould Adams Park and Hugh Muntz Gardens (Table 18 and Appendix B Figure 9). This fauna habitat type supports a mixed canopy, good structural and floral diversity and microhabitat features such as hollow trees, logs, woody debris and leaf litter. It also provides habitat and movement pathways for a range of least concern and potential habitat and movement pathways for conservation significant fauna, such as koala (*Phascolarctos cinereus)*, greater glider (southern and central) (*Petauroides volans*), yellow-bellied

glider (south-eastern) (*Petaurus australis australis*), grey-headed flying fox (*Pteropus poliocephalus)*, swift parrot (*Lathamus discolor)*, and south-eastern glossy black cockatoo (*Calyptorhynchus lathami lathami*). The prevailing eucalypt species of this fauna habitat type are winter and spring flowering species such as Blue gum (*Eucalyptus tereticornis),* Lemon scented gum *(Corymbia citriodora),* Narrow-leaved ironbark (*Eucalyptus crebra),* Grey ironbark (*Eucalyptus siderophloia),* Narrow-leaved red gum (*Eucalyptus seeana),* Blackbutt *(Eucalyptus pilularis)* and Broad-leaved ironbark *(Eucalyptus fibrosa)*. These flowering species provide value to MNES such as the grey-headed flying fox (*Pteropus poliocephalus)*, a species dependent on the availability of resources during winter months to fulfil critical parts of their life cycle (Department of Agriculture, Water and Environment, 2021)

- Small areas of wetlands, watercourses and drainage lines occurs within the Impact area, generally around Logan River, Scrubby Creek, Slacks Creek and Spring Creek (Table 18 and Appendix B Figure 10). These areas range in various disturbance levels, and generally contain native and exotic fringing riparian vegetation as well as sedges, rushes a reeds. This fauna habitat type provides habitat for least concern terrestrial and aquatic fauna species, and habitat for conservation significant fauna, such as koala (*Phascolarctos cinereus)*, greater glider (southern and central) (*Petauroides volans*)*,* yellow-bellied glider (south-eastern) (*Petaurus australis australis*), grey-headed flying fox (*Pteropus poliocephalus)*, swift parrot (*Lathamus discolor)*, and south-eastern glossy black cockatoo (*Calyptorhynchus lathami lathami*).

A description and photo of each ground truthed fauna habitat type is outlined in Table 19.

Table 18 Fauna habitat types within the Impact area

Broad fauna habitat type	Fauna habitat type	Condition	Area (ha)	Total area broad fauna habitat type (ha)
Developed areas	Developed Areas (vegetated)	Non-remnant	18.67	**74.6**
	Developed Areas (not vegetated)	Non-remnant	55.93	
Roads, rail corridor and stations	Rail corridor and stations	Non-remnant	61.69	**86.79**
	Roads	Non-remnant	25.10	
Eucalypt woodland to open forest	Eucalypt woodland on sandy plains	Remnant	0.99	**20.18**
		HVR		
	Eucalypt woodland to open forest on alluvial plains	Remnant	10.80	
		HVR		
		Regrowth		
	Eucalypt woodland to open forest on metamorphic soils	Remnant	1.40	
		HVR		
		Regrowth		
	Eucalypt woodland to open forest on sedimentary rocks	Remnant	6.99	
		HVR		
Parkland	Parkland (vegetated)	Non-remnant	3.04	**9.56**
	Parkland (not vegetated)	Non-remnant	6.52	
Regrowth and revegetation	Low mixed regrowth	Regrowth	1.50	**2.33**
		Non-remnant	0.23	
	Recent revegetation areas	Regrowth	0.17	
		Non-remnant	0.43	
Water	Water bodies, creeks and lakes	Water	0.65	**0.65**
Wetland and swamps	Wetlands	Non-remnant	0.28	**0.34**
	Wetlands and swamps	Remnant	0.06	

Broad fauna habitat type	Fauna habitat type	Condition	Area (ha)	Total area broad fauna habitat type (ha)
			Total	**194.45**[7]

[7] An inaccuracy of 0.01 may occur, associated with rounding to two values.

Table 19 Fauna habitat types observed within the Impact area

Fauna habitat type	Habitat characteristics and ecological value
Eucalypt woodland to open forest	
	• Mature mixed Eucalypt canopy including primary koala food tree *Eucalyptus tereticornis* • Dense or isolated patches of *Allocasuarina* within subcanopy • Good floristic diversity and structural complexity • Occurs along or within proximity to permanent watercourses such as Scrubby Creek and Spring Creek, providing habitat for least concern and conservation significant species • Medium to large tree hollows, providing habitat for microbats, birds and reptiles • Logs, woody debris and leaf litter provide complex ground microhabitat • Suitable nesting and foraging habitat for woodland and canopy dwelling birds • Mature trees providing foraging and roosting habitat for microbats species • Dense understorey along riparian corridors • Generally dominated by grassy understorey, with abundance of coarse woody debris and leaf litter • Connectivity to the surrounding landscape, likely to facilitate in fauna dispersal/movement. **Potential habitat for conservation significant species:**, white-throated needletail, koala, glossy black cockatoo, swift parrot, grey-headed flying fox, yellow-bellied glider and greater glider (southern and central), regent honeyeater, spotted-tail quoll

Fauna habitat type	Habitat characteristics and ecological value
Regrowth and revegetation	
	• Isolated patches surrounded by eucalypt woodlands or degraded forest remnants adjacent to developed areas or linear infrastructure • Accumulation of fallen wooden debris where vegetation has been trimmed/felled. • Moderate floral and structural diversity • Potential refuge habitat and movement corridor for least concern and conservation significant fauna • Sub-optimal nesting habitat for a diversity of woodland birds • Small tree hollows occasional, providing habitat for microbats, birds or reptiles • Habitat connectivity and nesting habitat for woodland species • Generally dominated by grassy or exotic understorey, with occasional coarse woody debris and leaf litter • Some connectivity to the surrounding landscape, likely to facilitate in fauna dispersal/movement. **Potential habitat for conservation significant species:** white-throated needletail, koala, south-eastern glossy black cockatoo, swift parrot, grey-headed flying fox, yellow-bellied glider, greater glider (southern and central), regent honeyeater, spotted-tail quoll

Fauna habitat type	Habitat characteristics and ecological value
Parkland	
	• Large open spaces with sporadic native and exotic trees and shrubs, usually in landscaping context • Occasional remnant Eucalypt canopy trees • Ground layer dominated by mowed lawn and slashed pasture grasses • Medium or small tree hollows occasional, providing habitat for microbats, birds or reptiles • Low-moderate floral and structural diversity • Animal breeding places observed include nests, hollow bearing trees, ground hollow and termitarium moulds with hollows present • Fauna movement corridors within fragmented urban context • High disturbance from edge effects and exotic flora • Low levels of coarse woody debris and fallen leaf litter • Moderate threats to native fauna from domestic dogs and cats • Regular use by community for dog walking and recreational activities **Potential habitat for conservation significant species:** white-throated needletail, koala, south-eastern glossy black cockatoo, swift parrot, grey-headed flying fox, yellow-bellied glider, greater glider (southern and central), regent honeyeater, spotted-tail quoll

Fauna habitat type	Habitat characteristics and ecological value
Developed areas	
	• Isolated patches surrounded by eucalypt woodlands, roads, railway, parkland and sporting fields • Cleared areas with sporadic Eucalypt or exotic canopy trees • Tree hollows generally absent • High exposure to noise, light • High disturbance from edge effects and exotic flora • Potential fauna movement corridors • Lack of shrub and ground layers, coarse woody debris and leaf litter • High threat to native fauna from domestic dogs and cats. **Potential habitat for conservation significant species:** white-throated needletail, , koala, south-eastern glossy black cockatoo, swift parrot, grey-headed flying fox, yellow-bellied glider, greater glider (southern and central), spotted-tail quoll, regent honeyeater

Fauna habitat type	Habitat characteristics and ecological value
Roads, rail corridor and stations	
	• Large patches surrounded by eucalypt woodlands, agricultural areas or parklands • Comprised of residential areas, industrial areas, roadside vegetation, rail corridor and stations, roads • Cleared or hardstand areas with sporadic Eucalypt or exotic canopy trees • Tree hollows generally absent • Very high disturbance from urban development, vehicle strikes, edge effects, exotic/landscaped flora, noise and light, human disturbance • Lack of shrub and ground layers, coarse woody debris and leaf litter • High threat to native fauna from domestic dogs and cats. **Potential habitat for conservation significant species:** white-throated needletail, , koala, south-eastern glossy black cockatoo, swift parrot, grey-headed flying fox, yellow-bellied glider and greater glider (southern and central), spotted-tail quoll

Fauna habitat type	Habitat characteristics and ecological value
Water	
	• Watercourses supporting fringing native and exotic riparian vegetation • Eucalypt and occasional exotic canopy trees present • Medium to large tree hollows present, providing habitat for birds, microbats and reptiles • Moderate floristic diversity and structural complexity • Foraging, drinking and breeding habitat for native and exotic fauna • Logs, woody debris and leaf litter provide ground microhabitat • Dominated by understorey with native and exotic grasses, sedges and reeds, with some coarse woody debris and leaf litter • Habitat continuity and connectivity along the edges, providing fauna movement /dispersal pathways • Fauna movement pathways to surrounding eucalypt woodland, agricultural areas, parklands or wetland. **Potential habitat for conservation significant species:** Mary river cod, white-throated needletail, koala, south-eastern glossy black cockatoo, swift parrot, grey-headed flying fox, yellow-bellied glider, greater glider (southern and central), regent honeyeater, spotted-tail quoll

Fauna habitat type	Habitat characteristics and ecological value
Swamps and wetlands	
	• Open ephemeral and permanent water with shallow margins of soft sandy and muddy substrate • Fringing Allocasuarina or Eucalypt canopy • Tree hollows generally absent • Margins and instream vegetation dominated by sedges, rushes and reeds • Foraging, drinking and breeding habitat for native and exotic fauna • Fauna movement pathways to surrounding eucalypt woodland, agricultural areas, parklands or water **Potential habitat for conservation significant species:** Australian painted snipe, Mary river cod, white-throated needletail, koala, south-eastern glossy black cockatoo, swift parrot, grey-headed flying fox, yellow-bellied glider, greater glider (southern and central), regent honeyeater, spotted-tail quoll

3.7 Introduced fauna species

Twelve (12) introduced fauna species were recorded during field surveys, one of which is restricted under the Biosecurity Act, European carp *(Cyprinus carpio).* Observed introduced fauna species included:

- Cane toad (*Rhinella marina*)
- Northern mallard (*Anas platyrhynchos*)
- Spotted dove (*Spilopelia chinensis*)
- Common myna (*Sturnus tristis*)
- Indian myna (*Acridotheres tristis*)
- Mosquitofish *(Gambusia holbrooki)*
- Mozambique Tilapia *(Oreochromis mossambicus)*
- *European carp (Cyprinus carpio)*
- Southern platyfish (*Xiphophorus maculatus)*
- Swordtail *(Xiphophorus helleri)*
- Bony bream *(Nematalosa erebi)*
- European fox (*Vulpes vulpes*).

However, given the disturbed and fragmented nature of the Impact area, other introduced fauna species likely to occur include:

- Feral cats (*Felis catus*)
- Wild/domestic dog *(Canis lupus familiaris)*
- Black rat (*Rattus rattus*)
- Pigs (*Sus scrofa*)
- European brown hare (*Lepus europaeus*)
- Rabbit (*Oryctolagus cuniculus*).

3.8 Wetlands and watercourses

The Impact area intersects approximately twenty-one (21) minor and major watercourses, as well as drainage features[8] (Appendix B Figure 10). The following four (4) major permanent watercourses including fish passage risk rating[9] intersecting the Impact area includes:

- Logan River (stream order 7 and tidal waterway for fish passage)
- Spring Creek (stream order 1 and low risk waterway for fish passage)
- Slacks Creek (stream order 2 and high -risk waterway for fish passage)
- Scrubby Creek (stream order 3 and high-risk waterway for fish passage).

The major watercourses generally traverse in a west to east direction. An additional seventeen (17) smaller permanent/ephemeral minor watercourses and drainage features intersect the Impact area in a west to east direction and flow into the four major watercourses (Appendix B Figure 10). No Ramsar wetlands intersect the Impact area. However, the PMST Report identified one Wetland of International

[8] According to *Queensland's Water Act 2000*.
[9] That is, risk rating according to Queensland waterway for waterway barrier works mapping according to Queensland's *Fisheries Act 1994*.

Importance, the Moreton Bay Wetlands Ramsar wetland located 15-20 km downstream from the Impact area with the major watercourses hydrologically connected into the Moreton Bay Wetland.

The Impact area intersects HES wetlands mapped under the Queensland EP Act at the following locations:

- Scrubby Creek between Gould Adams Park and Nealdon Park.
- Logan River at Edens Landing, South of Logan River Kiewa Drive Park.
- Holmview, East of Proposed Road, West of Chapman Drive.

Aquatic ecological values were assessed during targeted field surveys at Spring Creek, Slacks Creek, Scrubby Creek, the Logan River and associated tributaries including an unnamed tributary of the Albert River (Appendix B Figure 10). A summary of the aquatic ecological values is as follows:

- The majority of watercourses and wetlands within the Impact area are highly disturbed, however contain some native vegetation and fauna habitat (see Appendix B Figure 9 for a summary of fauna habitat values).
- The Logan River predominantly contained areas of runs (i.e. flow) with some sandy/silty pools in low flow areas along the edge. Other watercourses and drainage features comprise of limited or absent flow with limited macrohabitat features, predominantly silty/clay substrate with some rocky substrates, varying in complexity from pebbles/gravel to large boulders.
- The majority of watercourses had relatively low slopes and were well vegetated with native or exotic vegetation, with low levels of erosion. However, Slacks Creek, Scrubby Creek between Gould Adams and Nealdon Park, Logan River and Albert River near Hugh Muntz Gardens Park were impacted by surrounding land uses (e.g. partially cleared for agricultural/residential dwellings) and comprised lower bank stability with steep side slopes. No conservation significant aquatic species (fish, turtles) species were recorded during targeted aquatic surveys. Assemblages of aquatic fauna species such as native and invasive fish species and freshwater eels and turtles were observed during targeted field surveys.

3.9 Landscape connectivity

Several regional and state terrestrial and riparian biodiversity corridors[10] are mapped within the Impact area. The following four (4) biodiversity corridors are mapped in a north to south direction intersecting the Impact area, as shown in (Appendix B Figure 11).

- Approximately 62 ha of a mapped State significant terrestrial corridor, surrounding Karawatha Forest Park/Acacia Forest Park
- Approximately 62 ha of mapped regionally significant terrestrial corridor, surrounding Gould Adams Park and Nealdon Park
- Approximately 26 ha of a mapped State significant riparian and terrestrial corridor, surrounding Logan River
- While biodiversity corridors are mapped within the Impact area, the Impact area has been subject to severe disturbances and fragmentation for urban development, agriculture, industrial and linear infrastructure. Fauna movement throughout the Impact area is largely restricted to small, fragmented patches providing ‘stepping stone’ movement opportunities within urban environment, comprising fenced residential dwellings, roads, railways, grazing and cropping lands and industrial areas. In addition to the mapped biodiversity corridors, results from targeted field surveys identified the following two ground truthed fauna movement corridor intersecting the Impact area at the following locations (Appendix B Figure 11):

[10] Biodiversity corridors are also called wildlife corridors, which are connections across the landscape that link up areas of habitat. They support natural processes that occur in a healthy environment, including the movement of species to find resources, such as food and water Department of Climate Change, Energy, the Environment and Water, (2024) https://www.dcceew.gov.au/environment/biodiversity/conservation/wildlife-corridors).

- Approximately 0.67 ha, located on the northern, southern and eastern sections surrounding Gateway Motorway near Beenleigh Park and Wally Tate Park in Kuraby
- Landscape connectivity modelling has been undertaken within and surrounding the Impact area considering structural and functional connectivity. See Appendix G for details on methodology and results. The modelling provides information for the following types of fauna movement barriers and pathways based on assigning movement ‘resistance’ values to infrastructure and fauna habitat types within and surrounding the Impact area:
- Yellow indicates diffusion i.e. species movement is unimpeded
- Blue indicates channelled flow i.e. species movement is narrowed to conduits
- Red indicates impeded flow i.e. species movement is restricted.

Landscape connectivity modelling was undertaken for koala, and greater glider (southern and central) and yellow-bellied glider (south-eastern) (gliders), since they were assessed to most at risk of connectivity impacts as a result of the proposed action. The landscape modelling method was found to be effective in providing spatial and temporal analysis of species movement and ecological connectivity for linear infrastructure projects. Please refer to Section 5.4 of this report for a discussion of the proposed action’s potential impact to koala and glider movement patterns using landscape connectivity modelling results.

4.0 MNES Likelihood of occurrence

4.1 World heritage properties

There are no world heritage properties mapped within the Impact area or within the 5 km of the Impact area (i.e. study area). As such, no direct or indirect impacts to World heritage properties are expected as a result of the proposed action.

4.2 National heritage places

There are no national heritage properties mapped within the study area. As such, no direct or indirect impacts to National heritage places are expected as a result of the proposed action.

4.3 Wetlands of international importance (Ramsar)

No Ramsar wetlands intersect the Impact area. However, one Wetland of International Importance, the Moreton Bay Ramsar Wetlands, occurs approximately 15-20 km downstream of the study area. Whilst major watercourses outlined in Section 3.8 are hydrologically connected to the Moreton Bay Wetland, direct impacts are unlikely to occur as a result of the proposed action given the distance and it being separated by the Logan Central Business District and residential dwellings. Indirect impacts (refer Section for 5.2.2.4) will be managed through the implementation of control measures described in the OEMP.

4.4 Great Barrier Reef Marine Park (GBRMP)

The proposed action is approximately 16 km inland and 350 km from the southern extent of the GBRMP. As such, direct and indirect impacts to GBRMP as a result of the proposed action are unlikely.

4.5 Commonwealth marine area

There are no Commonwealth marine areas mapped within the study area. As such, no direct or indirect impacts to Commonwealth marine areas are expected as a result of the proposed action.

4.6 Threatened Ecological Communities (TEC)

Table 20 below summarises the nine TECs identified from the PMST Report with the potential to occur within the study area, their indicator REs (vegetation communities) with the SEQ bioregion and likelihood outcome based on ground truthed vegetation from targeted field surveys.

Table 20 Threatened Ecological Communities assessed with the potential to occur within Impact area

Name	EPBC Act status	Indicator REs within SEQ bioregion	Likelihood outcome (AECOM, 2024)
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	E	12.3.3a, 12.3.3, 12.3.3d, 12.3.19, 12.3.20, 12.3.10 and 12.3.18.	**Present** Ground truthed RE 12.3.3 and/or 12.3.3d that meet TEC's key diagnostic characteristics and condition thresholds within or adjacent (within 500 m) of the Impact area at Gould Adams Park/Nealdon Park
Grey box-grey gum wet forest of subtropical eastern Australia	E	12.9-10.3, 12.8.14a, 12.8.8a	**Not present** Not recorded within the Impact area, and no indicator REs present within or immediately adjacent to Impact area.

Name	EPBC Act status	Indicator REs within SEQ bioregion	Likelihood outcome (AECOM, 2024)
Swamp Tea-tree (*Melaleuca irbyana*) Forest of South-east Queensland	CE	12.9–10.11 and 12.3.3c	**Not present** Not recorded within the Impact area, and no indicator REs present within or immediately adjacent to Impact area.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	11.3.23, 11.3.26, 11.5.20, 11.8.2, 11.8.2a, 11.8.8, 11.9.9a, 11.9.13, 12.8.16, 13.3.1, 13.3.4, 13.9.2, 13.11.2, 13.11.3, 13.11.4, 13.11.8, 13.11.8a,13.12.8, 13.12.9	**Not present** Not recorded within the Impact area, and no indicator REs present within or immediately adjacent to Impact area.
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	E	12.2.7, 12.3.4, 12.3.4a, 12.3.5, 12.3.6, 12.3.20 (only parts not dominated by *Casuarina glauca*).	**Not present** Indicator RE's 12.3.6 ground truthed within Impact area, however patches do not meet TEC's key diagnostic characteristics and conditions thresholds.
Lowland Rainforest of Subtropical Australia	CE	12.3.1, 12.5.13, 12.8.3, 12.8.4, 12.8.13, 12.11.1, 12.11.10, 12.12.1, 12.12.16	**Not present** Not recorded within the Impact area, and no indicator REs present within or immediately adjacent to Impact area.
Subtropical and Temperate Coastal Saltmarsh	V	12.1.2	**Not present** Not recorded within the Impact area, and no indicator REs present within or immediately adjacent to Impact area.
Poplar Box Grassy Woodland on Alluvial Plains	E	11.3.2, 11.3.17, 11.4.7, 11.4.12, 12.3.10	**Not present** Not recorded within the Impact area, and no indicator REs present within or immediately adjacent to Impact area.
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	E	12.1.1 and 12.3.20	**Not present** Indicator RE 12.3.20 ground truthed within Impact area, however patches do not meet TEC's key diagnostic characteristics and conditions thresholds.

[1]Conservation status of TEC under the EPBC Act: CE = Critically Endangered, E = Endangered, V = Vulnerable

As outlined in Table 20, TEC Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions (subtropical floodplain eucalypt TEC) occurs within (Appendix B Figure 14):

- **Hugh Muntz Gardens:** While approximately 3.56 ha of subtropical floodplain eucalypt TEC occurs in Hugh Muntz Gardens within the vicinity of the Impact area, it is approximately 500 m from proposed vegetation clearing and construction activities. As such, this patch is considered sufficiently distant that direct or indirect impacts are unlikely.
- **Gould Adams Park/Nealdon Park**: Seven TEC patches (I-VII) were ground truthed in good to moderate condition (classes B3, C1 and C2) within and adjacent to the Impact area. Direct impacts are proposed to occur to a maximum of 1.30 ha total over four TEC patches (I – Class B3, IV – Class C1, V – Class B3 and VII – Class C1), and a 4.80 ha total buffer zone (that is, 50 m from the boundary of clearing) has been has been applied for five patches (I – Class B3, III – Class B3, IV – Class C1, V – Class B3 and VII – Class C1). The buffer zone applied enables the assessment of potential indirect impacts (for example, impacts arising from any new edge effects, alteration of hydrology, weed incursion). Additional assessment according to TEC patches is provided in Section 5.2.1.

A highly conservative approach was undertaken assigning TEC condition class. As such, even if a TEC patch did not meet all criteria for a condition class, the highest possible condition class was assigned. All patches of subtropical floodplain eucalypt TEC within Gould Adams Park/Nealdon Park did not meet thresholds for higher condition classes (Class A1, A2, B1 and B2) due to the extent of exotic cover and lower density of large trees per hectare, and < 5 native arboreal species observed during diurnal and nocturnal targeted fauna surveys. Subtropical floodplain eucalypt TEC at Gould Adams Park/Nealdon Park is presented in Plate 1, Plate 2 and Plate 3. The locations of TEC patches and the condition classes at Gould Adams Park/Nealdon Park is provided in Appendix B Figure 14, page 9.

Limited native vegetation buffer surrounds the TEC; and where it occurs, adjoining native vegetation did not meet the TEC's key diagnostic characteristics or conditions classes, however can also be considered important to the survival of the ecological community as per the TEC's Conservation Advice (Department of Climate Change Energy the Environment and Water, 2022).

Historic and current threats and degradation are evident in all TEC patches (Plate 1, Plate 2 and Plate 3), with fragmentation leading to isolated patches in modified urban landscape. In particular, historical clearing and thinning likely for grazing purposes from 1976 has occurred to patches III, IV, V and VII. All TEC patches are currently exposed to indirect impacts including hydrological changes from adjacent urban/industrial development with edge effects, weed incursion, altered fire regimes, invasive fauna, disturbance from urbanisation and recreational activity and potentially urban heat island effects. Conversely, historical images (provided in Appendix F) outlines remaining remnants of TEC patches have been islands within an urban matrix for decades (that is, since 1976 and for at least 48 years) and have persisted with relatively good condition and integrity (that is, TEC patches remain as class B3 that is habitat critical to the survival of the community, as well as class C1 and C2), with the exception of the edge's adjacent to linear infrastructure and development.

A Significant Impact Assessment to assess the proposed action's potential direct and indirect impacts to subtropical eucalypt floodplain TEC within Gould Adams Park/Nealdon Park has been undertaken within direct impact areas and a 50 m buffer zone from the boundary of clearing (Appendix F). Results from the SIA indicated that the proposed action is unlikely to have a significant impact on subtropical floodplain eucalypt TEC within Gould Adams Park/Nealdon Park.

Plate 1 **Ground truthed RE 12.3.3 adjacent to Impact area at Gould Adams Park/Nealdon Park, comprising floodplain eucalypt TEC in moderate to good condition.**

Plate 2 **Ground truthed RE 12.3.3 adjacent to Impact area at Gould Adams Park/Nealdon Park, comprising subtropical floodplain eucalypt TEC in moderate to good condition.**

Plate 3 **Ground truthed RE 12.3.3 within Impact area at Gould Adams Park/Nealdon Park, comprising subtropical floodplain eucalypt TEC in moderate to good condition.**

Plate 4 **Ground truthed RE 12.3.3 within Impact area at Gould Adams Park/Nealdon Park, showing dense layer of *cat's claw creeper.**

Plate 5 Ground truthed RE 12.3.3 within Impact area at Gould Adams/Battle Park, showing previous clearing and lack of native perennial native understorey vegetation.

Plate 6 **Ground truthed RE 12.3.3 within Impact area at Hugh Muntz Gardens, comprising subtropical floodplain eucalypt TEC in good condition.**

Plate 7 **Ground truthed RE 12.3.3 within Impact area at Hugh Muntz Gardens, comprising subtropical floodplain eucalypt TEC in good condition.**

4.7 Threatened flora

Forty-three (43) threatened flora species were identified in the PMST report (Appendix A) with the potential to occur. Of these, three (3) flora species were observed within or directly adjacent to the Impact area during the targeted field survey program (Appendix B Figure 11):

- Macadamia nut (*Macadamia integrifolia)*, listed as Vulnerable under the EPBC Act
  - Six (6) macadamia nut individuals were recorded by GHD (2021) in Lot 2 on RP897149 approximately 10 m west outside of the proposed Impact area. Two (2) individuals were recorded within the Impact area (AECOM, 2024) in Lot 249 on RP172249 and Lot 12 on RP115813. Macadamia nut observed by AECOM and GHD are not considered to be 'in the wild', since they were either actively being managed as amenity vegetation, or located in residential backyards and likely planted stock (Department of Environment and Science, 2020) (Appendix B Figure 11, page 7)
- Angle-stemmed myrtle (*Gossia gonoclada*), listed as Endangered under the EPBC Act
  - One (1) individual was recorded within Lot 9 on SP307207 approximately 14 m west of the Impact area (Appendix B Figure 11, page 15)
- Scrub turpentine (*Rhodamnia rubescens*), listed as Critically Endangered under the EPBC Act
  - One (1) individual was recorded by GHD (2021) in Lot 2 on RP897149 approximately 10 m west outside of the proposed Impact area. The individual recorded was juvenile within a tree guard and in very poor health with only a few leaves remaining. Based on this, the species is not considered to be 'in the wild' and unlikely to become part of a self-sustaining 'relatively natural ecological community'.

A detailed likelihood of occurrence assessment is provided in Appendix C. No additional threatened flora species have the 'potential to occur' within the Impact area, due to lack of suitable habitat and no observations of these additional threatened flora species (further outlined in Appendix C).

Table 21 below summarises the ground truthed habitat and number of individuals of threatened flora observed within the Impact area.

Table 21 Ground truthed habitat for threatened flora known within the Impact area

Species	Number of individuals observed within the Impact area	Ground truthed habitat (ha)
Angle-stemmed Myrtle (*Gossia gonoclada*)	0[11]	0.00
Macadamia nut[12] (*Macadamia integrifolia*)	2 (AECOM, 2024) and 6 (GHD, 2021)	0.016
Scrub turpentine[13] (*Rhodamnia rubescens)*	1 (GHD, 2021)	0.01

[11] Individual observed approximately 14 m outside the Impact area.
[12] Not 'in the wild'.
[13] Not 'in the wild'.

4.8 Threatened fauna

Seventy-eight (78) threatened fauna species were identified in the PMST report (Appendix A) with the potential to occur. Of these, two (2) threatened fauna species were observed within or directly adjacent to the Impact area during the targeted field survey program:

- Koala (*Phascolarctos cinereus*), listed as Endangered under the EPBC Act
  - Two (2) adult male koalas were detected during targeted thermal drone surveys undertaken by Endeavour Veterinary Ecology. One individual was located in bushland within Gould Adams Park approximately 4 m west of the Impact area. The second koala was located in Karawatha Forest Park approximately 317 m west of the Impact area, where a known small population of koala occurs. Both locations were located in mapped biodiversity corridors (Section 3.9) comprising bushland reserves (Appendix B Figure 16, pages 5 and 9)
- Grey-headed flying fox (*Pteropus poliocephalus),* listed as Vulnerable under the EPBC Act
  - Individuals were observed within mixed camps of black flying fox *(Pteropus alecto)* within three (3) different locations (Voyager Drive, Kuraby and Jacaranda Avenue, Kingston). Of these, only two (2) camps were located within the Impact area at Voyager Drive, Kuraby and Jacaranda Avenue, Kingston (Appendix B Figure 19, pages 3 and 8). The third camp at Ridgewood Reserve was located approximately 158 m west from the Impact area. All three camps are likely to be temporary due to the low numbers (that is, generally < 100) and intermittent occurrence during the targeted field surveys. These camps are not listed on the National Flying fox Monitoring Viewer and are unlikely to meet the criteria of a 'nationally important camp'[14] as defined in the National Recovery Plan (Commonwealth of Australia, 2021).

A likelihood of occurrence assessment was conducted for the remaining species identified in the desktop assessment with the 'potential' to occur. This evaluation was based on targeted survey results, an assessment of preferred species' habitats, evaluation of the type and condition of habitats present within and surrounding the Impact area, proximity of publicly available records (shown in Appendix B Figure 8) and outcomes from previous ecological assessments by GHD and Ausecology (Section 2.4). It was assessed that eight (8) threatened fauna species have the 'potential to occur' within the Impact area as shown below in Table 22.

A detailed likelihood of occurrence assessment is detailed in Appendix C.

Table 22 Threatened fauna species assessed with the potential to occur

Common name	Scientific name	EPBC Act status	Source
Australian painted snipe	*Rostratula australis*	E	PMST, ALA, WildNet
Greater glider (southern and central)	*Petauroides volans*	E	PMST, ALA, WildNet
Mary River cod	*Maccullochella mariensis*	E	PMST
Regent honeyeater	*Anthochaera phrygia*	CE	PMST, ALA, WildNet
South-eastern glossy black cockatoo	*Calyptorhynchus lathami lathami*	V	PMST, ALA, WildNet
Spotted-tailed quoll (southern sub-species)	*Dasyurus maculatus maculatus*	E	PMST, ALA
Swift parrot	*Lathamus discolor*	CE	PMST, ALA, WildNet

[14] Those that have contained ≥ 10,000 Grey-headed Flying-foxes in more than one year in the last 10 years or have been occupied by more than 2,500 Grey-headed Flying-foxes permanently or seasonally every year for the last 10 years criteria of a 'nationally important camp' as defined in the National Recovery Plan (Commonwealth of Australia, 2021).

Common name	Scientific name	EPBC Act status	Source
Yellow-bellied glider (south eastern)	*Petaurus australis australis*	V	PMST
White-throated needletail	*Hirundapus caudacutus*	V, Mi	PMST, WildNet, ALA

[1]Conservation status of threatened fauna under the EPBC Act: CE = Critically Endangered, E = Endangered, V = Vulnerable

Table 23 below summarises ground truthed habitat for threatened fauna known and with the potential to occur within the Impact area, including direct impact areas, functionally lost areas and indirect impact areas for grey-headed flying-fox. Further details about functionally lost and indirect impact areas are discussed in Section 6.4 of this report and Appendix F.

Note, a high level of conservatism in mapping threatened fauna habitat has been undertaken.

Table 23 Ground truthed threatened fauna habitat known and assessed with the potential to occur within and adjacent to the Impact area

Species	Likelihood	Potential habitat utilisation	Ground truthed habitat (ha)	Total ground truthed habitat (ha)[15]
Australian painted snipe (*Rostratula australis*)	Potential	Breeding (marginal), foraging and dispersal	0.98	0.98
White-throated needletail (*Hirundapus caudacutus)*	Likely	Foraging and dispersal	51.70	51.70
Greater glider (southern and central) (*Petauroides volans)*	Potential	Breeding	21.40	34.89
		Foraging	7.52	
		Dispersal	5.97	
Grey-headed flying fox (*Pteropus poliocephalus*)	Known	Breeding/Roosting	0.54	45.33
		Foraging/Dispersal	42.60	
		Breeding/Roosting (indirect)	2.20	
Koala (combined populations of Qld, NSW and the ACT) (*Phascolarctos cinereus*)	Known	Breeding/Foraging	27.48	107.74
		Shelter/Dispersal	80.27	
Mary River cod *(Maccullochella mariensis)*	Potential	Breeding/ Foraging/ Dispersal	0.65	0.65
Regent honeyeater (*Anthochaera phrygia*)	Potential	Foraging and dispersal	42.28	42.28
South-eastern glossy black cockatoo (south-eastern) (*Calyptorhynchus lathami lathami*)	Potential	Breeding	18.91	41.74
		Breeding and Foraging	7.13	
		Foraging	2.19	
		Dispersal	13.51	
Spotted-tailed quoll (southern sub-species) (SE mainland population) (*Dasyurus maculatus maculatus*)	Potential	Breeding/ Foraging/ Dispersal	26.20	26.20
Swift parrot (*Lathamus discolor*)	Potential	Foraging and dispersal	42.28	42.28

[15] Due to rounding to two decimal places, rounding errors of < 0.01 ha may occur.

Species	Likelihood	Potential habitat utilisation	Ground truthed habitat (ha)	Total ground truthed habitat (ha)[15]
Yellow-bellied glider (south-eastern) (*Petaurus australis australis*)	Potential	Breeding	21.40	34.89
		Foraging	7.52	
		Dispersal	5.97	

[1]Conservation status of threatened fauna under the EPBC Act: CE = Critically Endangered, E = Endangered, V = Vulnerable

4.9 Migratory fauna

DCCEEW has advised assessments for migratory species are not required, as the controlled action decision for the proposed action did not include listed migratory species as a controlling provision. The conservation status of MNES listed under the EPBC Act at the time of the DCCEEW referral decision (i.e. 9 March 2023) are considered for the proposed action. In particular, Latham's snipe (*Gallinago hardwickii*) was listed as migratory at the time of DCCEEW referral decision. While the species has been uplisted to Vulnerable on the 5th January 2024, it is considered a migratory species for the proposed action, and therefore not a controlling provision.

Results from the targeted field survey program are that three (3) migratory species were observed within or directly adjacent to the Impact area during the targeted field survey program (Appendix B Figure 11):

- Latham's snipe (*Gallinago hardwickii*)
  - One (1) individual observed in disturbed wetland habitat within the Impact area (Lot 7 on SP145849) (Appendix B Figure 11):
- Spectacled monarch (*Symposiachrus trivirgatus*)
  - One (1) individual observed within open eucalypt woodland on sandy plains approximately 13 m east of the Impact area (Lot O on SP248979)
- Glossy ibis (*Plegadis falcinellus*)
  - One (1) individual observed in wetland habitat within the Impact area (Lot 7 on SP145849).

5.0 Potential impacts

Potential impacts to conservation significant species and communities[16] may occur during the proposed action, comprising either direct impact (e.g., through vegetation loss) or indirect impacts (e.g., through introduction of weeds). The following section summarises the “nature, likelihood consequence and extent of impacts (including direct, indirect and facilitated impacts), including timing and whether the impact is temporary or permanent”.

The Impact area covers an area of 194.45 ha, and is shown in Figure 1.The Impact area is considered a ‘worst-case’ scenario in terms of assessing the potential impacts to conservation significant species and communities by the proposed action.

5.1 Temporary and permanent impacts

Direct impacts to vegetation and habitat during construction are considered to be permanent in nature. Indirect impacts during construction are considered to be temporary in nature, with construction predicted to be staged over five years between 2025 and 2030.

Temporary works for the proposed action are **conservatively assessed** to result in permanent impacts. In order to limit temporary laydown areas, the following approaches will be undertaken to:

- Maximise offsite pre-fabrication to minimise temporary laydown areas
- Exhaust opportunities to site temporary laydowns within previously cleared areas within the Impact area.
- Colocate temporary laydowns within future permanent footprint.
- Temporary access tracks are to be accessed via existing main and local roads – or captured within the permanent footprint.

In all instances, the size of temporary laydowns will be kept to the minimal amount needed and sited with strict consideration around avoiding fauna movement areas and key environmental sensitivities.

5.2 Construction phase

The greatest risk of potential impact to MNES values from the proposed action will occur during the construction phase. Construction activities will occur for approximately five years to support the installation of the 18.7 km rail corridor, station upgrades and associated access tracks including vegetation clearing, ground disturbance, earthworks, construction of hydrology/drainage features (e.g. culverts), and establishment of temporary construction compounds and laydown areas. Direct and indirect impacts potentially associated with these activities, and in the absence of mitigation measures are described below.

5.2.1 Direct impacts

5.2.1.1 Vegetation clearing and loss of habitat for conservation significant species and communities

The proposed action is located within an urban environment and approximately 90 % supports a mosaic of residential areas and developed areas including the existing rail corridor and stations comprising of non-remnant and regrowth vegetation (Appendix B Figure 8). Historical broad scale clearing for agricultural purposes is also evident. Approximately 10%, which is remaining of the Impact area, comprises remnant vegetation, high value regrowth, and water (Appendix B Figure 8). Despite the high degree of disturbance and clearing within the Impact area from residential and industrial development, areas of ecological value generally remain in remnant vegetation within Acacia Forest Park, Karawatha Forest Park, including Gould Adams Park/Nealdon Park.

The Impact area is primarily aligned to the existing operational rail corridor, roads and areas of disturbed urban vegetation, which has been subject to previous vegetation removal and ground

[16] That is, listed threatened flora/fauna species, migratory fauna and Threatened Ecological Communities.

disturbance for rail infrastructure development. Vegetation immediately surrounding the rail corridor is managed exotic grassland surrounded by high safety/security fencing. Beyond the boundary of the rail corridor, the proposed action proposes to impact disturbed urban vegetation primarily located within industrial and residential developed areas, and parkland and sporting fields, and native vegetation (mainly remnant and high value regrowth). The design of the proposed action has been developed and refined to maximise use of disturbed areas, co-locate and site existing infrastructure, to avoid and minimise further vegetation clearing wherever feasible. However, due to the location of the existing railway line, disturbance to vegetation and habitat for conservation significant species and communities is not completely unavoidable.

Potential impacts resulting from vegetation clearing and loss of habitat for conservation significant species and communities as a result of the proposed action may include:

- Reduced patch size of vegetation communities potentially compromising the viability of the community and associated habitat
- Loss of habitat causing a reduction in biological diversity or loss of local populations and genotypes
- Increase in edge effects, leading to fragmentation, increase in light and noise penetration, alterations in microclimates, and increased weed/pest incursion
- Loss of floristic diversity and the food resources this provides such as foliage, flowers, nectar, fruit and seeds
- Destruction of abiotic features necessary to support vegetation communities and habitat types
- Direct displacement of fauna from the Impact area, an overall reduction in fauna diversity and/or loss of local populations

The maximum extent of vegetation and habitats proposed to be directly impacted is quantified below for conservation significant flora and communities[17] in Table 24, and for conservation significant[18] fauna habitat below in Table 26. Table 24 and Table 26 show the reduction of MNES habitat from the Impact area referred on 17 December 2022, to the refined Impact area on November 2024. Measures to avoid, minimise and mitigate potential impacts to vegetation are outlined in Section 1.0 of this report.

5.2.1.1.1 Loss of conservation significant flora habitat

Table 24 outlines maximum extent of impacts proposed to occur to approximately 1.32 ha of habitat for conservation significant flora and communities.

Table 24 Potential habitat loss to TEC and conservation significant flora known to occur within the Impact area

MNES	Maximum direct Impact area (ha) (2022 EPBC Referral)	Maximum direct Impact area (ha) (Revised Impact area)[19]
Subtropical floodplain eucalypt TEC	1.55	1.30
Angle-stemmed Myrtle (*Gossia gonoclada*)	0.00[20]	0.00
Macadamia nut[21] (*Macadamia integrifolia*)	0.19	0.016
Scrub turpentine (*Rhodamnia rubescens)*	0.16	0.01

A Significant Impact Assessment and spatial mapping to assess potential direct and indirect impacts to the aforementioned conservation significant flora and communities is provided in Appendix F.

[17] That is, threatened flora and Threatened Ecological Communities protected under the EPBC Act.
[18] That is, threatened and migratory species protected under the EPBC Act.
[19] Due to rounding to two decimal places, rounding errors of < 0.01 ha may occur.
[20] This individual was observed approximately 14 m outside the impact area.
[21] Not occurring in the wild.

Measures to avoid, minimise and mitigate potential impacts to the aforementioned conservation significant flora and communities are outlined in Section 6.0 of this report.

The nature, likelihood and consequence of these impacts is further discussed in the risk assessment in Section 7.0 in this report.

Conservation significant flora species and communities recorded as 'known' to occur are listed below with a description of habitat within the Impact area and components of the study.

Subtropical floodplain eucalypt TEC

The habitat or areas most critical to the survival of the ecological community are those patches that are in the best condition (i.e. classes A and B) (Department of Climate Change, Energy, the Environment and Water, 2022a). These represent those parts of the ecological community that retain the highest diversity and most intact structure and ecological function and have the highest chance of persisting in the long-term. However, areas that otherwise meet the minimum condition thresholds (i.e. Class C) are also important for the functioning and survival of the ecological community. These areas are critical to the survival of the ecological community: if they occur in locations or landscape positions that are particularly important for biodiversity or function; and/or contain suites of species, or habitat features, that are important in a regional or local context. They also have the potential to recover, or be restored, to a higher condition. No Critical Habitat as defined under Section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat at this time (Department of Climate Change, Energy, the Environment and Water, 2022a).

No TEC patches of high condition class or A1, A2, B1 or B2 were observed within or adjacent to the Impact area. TEC patches within and adjacent to the Impact area were observed to be in good to moderate condition class B3, C1 or C2, and also contain historic and current threats such as clearing, hydrological changes from adjacent urban/industrial development, fragmentation leading to isolated patches in modified landscape with edge effects, weed incursion, altered fire regimes, invasive fauna, disturbance from urbanisation and recreational activity and potentially urban heat effects. On this basis, class B3 within the Impact area may be considered habitat critical to the survival of the ecological community, however is present within the lowest condition class for habitat critical to the survival, and is subject to previous and current disturbances and threats.

Targeted field surveys assessed a total of 1.30 ha of subtropical floodplain eucalypt TEC within the Impact area, and 4.81 ha within a 50 m buffer from the boundary of clearing as per the Approved Conservation Advice (Department of Climate Change Energy the Environment and Water, 2022). A breakdown of TEC extent and condition both directly and indirectly impacted is summarised in Table 25. Mitigation measures described in Section 6.0 will ensure direct are minimised and mitigated and potential indirect impacts are avoided for the TEC, and are unlikely to cause significant impacts or a reduction in quality, condition class and/or long-term viability of patches.

Table 25 Summary of extent and condition of TEC within direct impact area and buffer zone

Patch Number	Class	Direct impact area (ha)	Buffer zone (ha)	Total direct impact and buffer zone area (ha)
I	Class B3	0.48	0.98	1.46
III	Class B3	0.00	0.40	0.40
IV	Class C1	0.17	0.68	0.84
V	Class B3	0.64	2.37	3.01
VII	Class C1	0.01	0.38	0.39
Total		**1.30**	**4.81**	**6.10**

In addition, a review of historic aerial imagery (refer Section 3.1.2 of Appendix F) indicates the TEC has likely experienced high levels of threats to abiotic factors such as changed hydrological regimes, erosion, sedimentation and runoff, due to disturbances of clearing, fragmentation, and urban/industrial development since the 1970s, with increasing levels of disturbance and vegetation clearing from 2002 to 2015, and increasing industrial and urban development from 2017 (refer Section 3.1.5 of the Appendix F). In particular, Class B3 on the western portion of the Impact area has been cleared and fragmented since the 1976 (that is, 48 years).

Surrounding urban/industrial development is unlikely to have adversely modified or destroyed abiotic factors necessary for the TEC's survival (since it still occurs), which indicates the proposed action – having commensurate disturbance to previous development activities in similar proximity to the TEC – is also unlikely to adversely modify or destroy the TEC's abiotic factors nor adversely affect the quality and function of the TEC.

Specifically, industrial development on the southeastern portion of the TEC has been occurring for the past 7 years, and it is likely to be commensurate with activities for the proposed action. This industrial development is unlikely to have adversely affected the quality and function of the habitat critical to the survival of the TEC (since it still currently occurs), which indicates the proposed action is also unlikely to adversely affect habitat critical to the survival of the community. In addition, indirect impacts to habitat critical to the survival of the TEC adjacent to the Impact area will be temporary and are proposed to occur for approximately 2 years during construction phase.

Angle stemmed myrtle

The angle-stemmed myrtle inhabits sloping metamorphic or flat alluvial terraces of largely permanent waterways, with tidal influence, at an elevation of 5-70 m. The species prefers well-drained clay soils derived from metamorphosed sediments and Cainozoic or alluvial deposits.

One (1) individual was recorded during targeted flora surveys, located in Lot 9 on SP307207 approximately 14 m west of the Impact area. The individual is not proposed to be impacted by the proposed action.

Although this species is known from the surrounding area, the location of this individual does not meet the described habitat for these species. The species profile description describes the habitat as steep slopes often in lowland riparian rainforest and notophyll vine forest, along permanent watercourses. This individual is unlikely to become part of a self-sustaining 'relatively natural ecological community' given it is located within a restricted area situated in between residential dwellings and a cleared manicured lawn comprising of the existing rail corridor. This individual was located outside of the Impact area and is unlikely to be impacted by the proposed action.

Furthermore, habitat is already degraded as a result of ongoing development and land clearing, indicating that any population present is likely already impacted. These land practices are recognised as a threatening process and are likely to continue regardless of the proposed action. The proposed action's infrastructure may be micro-sited to ensure no direct impacts to known individuals or populations occur.

Macadamia nut

Macadamia nut is conserved in at least four small reserves in south-east Queensland. This species grows in remnant rainforest, including complex mixed notophyll forest, and prefers partially open areas such as rainforest edges. Macadamia nut occurs within the Northern Rivers (NSW) and South East Queensland Natural Resource Management Regions.

Six individuals were observed within the Impact area by GHD (2021) and AECOM (2024). However, all individual species were located in amenity vegetation or residential areas and are considered to be 'not in the wild'. A maximum of 0.006 ha of potential habitat occurs within the Impact area.

Furthermore, habitat is already degraded as a result of ongoing development and land clearing, with a high density of *Lantana camara* present indicating that any population present is likely already impacted. The presence of *Lantana camara* is recognised as a threatening process and is likely to persist regardless of the proposed action.

Scrub turpentine

Scrub turpentine inhabits all rainforest sub-forms except cool temperate rainforest and is a common pioneer species in eucalypt forests and adjacent transition zones of dry sclerophyll and grassy woodlands. The species occupies a range of volcanically derived and sedimentary soils and can be found in creekside riparian areas.

One individual was recorded by GHD (2021) as planted outside of its naturally occurring habitat and not considered 'in the wild'. The individual was juvenile within a tree guard and in very poor health. The species is very susceptible to *Austropuccinia psidii* (Myrtle rust) with the impact evident on this

individual with only a few leaves remaining. Habitat for this species is recorded littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. Based on this, habitat within the Impact area is limited to riparian zones on alluvial soils. This species is unlikely to become part of a self-sustaining ‘relatively natural ecological community’. Therefore, the proposed action is not anticipated to impact the species or suitable habitat for the species.

5.2.1.1.2 Loss of conservation significant fauna habitat

Table 26 below outlines maximum extent of direct impacts proposed to occur for the following conservation significant fauna species, divided into breeding, foraging, shelter (where applicable), dispersal habitat and functionally lost areas.

Table 26 Potential habitat loss direct impacts to conservation significant fauna which are known or have the potential to occur within the Impact area

MNES	EPBC Act status[1]	Potential habitat utilisation	Direct Impact area, including functionally lost areas (ha)[22]
Australian painted snipe (*Rostratula australis*)	E	Breeding (marginal), foraging and dispersal	0.98
		Total	**0.98**
Greater glider (southern and central) (southern & central) (*Petauroides volans)*	E	Breeding	21.40
		Foraging	7.52
		Dispersal	5.97
		Total	**34.89**
Grey-headed flying fox (*Pteropus poliocephalus*)	V	Breeding/Roosting	0.54
		Foraging/Dispersal	42.60
		Total	**43.14**
Koala (combined populations of Qld, NSW and the ACT) (*Phascolarctos cinereus*)	E	Breeding/Foraging	27.48
		Shelter/Dispersal	80.27
		Total	**107.74**
Mary River cod *(Maccullochella mariensis)*	E	Breeding/ Foraging/ Dispersal	0.65
		Total	**0.65**
Regent honeyeater (*Anthochaera phrygia*)	CE	Foraging and dispersal	42.28
		Total	**42.28**
South-eastern glossy black cockatoo (*Calyptorhynchus lathami lathami*)	V	Breeding	18.91
		Breeding and Foraging	7.13
		Foraging	2.19

[22] Due to rounding to two decimal places, rounding errors of < 0.01 ha may occur.

MNES	EPBC Act status[1]	Potential habitat utilisation	Direct Impact area, including functionally lost areas (ha)[22]
		Dispersal	13.51
		Total	**41.74**
Spotted-tailed quoll (southern sub-species) (SE mainland population) (*Dasyurus maculatus maculatus*)	E	Breeding/ Foraging/ Dispersal	26.20
		Total	**26.20**
Swift parrot (*Lathamus discolor*)	CE	Foraging and dispersal	42.28
		Total	**42.28**
White-throated needletail (*Hirundapus caudacutus)*	V, Mi	Foraging and dispersal	51.70
		Total	**51.70**
Yellow-bellied glider (south-eastern) (*Petaurus australis australis*)	V	Breeding	21.40
		Foraging	7.52
		Dispersal	5.97
		Total	**34.89**

[1]Conservation status of threatened fauna under the EPBC Act: CE = Critically Endangered, E = Endangered, V = Vulnerable, Mi = Migratory

A Significant Impact Assessment and spatial mapping to assess potential direct and indirect impacts to relevant conservation significant fauna is provided in Appendix F .

Measures to avoid, minimise and mitigate potential impacts to the aforementioned conservation significant fauna are outlined in Section 6.0 of this report.

The nature, likelihood and consequence of these impacts is further discussed in the risk assessment in Section 7.0 of this report.

Conservation significant fauna species that are known or have the potential to occur within the Impact area are listed below with a description of habitat.

Spotted-tailed quoll (southern sub-species) (SE mainland population) (*Dasyurus maculatus maculatus*)

The spotted-tailed quoll prefers relatively undisturbed mature wet forest, with potential den sites. It inhabits a variety of vegetation communities, including temperate and subtropical rainforests, wet sclerophyll forest, lowland forests, open and closed eucalypt woodlands, inland riparian and River Red Gum (*Eucalyptus camaldulensis*) forests and coastal heathlands. Spotted-tailed quolls shelter in fallen logs, boulder piles, burrows, tree hollows and occasionally under dwellings during the day.

This species is considered a potential occurrence within the Impact area due to the presence of marginal suitable habitat, mainly within the Karawatha Forest Park and a record (2004) occurring approximately 8.93 km from the Impact area.

A maximum of 26.20 ha of potential habitat is proposed to be impacted by the proposed action. All potential habitat is considered marginal due to the lack of structural diversity and complexity as well as potential denning sites. All potential habitat is functionally disconnected to protected areas in the wider region, separated by the existing railway corridor and/or motorways.

No evidence of this species including potential scats and signs were observed during the reconnaissance surveys and targeted habitat assessments. Field surveys conducted across 2023 included the recommended methodologies and effort is sufficient as per the species referral guidelines. Furthermore, cane toads were commonly recorded, which attributes to poisoning and in some cases death of the spotted-tail quoll. Due to the highly modified and disturbed urban landscape, the majority of remnant vegetation is considered to be unlikely important habitat (Department of the Environment, 2009) and is not located within an area of important populations (Department of Climate Change Energy the Environment and Water, 2023).

Greater glider (southern & central) (*Petauroides volans*)

The Greater glider (southern and central) occurs in Eucalyptus forests and woodlands. They inhabit hollow-bearing trees. The species potentially occurs within the Impact area based on the presence of suitable foraging and breeding habitat including records within the Study area. This species was not recorded during targeted field surveys.

A maximum of 34.89 ha of potential habitat is proposed to be directly impacted by the proposed action. The failure to detect the species during targeted surveys suggests the species is present at low abundance and/or habitat within the Impact area and it is used on an occasional or intermittent basis only. The paucity of records of greater glider (southern and central) within the desktop search extent support this view suggesting the species is generally scarce within the surrounding landscape.

Due to isolation from existing linear infrastructure in between patches of habitat the Impact area is unlikely to support dispersal and emigration from surrounding landscapes.

Koala (combined populations of Qld, NSW and the ACT) (*Phascolarctos cinereus*)

Koalas inhabit in coastal and inland areas that typically characterised with eucalyptus woodlands. Key habitat types identified as important to species recovery are large contiguous tracts of vegetation that buffer and provide connectivity to riparian corridors – all dominated by koala food trees (i.e. Eucalyptus trees).

Koalas are known to occur within the Impact area. The species will breed, forage and disperse throughout non-remnant and remnant vegetation within the Impact area. Moreover, these vegetation communities may act as a refuge for dispersing individuals. Whilst majority of the habitat is poor quality,

large patches of high-quality habitat occur in remnant areas specifically Karawatha Forest Park and Nealdon and Gould Adams Park.

A maximum of 107.74 ha of habitat is proposed to be impacted by the proposed action. Given the peri-urban context of the Impact area, where it is noted that koalas rely on small patches of vegetation, there is a risk of notable habitat loss occurring.

Yellow-bellied glider (south-eastern) (*Petaurus australis australis*)

The Yellow-bellied glider (south-eastern) occurs in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests. The subspecies shows a preference for large patches of mature old growth forest that provide suitable trees for foraging and shelter. There is also a clear preference for forests with a high proportion of winter-flowering and smooth-barked eucalypts. The subspecies is social and lives in family groups of two to six individuals, throughout an exclusive home range of approximately 50–65 ha. Hollow-bearing trees used by the species are primarily living, smooth-barked eucalypts of multiple species.

The species potentially occurs within the Impact area based on the presence of suitable habitat. No individuals or evidence of sap extraction were observed during targeted field surveys. However, since multiple eucalypt species with a DBH over 30 cm and 50 cm were observed during field surveys including the presence of flowering eucalypt species. Furthermore, riparian habitat may provide areas of refuge in times of natural disasters (i.e. fire and drought).

The Impact area is not listed as a stronghold for important populations listed in the conservation advice. A maximum of 34.89 ha of potential habitat is proposed to be directly impacted as a result of the proposed action. Direct impacts are expected due to vegetation clearing for construction of the proposed action. Removal of this habitat is expected to have only a low impact as only a small number of individuals are likely to utilise these areas and there will be availability of equally or greater quality suitable habitat remaining in the local area, specifically within Karawatha Forest Park.

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

The Grey-headed flying fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, *Melaleuca* spp. swamps and *Banksia* spp. woodlands. It also feeds on commercial fruit crops and on introduced tree species in urban areas. However, the primary food source is blossom from eucalyptus and related genera. Habitat critical to the survival of the grey-headed flying-fox includes winter and spring flowering vegetation communities. Habitat critical to the survival of the Grey-headed Flying fox may also be vegetation communities not containing the above tree species but which:

- Contain native species that are known to be productive as foraging habitat during the final weeks of gestation, and during the weeks of birth, lactation and conception (August to May)
- Contain native species used for foraging and occur within 20 km of a nationally important camp as identified on the DCCEEW interactive flying fox web viewer, or
- Contain native and or exotic species used for roosting at the site of a nationally important Grey-Headed Flying fox camp as identified on the DCCEEW interactive flying fox web viewer.

The species was confirmed present within the Impact area and surrounds during targeted field surveys.

Suitable foraging habitat was widely observed within the Impact area with known mixed species flying fox colonies also located within the Impact area. As the species is known to disperse up to 20 km to forage the Impact area is considered to represent likely foraging habitat and requires further assessment.

A maximum of 43.14 ha of habitat is proposed to be directly impacted by the proposed action.

Regent honeyeater (*Anthochaera phrygia*)

One ALA record dated 2020 occurs within the study area. The record has high spatial uncertainty (2 km) and occurs 1 km east of the Impact area located on Overlord Place. Four WildNet records occur within the study area, the most recent dated 1994.

While the Impact area has been modelled as 'likely to occur' for the species according to its recovery plan (Department of the Environment, 2016), it is considered the species has the 'potential to occur' due to marginal habitat occurring within the Impact area and one record from 4 years ago which occurs within the study area. Habitat is considered marginal, due to the low densities of key foraging mistletoe resources, lack of box-ironbark woodland and no woodlands dominated by key trees species as outlined within the species' recovery plan. Eucalypt woodlands and riparian areas that do occur are generally scattered throughout the Impact area in a highly degraded and urbanised environment.

No evidence of this species was observed during targeted field surveys. Field surveys conducted across 2023 included the recommended methodologies and the effort is sufficient as per the species referral guidelines.

A maximum of 42.28 ha of potential marginal habitat is proposed to be impacted by the proposed action. In a regional context, this reduction in available habitat is not considered notable since Impact area is not located within key breeding areas where the species is regularly recorded, according to the species' conservation advice available on the SPRAT database (Department of the Environment, 2015).

Swift parrot (*Lathamus discolor*)

Swift parrots inhabit in woodlands and breed in tree-hollows in old-growth or other forest with suitable hollows, in proximity to the main food source, flowering Tasmanian blue gum. Non-breeding birds preferentially feed in inland box-ironbark and grassy woodlands, and coastal swamp mahogany (*Eucalyptus robusta*) and spotted gum (*Corymbia maculata*) woodland when in flower.

According to the species' National Recovery Plan (Department of Climate Change, Energy, the Environment and Water, 2024), key tree species in the mainland include Yellow Gum (*Eucalyptus leucoxylon*); Red Ironbark (*Eucalyptus tricarpa*); Mugga Ironbark (*Eucalyptus sideroxylon*); Grey Box (*Eucalyptus macrocarpa*); White Box (*Eucalyptus albens*); Yellow Box (*Eucalyptus melliodora*); Swamp Mahogany (*Eucalyptus robusta);* Forest Red Gum (*Eucalyptus tereticornis*); Blackbutt (*Eucalyptus pilularis*); and Spotted Gum (*Corymbia maculata*). DCCEEW also states *"Corymbia Citriodora* is a regionally relevant substitution of *C. maculata"* (Logan and Gold Coast Faster Rail (EPBC 2022/09439) PD adequacy review comments, 2024 (LGC Adequacy Review, 2024)), however is not referenced as such in the superseded or updated recovery plan (Department of Climate Change, Energy, the Environment and Water, 2024). Foraging/dispersal habitat for the species comprising *Eucalyptus tereticornis, Eucalyptus robusta, Corymbia henryi* and *Corymbia citriodora* occurs within the Impact area. However, the Impact area is not considered a known priority habitat for conservation management of nesting and foraging resources. In addition, 2 ALA records dated 2014 occur within the Study area, one within Gould Adams Park approximately 537 m from the Impact area. As such, the species may occur within the Impact area as a vagrant and may sporadically/temporarily occur during winter flowering events.

Whilst, rare occurrences of this species are seen in southern Queensland, two ALA records have been recorded approximately 537 m from the Impact area, suggesting this species may utilise the vegetation within the Impact area. In contrast, given the existing disturbances in the surrounding area, the proposed action will not result in habitat fragmentation in the context of this species. All other key threats to this species are unlikely to be increased beyond current levels.

The species is a migrant and is expected to be highly mobile and able to utilise habitats outside the Impact area based on available resources. A maximum of 42.28 ha of potential habitat is proposed to be impacted by the proposed action.

Australian painted snipe (*Rostratula australis*)

Australian painted snipe inhabits in shallow terrestrial freshwater habitats within wetlands, including temporary and permanent lakes, swamps and claypans. Nesting habitats were recorded near small islands with a combination of very shallow water, exposed mud, dense low cover and sometimes some tall dense cover.

The species is considered to potentially occur within the Impact area due to the presence of suitable habitat and 8 records occurring within the Study area. A maximum of 0.98 ha of potential habitat is proposed to be impacted by the proposed action.

The remaining habitat is considered marginal or of low value due to the absence or minimal presence of bare muddy margins, steep banks, little or no open water with tall or dense ground cover present including a high weed incursion predominantly consisting of Singapore daisy (*Sphagneticola trilobata*).

No individuals were observed during targeted field surveys. As such, it is likely that only a small number of dispersing individuals would utilise potential habitat on a transitory basis. Furthermore, areas of higher quality habitat occur in the wider area including State significant wetlands which are more likely to be utilised.

South-eastern glossy black cockatoo (*Calyptorhynchus lathami lathami*)

South-eastern glossy black cockatoos feed almost exclusively on the seeds of she oaks (*Allocasuarina* spp. and *Casuarina* spp.), usually relying on one or two species within a region. South-eastern glossy black cockatoos are hollow nesters, utilising large hollows in both living and dead Eucalyptus trees. The species usually occurs in pairs or in groups of three (made up of a breeding pair and their offspring), in woodlands. Habitat critical to the survival of the species is not defined however it is noted that the highly specialised diet and nesting habitats should be considered. Important populations are also not defined.

The species potentially occurs within the Impact area based on the presence of suitable breeding, foraging and dispersal habitat including a record (1993) occurring 200 m west of the Impact area. No evidence of this species including ort chewings were observed during targeted field surveys. However previous ecological surveys (GHD, 2021) did observe ort chewings within the Impact area.

A maximum of 41.74 ha of potential breeding, foraging and dispersal habitat is proposed to be impacted. Due to the modified environment habitat is already degraded as a result of ongoing development and land clearing, indicating that any population present is likely already impacted. These land practices are recognised as a threatening process and are likely to continue regardless of the proposed action.

White-throated needle tail (*Hirundapus caudacutus*)

This species may potentially occur as a flyover species above the Impact area as multiple records occur within the study area. A maximum of 51.70 ha of potential habitat is proposed to be impacted. As habitat requirements for the species are not well-understood, all eucalypt woodland and forest within the Impact area is considered important habitat. However, as this species has a very large distribution across Australia and is constantly moving, only small numbers are expected to utilise the Impact area at one time. Furthermore, this species is predominately aerial and has broad habitat requirements, impacts are unlikely to affect the persistence of the species. In addition, it is likely vast areas of important habitat occur within the wider local area.

Mary River cod (*Maccullochella mariensis*)

The species is considered as potential to occur due to marginal habitat occurring within the Impact area. No records occur within the study area and no individuals were observed during targeted field surveys.

A maximum of 0.65 ha of potential habitat is proposed to be impacted by the proposed action.

The likelihood of Mary River cod breeding at sites within the Impact area is highly unlikely given the distance of the sites from any known Mary River cod locations and an absence of suitable breeding habitat (large woody debris and undercut banks). The nearest stocking location to the Impact area is approximately 20km upstream of one site, however all other stocking locations were 60-160 km upstream with numerous hydrological impoundments between stocking and surveyed locations.

Given this, it was determined that Mary River cod presence at most sites was unlikely as there was not suitable habitat. In addition, the presence of exotics is likely to predate on Mary River cod fingerlings and compete for resources. The notable scarcity if not total absence of large woody debris and undercut banks at many of the study sites further decreases the chance of successful breeding within the Impact area.

5.2.1.2 Loss of fauna movement and habitat fragmentation

As the Impact area is located within an urban environment and has largely been co-located or adjacent to the existing railway corridor, habitats have already been subjected to disturbance, fragmentation, weed incursion and edge effects. This disturbed habitat is already likely to restrict north-south and east-

west fauna movement, as well as the presence of existing barriers such as fences, roads, buildings and lack of canopy cover.

However, the proposed action will also impact mapped and/or ground truthed biodiversity or fauna movement corridors (outlined in Section 3.9 and shown in Figure 1 and Appendix B Figure 11), surrounding Beenleigh Park/Wally Tate Park, Karawatha Forest Park, Gould Adams Park, Nealdon Park and Logan River.

These impacts to fauna movement and habitat fragmentation as a result of either partial or full clearing[23] for the proposed action are likely to result in:

a. Dissection and disconnection of vegetation and habitats
b. Increase in edge effects[24], light and noise penetration, alterations in microclimates, and increased weed/pest incursion
c. Reduced area of vegetation and habitat patches
d. Isolation between vegetation and habitat patches
e. Impacts to the success of seed dispersal, species recruitment and ultimately the long-term viability and persistence of vegetation and habitats
f. Reduction of fauna movement opportunities, leading to reduced species recruitment, genetic flow and ultimately affect the long-term viability and persistence of fauna populations within the landscape.

Conservation significant fauna which may be susceptible to fragmentation and reduced movement include koala, and to a lesser extent greater glider (southern and central) and yellow-bellied glider (south-eastern). These species were assessed to be at risk due to low dispersal ability, large home ranges and/or requirement for large areas of intact habitat. Gaps between areas of suitable habitat may restrict movement of individuals and access to required habitat resources while also increasing risk of predation from domesticated dogs.

Other potentially occurring conservation significant fauna are less susceptible, such as south-eastern glossy black cockatoo, grey-headed flying fox, regent honeyeater, swift parrot or Mary River cod since they are highly mobile, likely to utilise habitats within the Impact area on a temporary basis, able to disperse to other regions dependent on seasonal resources, adaptable to fragmented urban landscape, or can traverse cleared or modified areas without significant risk.

The proposed action's infrastructure siting has been developed and refined to maximise the use of disturbed areas. Where reasonable and practicable, co-location and micrositing of existing infrastructure and disturbance footprints, to avoid and minimise further vegetation clearing wherever feasible, is encouraged and further discussed in Section 6.0.

Landscape connectivity modelling summarised in Section 3.9 and Section 5.4, and provided in detail in Appendix G, as well as Significant Impact Assessments provided in Appendix F outline potential direct, indirect and facilitated impacts including fauna safe road and rail design considerations and opportunities to allow for movement/migration pathways for relevant conservation significant fauna movement.

The landscape connectivity modelling (Appendix F) also shows the receiving habitat where impacted MNES will disperse as a result of clearing and construction for the proposed action. This will predominantly be within undisturbed vegetation adjacent to the Impact area at Beenleigh Park and Wally Tate Park, Karawatha Forest Park/Acacia Forest Park, Gould Adams Park, Nealdon Park, Logan River, Albert River and Hugh Muntz Gardens. There is a high capacity of these receiving areas to support displaced impacted MNES, since they are generally in moderate to high condition and associated within mapped biodiversity corridors and ground truthed fauna movement corridors. This means any displaced impacted MNES will be able to traverse to other areas of suitable habitat within the landscape.

[23] Partial clearing is where >10% of canopy cover remains, while full clearing is where <10% of crown cover remains.
[24] Defined as the consequences on vegetation and wildlife that occur as a result of one type of vegetation sharing a border with another.

5.2.1.2.1 Receiving habitat

An explanation of how receiving habitat (mentioned above in Section 5.2.1.2) will meet the needs of displaced MNES as a result of the proposed action is summarised in Table 27. Where receiving habitat occurs within the study area, vegetation communities have been ground truthed to determine habitat suitability. ALA records have also been reviewed to verify MNES species presence within the receiving habitat. Vegetation communities and species-specific habitat features outside the study area have been based from desktop assessment, ALA species record databases and Logan City Council and Brisbane City Council databases. It is assumed receiving habitat outside the Impact area is homogenous to areas where it intersects or adjoins the Impact area.

Measures to avoid, minimise and mitigate potential impacts to fauna movement opportunities are outlined in the OEMP.

Table 27 Receiving habitat suitability for displaced MNES fauna

Receiving habitat	Description of receiving habitat
Acacia Forest Park:	• A statewide biodiversity corridor is mapped across Acacia Forest Park. • Acacia Forest Park supports a mixed canopy of Eucalypts and *Allocasuarina* species dominated by RE 12.9-10.17c with 10-30% cover and mature trees between 10-30 m tall which reflects vegetation communities that were once widespread within the south east Queensland region. RE 12.3.6 fringes an unnamed tributary flowing in an east-west direction across Acacia Forest Park. Hollows in the form of mature eucalypts with > 30 cm and 50 cm diameter at breast height (DBH) are present including arboreal termite mounds. • An abundance of coarse woody debris and fallen leaf litter provides a complex ground level of microhabitats. • Given the presence of water resources, mature eucalypt including winter flowering species and patches of *Allocasuarina littoralis*, • The receiving habitat contains suitable habitat for the following MNES species; **Koala, grey-headed flying-fox, greater glider (southern and central), yellow-bellied glider (south-eastern), south-eastern glossy black-cockatoo, regent honey eater and swift parrot**.
Karawatha Forest Park	• Karawatha Forest Park covers an area of approximately 900 ha (Brisbane City Council, 2024) and provides a large contiguous patch of remnant eucalypt forest dominated by RE 12.3.3 with old growth hollow bearing trees present, which reflects vegetation communities that were once widespread within the south east Queensland region. • Greater gliders (southern and central) and koalas are known to persist within the Karawatha Forest Park (Brisbane City Council, 2024; Atlas of Living Australia, 2024). • This area supports diverse eucalypt communities with a dense stratum of *Allocasuarin*a spp and maintains adequate connectivity for MNES species via the Compton Road land bridge, which connects Karawatha Forest and Kuraby Bushland providing movement opportunities into the broader landscape. • Multiple wetlands are scattered throughout Karawatha Forest Park providing water resources and refuge in times of drought. • An abundance of coarse woody debris and fallen leaf litter provides a complex ground level of microhabitats. • The dominant vegetation community contains *Eucalyptus tereticornis*, a favoured koala food tree. • The receiving habitat contains suitable habitat for the following MNES species; **Koala, grey-headed flying-fox, greater glider (southern and central), yellow-bellied glider (south-eastern), south-eastern glossy black-cockatoo, regent honey eater and swift parrot.**
Logan River and Albert River	• Both are large perennial river systems that flow in an easterly direction before discharging into Moreton Bay. • The broader landscape of the Logan River generally consists of historically cleared land for agricultural grazing, with scattered trees, patches of remnant

Receiving habitat	Description of receiving habitat
	vegetation and riparian vegetation. These areas may be utilised temporarily as a 'stepping stone' to more suitable habitat associated with remnant vegetation and Moreton Bay and Eagleby Wetlands. • Fringing riparian vegetation with majority intact, this provides refuge habitat for MNES species during extreme weather events (i.e. drought, heat waves). • Both the Logan and Albert River support a diverse range of habitats for a variety of species and a high availability of resources such as refuge, food, water and nutrients and provide suitable habitat for an array of migratory bird species. • Both river systems are mapped as statewide biodiversity corridors and provide east-west movement for MNES terrestrial ground fauna. • The receiving habitat contains suitable habitat for the following MNES species; **Koala, grey-headed flying-fox, south-eastern glossy black-cockatoo, regent honeyeater and swift parrot.**
Nealdon Park and Gould Adams Park	• Scrubby Creek (stream order 3) runs in a west-east direction between Nealdon Park and Gould Adams Park and has high habitat connectivity as it converges with the Logan River. • Majority of development has been set back from the high bank of the waterway allowing riparian connectivity to occur. Nealdon Park and Gould Adams Park provides structural complexity with large contiguous patch of suitable habitat in the form of remnant eucalypt forest dominated by RE 12.3.3 on alluvial flats with 30-70% cover with trees 10-30 m tall. Both areas reflect vegetation communities that were once widespread within the south east Queensland region. • Temporarily inundated ecosystems provide a source of water and refuge for local fauna whilst hollows in the form of mature eucalypts with > 30 cm and 50 cm DBH are present including arboreal termite mounds provide refuge/denning resources for hollow dependent fauna. • An abundance of coarse woody debris and fallen leaf litter provides a complex ground level of microhabitats. • The receiving habitat contains suitable habitat for the following MNES species; **Greater glider (southern and central), yellow-bellied glider (south-eastern), regent honey eater, swift parrot, koala, grey-headed flying-fox and south-eastern glossy black-cockatoo.**
Wally Tate Park and Beenleigh Park:	• Both Parks consist of mixed eucalypt regrowth vegetation refer (Appendix B Figure 8) with an approximate canopy height of 15 m. • Dense leaf litter and shrub cover provide shelter and microhabitat complexity. • Both Parks are within a mapped statewide biodiversity corridor providing east-west movement opportunities associated with the vegetation adjacent the Gateway Motorway and Bulimba Creek. • Both receiving habitats provides suitable habitat for the following MNES species; **koala, grey-headed flying -fox, south-eastern glossy-black cockatoo and yellow-bellied glider (south-eastern) and greater glider (southern and central).**
Hugh Muntz Gardens	• Hugh Muntz Garden contains patches of eucalypt woodland (12.3.3) (refer Appendix B Figure 8), including a large artificial wetland and associated riparian vegetation. • Woody debris fringing deeper permanent water with reed species was also present providing refuge and foraging resources for an array of species. • Mature *Eucalyptus tereticornis* (over 30 cm DBH) provides suitable denning opportunities for hollow dependent fauna and is also a favoured food tree of the koala. *Melaleuca quinquenervia* and *Casuarina glauca* occur scattered throughout the area.

Receiving habitat	Description of receiving habitat
	• The receiving habitat provides suitable habitat for the following MNES species; **Koala, grey-headed flying-fox, regent honeyeater, swift parrot, yellow-bellied glider (south-eastern) and greater glider (southern and central).**

5.2.1.3 Injury and mortality of fauna

The proposed action has the potential to cause injuries or mortality to conservation significant fauna as well as other native fauna. Fauna may be injured or killed as a result of the proposed action through:

- Strike from moving vehicles/machinery – key issue for ground dwelling species, particularly those with poor mobility
- Entrapment in habitat during removal – key issue during tree felling for species that use tree hollows or hollow logs for roosting and denning
- Entrapment in trenches/holes – key issue for ground dwelling species (reptiles and small mammals), particularly those that are active at night and cannot detect trenches to avoid.

Arboreal or terrestrial conservation significant fauna such as koala, yellow-bellied glider (south-eastern) and greater glider (southern and central) are the most susceptible to injury and mortality as a result of the proposed action. Vehicle strike is a key threatening process for koala (Department of Climate Change Energy the Environment and Water, 2022).

A Significant Impact Assessment and spatial mapping to assess potential direct and indirect impacts to relevant conservation significant fauna is provided in Appendix F.

Measures to avoid, minimise and mitigate potential impacts to conservation significant fauna are outlined in the OEMP.

5.2.2 Indirect impacts

All MNES species are susceptible to indirect impacts to some degree, however, some are known to be more susceptible than others, or have been identified as a key threatening process for the MNES species. Species-specific buffer zones (Section 6.4) have been used to assess potential and unintentional indirect impacts which may arise from the proposed action, located within retained vegetation outside of the Impact area.

5.2.2.1 Edge effects

Edge effects in ecology are identified as any difference in environment between the edge and interior of a particular vegetation patch (Murcia, 1995). Environmental characteristics which differ across edges cover many components of the environment including atmosphere (e.g., microclimate), vegetation (e.g., structure, composition, functioning), fauna and their habitat, and soil (Murcia, 1995).

Edges and their effects can be created through clearing of vegetation, such as new edges created by access tracks and the stabling yards.

The main environmental impacts to new edges created by the project are considered to include:

- Modification of microclimate where new edges are created due to greater penetration of light and wind into the vegetation.
- Temperature extremes are greater, and humidity of air is generally less at the edge than in the interior of vegetation. This effect is known to increase in size if vegetation is dense or cover is high.
- Physical disturbance to vegetation at the edge. Ongoing damage to the edge of vegetation may occur due to grading and weed control of road edges and vehicle use. Similarly, unsealed tracks can facilitate an increase incident of fire ignitions.
- Changes to soil properties including compaction of the soil, less organic matter and more erodible.
- Introduction of weeds, pests and pathogens through mud and dirt which falls off vehicles.
- Changes to vegetation through the above listed impacts.

In particular, subtropical eucalypt floodplain forest and woodland of the Subtropical floodplain eucalypt TEC may be particularly sensitive to edge effects due to its particular characteristics of native species composition and environmental conditions.

Many of these potential environmental impacts including introduction of weeds, pest and pathogens, and vegetation impacts will be managed through best practice biosecurity practices and vehicle restrictions. Rehabilitation/revegetation of areas no longer used for construction activities will further reduce potential impacts.

In addition, species-specific buffer zones have been applied to assess and manage potential edge effects to subtropical floodplain forest TEC, greater glider (southern and central), yellow-bellied glider (south-eastern) and grey-headed flying fox are outlined in Section 5.2.2.7 of this report. Measures to manage edge effects are further described in Section 6.4 of this report and the OEMP.

5.2.2.2 Introduction, spread of introduced flora and fauna (weeds and pests) and pathogens

The introduction and/or spread of weeds, pest and pathogens can become a significant biosecurity risk for the proposed action's public amenity or environment (that is vegetation, habitat and ecosystems). Weeds, pests and pathogens can also compromise the integrity and outcompete native species, reduce the germination of native flora, increase the intensity and/or frequency of fires, and threaten the long-term survival of conservation significant species and communities.

Due to the urban and fragmented nature of the Impact area, weeds were frequently observed within disturbed (that is non remnant) and undisturbed (that is, remnant and high value regrowth) vegetation and evidence of pests were common (outlined in Sections 3.5 and 3.7).

A Significant Impact Assessment and spatial mapping to assess potential weed and pest impacts to relevant conservation significant flora, fauna and communities is provided in Appendix F. Measures to avoid, minimise and mitigate potential weed and pest impacts are outlined in the OEMP.

5.2.2.3 Noise, light and vibration

Increased light, noise and vibration can alter individual species behaviours, and disrupt the balance of inter-species interactions. Typically, fauna will move away from noise and light sources as these may be perceived as a threat. These disturbances occur as a result of traffic and often extend into the area surrounding a road creating a 'road-effect zone'. This road effect zone is degraded or sometimes completely unsuitable for wildlife resulting in indirect habitat loss (Bhardwaj *et al.*, 2021). The road effect zone is also expected to occur as a result of rail activities for the proposed action. For example, studies on microchiropteran bats have found that the activity of many species significantly decreased with proximity to a freeway with the overall road-effect zone ranging from 123 m to 890 m. Acclimatisation by some species may occur over the medium to long term, and many of the species within the Impact area occur in areas already subject to high noise, light and general activity.

Current research indicates that there are no government policies or other widely accepted guidelines in respect to the noise levels for road and rail operation which may be acceptable to wildlife. The levels or character of noise that may "startle" or otherwise affect the feeding or breeding pattern of birds or other wild animals are also not firmly established in the technical literature. Sudden loud, impulsive or impact noises are capable of causing birds and other fauna to become startled, which if occurring over the longer term, may affect feeding and breeding behaviour in some species. These impacts are expected to occur to the fauna using the habitats both within and immediately adjacent to the Impact area. However, as the proposed works occur immediately adjacent to the existing rail line, the Impact area is already exposed to high levels of artificial noise and light. It is expected, construction impacts are likely to be consistent with existing disturbance levels.

During the construction phase, there will be an increase in noisy activity in the Impact area as machinery undertakes clearing and other activities. Impacts of construction noise will be temporary and will not affect the entire Impact area simultaneously. However, when activity and noise is occurring in areas adjoining retained habitat, potential impacts may include the following:

- Reduced foraging ability by auditory predators due to increased background noise.
- Increased risk of predation by visual predators due to increased background noise.
- Increased potential for collisions with vehicles/machinery.

- Human visitation causing disturbance to foraging or breeding behaviours.

Ecological impacts of night time light pollution have been shown to negatively impact behavioural and physiological processes for animals, in particular, nocturnal birds (e.g. owls) and nocturnal mammals (e.g. rats and bats) (Smith *et al.*, 1994; Augusteyn *et al.*, 2018; Kathryn L. G. Russart and Randy J. Nelson, 2018). Specific impacts may include changes to migration and movement patterns, fauna injury/mortality through collision with lighting structures, alteration of predator-prey relationships, and changes to foraging and communication behaviours.

Whilst further research is required to determine light levels for road and rail operation which may be acceptable to wildlife, the *National Light Pollution Guidelines for Wildlife* (Department of Climate Change Energy the Environment and Water, 2023) has been considered as part of the impact assessment. Artificial light used during proposed action construction can affect both nocturnal and crepuscular animals by disrupting patterns, with quality of light (e.g. wavelength, colour), intensity and duration potentially evoking different responses. Impacts from increased light levels include disorientation from or attraction toward artificial sources of light; mortality from collisions with structures; and effects on light-sensitive cycles of species (e.g. breeding and migration for fauna and flowering in plants). An increase in artificial lighting during construction of the proposed action may also increase the abundance and efficiency of predators. This could result in fauna avoiding some areas due to an increased perceived risk of predation and/or becoming more vulnerable to predation. The use of artificial lighting is expected to be limited to concentrated work areas over short durations during the construction of the proposed action. Measures to manage noise, light and vibration are outlined in the OEMP.

5.2.2.4 Erosion, sediment runoff and alteration to hydrology

The proposed action proposes to lengthen/replace existing culverts and install additional bridge piers over Scrubby Creek, Slacks Creek and the Logan River. The proposed action has the potential to cause erosion, sediment runoff, and alterations to surface water and ground water levels which can adversely impact:

- Soil structure and composition through the loss of topsoil and exposure of subsoil, which often has poor physical and chemical properties
- Water quality and nutrient levels
- Vegetation composition and health
- Water turbidity
- Contamination of existing ground water sources which may also affect groundwater.

The Logan River, Spring Creek, Slacks Creek, Scrubby Creek, and wetlands near Scrubby Creek, Edens Landing and Holmview are likely to be the most susceptible to erosion, sediment runoff and alteration to hydrology (see Section 3.8).

Potential acid sulfate soils (PASS) may be present in the Impact area, including adjacent to Scrubby Creek at Gould Adams Park/Nealdon Park, Logan River, and Edens Landing near Ridgewood Reserve North and Edens Parkland. PASS was confirmed to be present in Beenleigh near Holmview Station and adjacent to Beenleigh Station. The field screening results show that PASS may be present at depths ranging from 6 to 16.5 metres below ground (mbgl) and may be encountered during the installation of pre-cast bridge piers at these depths. PASS encountered during construction will be managed in accordance with relevant Federal and State guidelines, including *Queensland Acid Sulfate Soil Technical Manual (Department of Resources and Department of Environment, Science and Innovation 2024), National Acid Sulfate Soils Guidance (Department of Agriculture and Water Resources, 2018)* and *Best Practice Erosion and Sediment Control Guidelines* (International Erosion Control Association (IECA), 2019) so that there is no impact on the TEC. The bridge piers at Scrubby Creek will be installed so that in-situ PASS will not be exposed to the atmosphere, and material removed during installation will be neutralised and disposed of at an appropriately licensed facility. While some groundwater waste will be generated during the bridge pier installation, sustained dewatering of the aquifer is not required, so there will be no impact on regional groundwater levels or surface water that the TEC depends on. Based on the considerations described above, the risk of PASS impacting the TEC is considered low.

Measures to manage erosion, sediment runoff and alteration to hydrology are outlined in the OEMP.

5.2.2.5 Dust

Soil exposed through vegetation clearing or ground disturbance can lead to dust generation, which in turn can reduce the abundance and diversity of terrestrial and aquatic habitats if excessive levels are sustained over time. When dust settles on plant foliage it can reduce the amount of light penetration on the leaf surface, block and damage stomata, and slow rates of gas exchange and water loss. Reduction in the ability to photosynthesise due to physical effects may result in reduced growth rates of vegetation and decreases in floral vigour and overall community health (Farmer, 1993).

Measures to manage increased dust are outlined in the OEMP.

5.2.2.6 Environmental spills

The proposed action has a risk to cause environmental spills due to the use of vehicles, machinery and the use/storage of fuels and chemicals.

In particular, the Impact area is located within the vicinity to Logan River, Spring Creek, Slacks Creek, Scrubby Creek, and wetlands near Scrubby Creek, Edens Landing and Holmview (see Section 3.8), which are sensitive (including its native resident flora and fauna species) to environmental spills.

Measures to manage environmental spills are outlined in the OEMP.

5.2.2.7 Species-specific indirect impacts

Species-specific indirect impacts have been assessed via buffer zones for the following four relevant MNES conservation significant species and communities:

- A 50 m buffer zone around direct TEC impact areas has been applied as per the Approved Conservation Advice (Department of Climate Change Energy the Environment and Water, 2022). The buffer zone totals 4.80 ha of Class B3 and Class C1 TEC patches I, III, IV, V and VII. It has been assessed that indirect impacts are unlikely within the buffer zone (see Appendix F for full details). Despite that it is anticipated that indirect impacts are unlikely to occur to TEC, monitoring, management and rehabilitation measures will be applied to manage edge effects, hydrological changes and relevant threats listed in the Approved Conservation Advice. These management approaches will help avoid a potential reduction in quality, condition class and/or long-term viability of patches.
- A 50 m buffer zone around mapped breeding habitat for greater glider (southern and central) and yellow-bellied glider (south-eastern) has been applied within large patches of contiguous vegetation within key fauna biodiversity areas (i.e. Acacia Forest Park and Gould Adams Park/Nealdon Park), based on a review of scientific literature and statutory documentation (Department of Agriculture Water and the Environment, 2022; Department of Climate Change Energy the Environment and Water, 2022; Environment Protection Authority, 2018; Eyre, 2006). The buffer zone totals 7.26 ha for each species, and indirect impacts have been assessed as unlikely to occur (see Appendix F for full details). Despite that it is anticipated that indirect impacts are unlikely to occur to greater glider (southern and central) and yellow-bellied glider (south-eastern), monitoring and management measures will be applied to manage noise, light vibration, weeds, pests, pathogens and dust.
- For grey-headed flying-fox camps within the Impact area (Voyager Drive, Kuraby and Jacaranda Avenue, Kingston), a 300 m buffer zone around mapped breeding/roosting habitat was applied to assess potential indirect impacts to breeding/roosting habitat, based on a review of scientific literature and statutory documentation (Department of Transport and Main Roads, 2024; Eby, 2009). Within this 300 m buffer zone, 1.78 ha of breeding/roosting habitat occurs at Voyager Drive, Kuraby and 0.42 ha occurs at Jacaranda Avenue, Kingston (Appendix B Figure 19, page 2 and page 8). Indirect impacts have the potential to occur to camps at Voyager Drive, Kuraby and Jacaranda Avenue, Kingston (Table 28).
- The camp at Ridgewood Reserve, Edens Landing is not located within the Impact area (i.e. no direct impacts are proposed), however a 300 m buffer zone around the central camp location was applied to conservatively map breeding/roosting habitat, and to assess if the buffer zone intersects the Impact area. Approximately 7.57 ha of breeding/roosting habitat at Ridgewood Reserve, Edens Landing occurs within the buffer zone outside the Impact area, and the buffer zone comprising sporadic foraging/dispersal habitat intersects the Impact area (Appendix B Figure 19, page 13).

Proposed works at the Ridgewood Reserve, Edens Landing are unlikely to cause indirect impacts, since no grey-headed flying-fox observed in December 2024 and January 2025 monitoring events, works are approximately 150-200 m from the camp, vegetation immediately surrounding the camp will be retained, works will be temporary (ie. 3-4 months), no high impact activities[25] will be undertaken within 100 m of a camp, and will generally be undertaken at night when grey-headed flying-fox are likely to be absent (when foraging).

Indirect impacts have the potential to occur to camps at Voyager Drive, Kuraby and Jacaranda Avenue, Kingston (Table 28) but are unlikely to occur to the camp at Ridgewood Reserve, Edens Landing. Despite this, monitoring and management measures outlined in Section 6.5 of this document and Section 10.2 of the OEMP will be undertaken within a 300 m buffer zone at all three camps at Voyager Drive, Kuraby, Jacaranda Avenue, Kingston and Ridgewood Reserve, Edens Landing for noise, light, vibration, weeds, pests, pathogens and dust. Indirect impacts to breeding/roosting habitat have been acquitted via offsets at Voyager Drive, Kuraby, Jacaranda Avenue, Kingston as provided by Table 28 below.

Table 28 Summary of indirect impacts to be offset for relevant MNES value

Relevant MNES value	Indirect impact area (ha)
Grey-headed flying-fox	1.78 ha at Voyager Drive, Kuraby 0.42 ha at Jacaranda Avenue, Kingston
Total	2.20 ha

5.3 Operational and maintenance phase

The proposed action is limited to construction only (for key mitigation and management measures relating to the design and construction phase refer to the Proposed Action's action management – *Appendix C – Overarching Environmental Mitigation Plan)*. Upon completion of the proposed action, impacts as a result of the operation and maintenance of the railway are expected to be consistent with existing disturbance levels on the Beenleigh and Gold Coast lines. Repeated impacts on MNES values during the maintenance phase of the proposed action are likely to be infrequent, mainly consisting of indirect impacts (e.g. noise and light) during periodic maintenance activities. These activities will occur within the rail corridor, access tracks and stations and include maintenance of fauna movement infrastructure, drainage inspections and maintenance (e.g. culverts) and regrowth control (predominantly ground slashing) to allow for the safe operation of trains and maintenance vehicles.

As part of the ongoing operation of the railway, the following potential impacts will be facilitated by the proposed action:

- Changes in pedestrian movement to and from stations, potentially disrupting native fauna behaviour
- Potential increase in the incursion and spread of weeds, pest and pathogens
- Potential change fauna movement/behaviour with changes to existing culvert/bridge crossings
- Potential increase in fauna injury/mortality from vehicle strikes
- Potential increases in noise and light (especially with upgraded stations) which may:
  - Increase disorientation and alteration in use of habitats and movement pathways
  - Alter predator-prey dynamics
  - Influence seasonal movement cycles of species.

5.4 Landscape connectivity impacts

The proposed action's potential impact to koala, and greater glider (southern and central) and yellow-bellied glider (south-eastern) movement patterns using landscape connectivity modelling results are

[25] Impact pile driving, impact guard rail installation or removal, saw cutting, rock / concrete breaking (hammering), rock removal or placement.

summarised below and further described in Appendix G. These species were assessed to be most at risk of connectivity impacts, and the koala has been assessed with a significant impact as a result of the proposed action.

The results from the landscape connectivity model identified:

- Current koala and greater glider (southern and central) and yellow-bellied glider (south-eastern) movement opportunities generally align with mapped biodiversity corridors (Figure 1) and ground truthed fauna movement corridors (Appendix B Figure 11).
- As a result of the proposed action and proposed fauna connectivity infrastructure such as proposed culverts, several areas of diffuse koala movement occurs
- As a result of the proposed action and proposed fauna connectivity infrastructure, the following areas show potential impedance (restrictions) to koala movement within the Impact area:
  - Acacia Forest Park
  - Gould Adams Park/Nealdon Park
  - Logan River in Loganlea
  - Edens Landing Station
- As a result of the proposed action and proposed fauna connectivity infrastructure, the following areas are unlikely to show significant changes to koala movement from existing conditions to future conditions (i.e. with the proposed action in place):
  - Kuraby
  - Woodridge
  - Logan Central
  - Holmview Road Reserve, near Holmview Station
  - Beenleigh Station
  - Kingston Road, Kingston
  - Loganlea Road, Loganlea
  - Bethania (except for St Jude's Bethania Gardens, near Federation Drive)
- As a result of the proposed action, diffuse greater glider (southern and central) and yellow-bellied glider (south-eastern) movement is unlikely to be maintained within the Impact area
- As a result of the proposed action, the following areas show potential impedance (restrictions) to greater glider (southern and central) and yellow-bellied glider (south-eastern) movement within the Impact area:
  - Kuraby State School
  - Acacia Forest Park
  - Anzac Park
  - Gould Adams Park/Nealdon Park
  - Edens Landing Station
  - Trinity College – Beenleigh
- As a result of the proposed action and proposed fauna connectivity infrastructure, the following areas are unlikely to show significant changes to greater glider (southern and central) and yellow-bellied glider (south-eastern) movement from existing conditions to proposed future conditions (i.e. with the proposed action in place):
  - Woodridge
  - Logan Central
  - Bethania
  - Holmview Road Reserve, near Holmview Station
  - Beenleigh Station
  - Hugh Muntz Gardens.

The linear nature of the proposed action means that impacts will primarily occur along patch edges (and broadscale clearing of entire patches is generally unlikely to occur), and patch isolation is unlikely to be a key issue. Despite this, based on the landscape connectivity modelling results, the following locations have a potential risk to be impacted in terms of landscape connectivity after construction is completed for the proposed action (please refer to Appendix G for details):

- Kuraby State School
- Acacia Forest Park

- Anzac Park, Kingston
- Gould Adams Park/Nealdon Park
- Edens Landing Station

Section 5.2.1.2 of this report outlines potential landscape connectivity impacts (in terms of fauna movement and habitat fragmentation) as a result of the proposed action.

As a result of this landscape connectivity modelling and ongoing design work, pre-construction design management measures such as fauna fencing, passage and fauna furniture have been selected in strategic locations to ensure fauna connectivity outcomes and outlined in Section 6.2 are proposed to avoid, minimise and manage potential impacts to local scale connectivity and fauna movement, in particular for koala, greater glider (southern and central) and yellow-bellied glider.

5.5 Cumulative impacts

The following section presents a local and regional scale analysis of likely impacts with reference to the proposed action's potential contribution to cumulative impacts in the context of development patterns in the locality and region.

The proposed action is one of a several regionally strategic transport projects to increase connectivity within and between Brisbane, Logan and Gold Coast regions, address congestion, promote electrified public and active transport options instead of (generally) petrol-powered cars, promote sustainable and infill growth patterns, and promote sustainable and infill growth patterns and (Queensland Government, 2024). Transport projects which intersect the proposed action Impact area, but do not form part of the proposed action, include:

- Loganlea Station Relocation (LSR), a proposal to relocate the Loganlea train station and the park 'n' ride closer to Logan Hospital.
- European Train Control System (ETCS), a new generation train signalling system being rolled out across the south-east Queensland rail network.
- Open level crossing removals (OLCRs), a program of safety improvements at level crossings in Queensland, including Beenleigh Road, Kuraby and Station Road, Bethania.

Consideration has been given to the potential for cumulative impacts to MNES, based on the known scope of these projects within the proposed action Impact area. These projects have been subject to their own environmental assessment to determine the extent of MNES impacts, as summarised below:

- **LSR**: approximately 6.09 ha of direct impacts to non-remnant vegetation consisting of scattered trees, landscaped road reserves and residential and school gardens, interspersed between houses and roads. These impacts were assessed as not significant, with the project being determined as 'not a controlled action' (EPBC Ref: 2022/09348).
- **ETCS**: all of the works are proposed within the existing rail corridor and therefore, are not anticipated to impact on MNES. TMR has undertaken an assessment and is satisfied that there is no impact on MNES.
- **OLCRs – Beenleigh Road, Kuraby and Station Road, Bethania**: TMR has undertaken an assessment of the proposed grade separation works at these locations and is satisfied that significant impacts to MNES are not considered likely.

Cumulative impacts within development patterns

The proposed action primarily occurs within brownfield (rather than greenfield) areas supporting an urban matrix of residential areas, disturbed and undisturbed vegetation, parklands, roads, railways and industrial land. Proposed impacts to MNES would be limited to the narrow, linear alignment within the Impact area and primarily impact habitat patch edges.

In addition, while local cumulative impacts may occur to vegetation/habitat quality (e.g. edge effects), fauna diversity and available local resources, comprehensive measures to avoid, minimise, mitigate and manage impacts of the proposed action are provided within Section 6.0 of this document and the OEMP.

Local scale impacts to the MNES species known or likely to occur in the Impact area were assessed via Significant Impact Assessments (Appendix F). Based on assessment of impacts from the proposed action alongside cumulative impacts in the context of development patterns in the locality and region there are no significant regional scale cumulative impacts.

An analysis of the local and regional scale impacts to MNES populations from the proposed action is summarised in Table 29.

Table 29 Summary of local and regional scale impacts to MNES populations

MNES	Local and regional scale impacts
Koala	As the Impact area is classified as an urban area, there are existing effects of habitat loss and fragmentation. However, as the Impact area is generally co-located within the existing rail line, there is minimal risk of increasing the severity of current habitat fragmentation. Furthermore, the proposed action proposes to incorporate permanent connectivity structures in the design of the proposed action. These permanent connectivity structures maintain or improve the current ecological connectivity for fauna across the proposed action's Impact area and existing rail line and rail corridor. The majority of koala habitat presents as scattered eucalypt trees within a fragmented landscape. However, all koala habitat within the Impact area is considered habitat critical to the survival of the species. A Significant Impact Assessment for this species is provided in Appendix F and accounts for the local scale impacts to the species. All significant impacts will be fully acquitted in the proposed offsets package. The long-term viability of remaining populations is not anticipated to be significantly impacted as higher quality habitat will remain in the surrounding local area. In review of the development projects relevant to MNES values existing in the region there are no anticipated regional scale cumulative impacts to the species. Potential habitat for the koala occurs within the LSR Project in the form of regrowth vegetation including non-juvenile koala habitat trees. It is expected that koala use would be minimal and for short periods of rest/dispersal/foraging. Sheltering habitat for koalas is considered marginal as good canopy cover is limited. Furthermore, the LSR Project is located in a highly disturbed landscape where the original vegetation and habitat has been removed for urban infrastructure and residential living and is dominated by non-remnant vegetation.
Greater glider (southern and central) and Yellow-belied glider (south eastern)	As the Impact area is classified as an urban area, there are existing effects of habitat loss and fragmentation. However large patches of habitat occur within Nealdon Park and Karawatha Park both of which connect to the broader landscape. As no individuals were observed within the Impact area, the species may be present at low abundance. The majority of vegetation clearing required for the proposed action will occur to a linear area that runs north south and that has already been disturbed. European red fox was observed during targeted field surveys, and feral cats have the potential to occur. Furthermore, the proposed action proposes to incorporate permanent connectivity structures in the design of the proposed action. These permanent connectivity structures maintain or improve the current ecological connectivity for fauna across the proposed action's Impact area and existing rail line and rail corridor. High levels of weed incursion already occur within the Impact area. A Significant Impact Assessment is provided in Appendix F accounts for the local scale impacts to the species. Monitoring and management measures will occur within direct impact areas and a 50 m buffer zone (described in Section 5.2.2.7). The long-term viability of remaining populations is not anticipated to be significantly impacted as higher quality habitat will remain in the surrounding local area. In review of the development projects relevant to MNES values existing in the region there are no anticipated regional scale cumulative impacts to the species. No habitat for the greater glider or yellow-bellied glider occurs within the LSR Project. Furthermore, The LSR Project is located in a highly disturbed landscape where the original vegetation and habitat has been removed for urban infrastructure and residential living and is dominated by non-remnant vegetation.
South-eastern glossy black-cockatoo	No individuals or indirect evidence for this species was observed within the Impact area. This suggests the species may be present at low abundance within the Impact area and/or that habitat within the Impact area is used on an occasional or intermittent basis only. *Allocasuarina* and *Casuarina* foraging species occur sporadically throughout the Impact area including breeding habitat, all of which is considered habitat critical to the

MNES	Local and regional scale impacts
	survival of the species. The species is highly mobile and likely to utilise habitat outside of the Impact area. The high level of disturbance (e.g. weeds and anthropogenic impacts) and fragmentation to the existing habitat means that the species would likely have a preference for habitat outside of the Impact area. Full MNES Significant Impact Assessment is provided in Appendix F and accounts for the local scale impacts to the species. All habitat will be fully acquitted in offsets. The long-term viability of remaining populations is not anticipated to be significantly impacted as higher quality habitat will remain in the surrounding local area. In review of the development projects relevant to MNES values existing in the region there are no anticipated regional scale cumulative impacts to the species. Potential habitat for the south-eastern glossy black cockatoo occurs within the LSR Project in the form of regrowth vegetation. While large trees that may contain hollows occur, it is expected that south-eastern glossy black cockatoo use would be minimal/temporary, and primarily for foraging/dispersal. Furthermore, the LSR Project is located in a highly disturbed landscape where the original vegetation and habitat has been removed for urban infrastructure and residential living and is dominated by non-remnant vegetation.
Grey-headed flying-fox	The Impact area contains myrtaceous species and exotic species with fleshy fruits that area seasonal foraging resources considered habitat critical to the survival of the species. A Significant Impact Assessment is provided in Appendix F and accounts for the local scale impacts to the species. All habitat will be fully acquitted in offsets. The long-term viability of remaining populations is not anticipated to be significantly impacted as higher quality habitat will remain in the surrounding local area. In review of the development projects relevant to MNES values existing in the region there are no anticipated regional scale cumulative impacts to the species. Potential habitat for the grey-headed flying-fox occurs within the LSR Project in the form of regrowth. Grey-headed flying-fox are expected to use the trees within and adjacent to the Project Area for foraging and for dispersal between larger, more suitable patches of vegetation Furthermore, The LSR Project is located in a highly disturbed landscape where the original vegetation and habitat has been removed for urban infrastructure and residential living and is dominated by non-remnant vegetation.

Regional vegetation scale analysis

There is approximately 138,226,365 ha (79.97%) of existing remnant vegetation within Queensland (between 1997-2021). The SEQ Bioregion comprises approximately 44% of extant remnant vegetation. Additionally, within the SEQ bioregion, vegetation clearing generally occurs largely within the Moreton Basin subregion (where the Impact area is located) and other subregions (Queensland Government, 2024).

The proposed action will impact approximately 174 ha (approximately 90% of the Impact area), comprising disturbed urban vegetation that is residential areas and industrial land, roads, railway corridors and stations, parklands (not vegetated), artificial wetlands, mixed regrowth and revegetation areas. In addition, the proposed action will impact approximately 20 ha (10% of the Impact area) of undisturbed vegetation that is eucalypt woodland and native aquatic vegetation. In a regional context, the proposed action's impact to undisturbed (remnant) vegetation is expected to be minor, impacting approximately less than 0.001% of undisturbed (remnant) vegetation within the SEQ bioregion.

Local vegetation scale analysis

Table 30 and Table 31 below show the proposed action's local scale[26] impacts to remnant (undisturbed) vegetation communities, based on latest available 2021 RE data from Queensland Government's *Map And Statistical Data By Local Government Area* (Queensland Government, 2023).

Table 30 Proposed action's total impact to remnant vegetation within Brisban and Logans LGAs

LGA	Remaining remnant vegetation in 2021 (ha)	Remaining remnant vegetation in 2021 (%)	Proposed action's maximum total impact to undisturbed vegetation within LGA (ha)	Proposed action's maximum total impact to undisturbed vegetation within LGA (%)
Brisbane	54,247	41.26%	10.79	**0.02**
Logan	26,088	27.31%	10.20	**0.04**

Table 31 Proposed action's impact to remnant vegetation communities (REs) within Brisbane and Logan LGAs

Vegetation community[27]	Relevant REs	Proposed action's maximum impact area (ha)	Total extant undisturbed (remnant) vegetation within Brisbane and Logan LGAs (ha)	Proposed action's maximum impact area (%)
Aquatic vegetation usually fringed with *Eucalyptus tereticornis* on closed depressions on alluvial plains.	12.3.7d	0.06	No available data	**No available data**
Corymbia citriodora subsp. variegata or *Corymbia henryi* woodland to open forest	12.11.5	0.92	9852.4	**0.009**
	12.9-10.19a	0	3035.9	**0**
	12.9-10.17b	0.40	151.6	**0.26**
Eucalyptus crebra, E. tereticornis, Corymbia intermedia grassy woodland on metamorphics	12.11.14	0.32	73.9	**0.44**
Eucalyptus moluccana woodland on margins of Quaternary alluvial plains	12.3.3d	0.49	334	**0.15**
Eucalyptus racemosa subsp. *racemosa and Corymbia intermedia* and/or *Eucalyptus seeana* woodland on remnant tertiary surfaces	12.5.3	0.67	25.3	**2.64**
	12.5.3a	0.33	No available data	**No available data**
	12.9-10.17c	3.86	630.4	**0.61**
	12.11.27	0.09	841.1	**0.01**
Eucalyptus siderophloia, E. propinqua open forest	12.11.3	1.37	4813.5	**0.03**
	12.9-10.17d	2.73	225.6	**1.21**

[26] Within the Brisbane and Logan LGAs.
[27] Disturbed urban vegetation (non-remnant vegetation) and regrowth vegetation is excluded from analysis, since no Queensland Government data exists for these vegetation conditions.

Vegetation community[27]	Relevant REs	Proposed action's maximum impact area (ha)	Total extant undisturbed (remnant) vegetation within Brisbane and Logan LGAs (ha)	Proposed action's maximum impact area (%)
Eucalyptus tereticornis, *Casuarina cunninghamiana* subsp. *cunninghamiana* +/- *Melaleuca* spp. fringing woodland	12.3.7	3.84	1685.7	**0.23**
Eucalyptus tereticornis and mixed woodland to open forest on alluvium	12.3.3	1.01	383.3	**0.26**
	12.3.11	1.27	2790.5	**0.05**
Melaleuca quinquenervia, Eucalyptus and spp. and *Casuarina glauca* open forest on coastal alluvial plains	12.3.6	2.47	1026.8	**0.24**

6.0 Mitigation measures

A range of measures have and will be implemented to avoid, minimise, mitigate, rehabilitate and remediate potential direct, indirect and facilitated impacts to all known or potentially occurring conservation significant species and communities. These measures will be specific to a particular phase and/or occur across multiple phases. For each measure proposed, the OEMP outlines:

- Objective and issue
- Control
- Timing
- Responsibility
- Outcome Performance Criteria
- Monitoring and Evaluation Program
- Contingency Measures.

The following mitigation measures for the proposed action are provided according to the hierarchy of mitigation, which is to:

1. **Avoid**: maximise use of disturbed areas, co-locate existing infrastructure and disturbance footprints, avoid vegetation clearing wherever feasible
2. **Minimise**: minimise or undertake partial (rather than full) vegetation clearing wherever feasible
3. **Mitigate**: implement measures to reduce or manage direct, indirect and cumulative impacts
4. **Remediate** and/or **rehabilitate** progressively remediate and rehabilitate temporarily impacted vegetation and habitats
5. **Offsets**: where significant impacts to MNES occur, TMR propose to deliver land-based environmental offsets. These requirements are addressed separately in the Offset Management Strategy outlined in Appendix D of the PD.

6.1 Avoid and Minimise

The design has been influenced by design optioneering, refinement of properties during acquisition, review of construction staging and methodology, stakeholder and asset owner input/feedback, design technical investigations, and targeted ecology surveys.

Throughout the proposed action's procurement phase, the Impact area has been further refined and reduced. As a result, footprint optimisations/reductions have occurred. The revised Impact area encompasses 194.45 hectares (ha), compared to 293.95 ha for the referral. While a high level of conservatism in mapping for threatened species habitat has already been undertaken, footprint refinement has resulted in an overall impact reduction for MNES species habitat. 'Major change areas' of reduction to MNES are shown in Figure 1 of the PD Report.

Results from Table 32 and Table 33 compare the December 2022 referral to new information based on the revised Impact area (Section 6.1), increased targeted field survey program (Section 2.5), and refined vegetation and habitat mapping (Appendix B and Appendix D).

A breakdown of the proposed action's footprint refinement is summarised below in Table 32**,** and the impact area reduction for MNES species is presented in Table 33.

Table 32 Summary of the proposed action's footprint refinement

	2022 Referral Impact area	Revised Impact area
Impact area (ha)	294.19	194.45 ha
	Overall reduction (ha)	**99.74**
	Overall reduction (%)	**33.90**

Table 33 Impact area comparison for MNES fauna between 2022 Referral Impact area and Revised Impact area[28]

	Potential habitat utilisation	Maximum Impact area (ha) (2022 Referral)	Maximum Impact area (ha)[29] (Revised Impact area)	Percentage (%) impact area reduction since Referral
Australian painted snipe (*Rostratula australis*)	Breeding (marginal), foraging and dispersal	2.31	0.98	57.58
	Total	**2.31**	**0.98**	**57.58**
Greater glider (southern and central) (southern & central) (*Petauroides volans)*	Breeding	32.03	21.40	33.19
	Foraging	8.45	7.52	11.01
	Dispersal	8.94	5.97	33.22
	Total	**49.42**	**34.89**	**29.40**
Grey-headed flying fox (*Pteropus poliocephalus*)	Breeding/Roosting	1.23	0.54	56.10
	Foraging/Dispersal	65.93	42.60	35.39
	Indirect impacts (Breeding/Roosting)	0	2.20	0
	Total	**67.16**	**45.33**	**32.50**
Koala (combined populations of Qld, NSW and the ACT) (*Phascolarctos cinereus*)	Breeding/Foraging	37.81	27.48	27.32
	Shelter/Dispersal	139.34	80.27	42.39
	Total	**177.15**	**107.74**	**39.18**
Mary River cod (*Maccullochella mariensis*)	Breeding/ Foraging/ Dispersal	1.42	0.65	54.23
	Total	**1.42**	**0.65**	**54.23**
Regent honeyeater (*Anthochaera phrygia*)	Foraging and dispersal	64.80	42.28	34.75
	Total	**64.80**	**42.28**	**34.75**
	Breeding	29.17	18.91	35.17

[28] Due to rounding to two decimal places, rounding errors of < 0.01 ha may occur.
[29] Including direct impact areas, functionally lost areas, and grey-headed flying-fox indirect impact areas.

	Potential habitat utilisation	Maximum Impact area (ha) (2022 Referral)	Maximum Impact area (ha)[29] (Revised Impact area)	Percentage (%) impact area reduction since Referral
South-eastern glossy black cockatoo (*Calyptorhynchus lathami lathami*)	Breeding and Foraging	10.05	7.13	29.05
	Foraging	2.47	2.19	11.34
	Dispersal	22.65	13.51	40.35
	Total	**64.34**	**41.74**	**35.13**
Spotted-tailed quoll (southern sub-species) (SE mainland population) (*Dasyurus maculatus maculatus*)	Breeding/ Foraging/ Dispersal	41.51	26.20	36.88
	Total	**41.51**	**26.20**	**36.88**
Swift parrot (*Lathamus discolor*)	Foraging and dispersal	64.80	42.28	34.75
	Total	**64.80**	**42.28**	**34.75**
White-throated needletail (*Hirundapus caudacutus*)	Foraging and dispersal	92.57	51.70	44.15
	Total	**92.57**	**51.70**	**44.15**
Yellow-bellied glider (south-eastern) (*Petaurus australis australis*)	Breeding	32.03	21.40	33.19
	Foraging	8.45	7.52	11.01
	Dispersal	8.94	5.97	33.22
	Total	**49.42**	**34.89**	**29.40**

In addition to the proposed action updates (outlined in section 2.1.4 of the Preliminary Documentation Report), the proposed action's Project team incorporated a substantial focus on footprint reduction throughout the Procurement phase which required the tendering parties to investigate and assess various options to reduce impacts on vegetation wherever practicable. This resulted in more certainty in the final footprint required to deliver the Project, as such, the following design refinements have been implemented, resulting in a reduction of impact to areas of ecological values for the proposed action:

- Design refinement has occurred at Acacia Forest Park with an approximate 20 % reduction in the Impact area.
- Design and construction refinement has occurred at Scrubby Creek with a focus on minimising impacts to environmental and ecological factors, estimating a 22% reduction in the Impact area. Specifically this was driven by restricting the temporary disturbance footprint as much as possible in regards to bridge construction methods.
- Design refinement has occurred at Beenleigh estimating a 55% reduction in the Impact area, Importantly, the design has progressed, design refinement has resulted in excluding Hugh Muntz Park from the project footprint therefore avoiding all direct and indirect impacts to Hugh Muntz Park (including the subtropical floodplain eucalypt TEC).
- Design refinement has occurred around Battle Park, which contains Logan City Council offsets. Changes to the rail maintenance access roads (RMAR) as well as the horizontal clearances to fence lines has resulted in reduction of impacts to the Council vegetation.
- A bridge crossing the rail corridor at Spann's Road and Church Road had previously contained spiral ramps, predominantly aimed at cycle users, which resulted in more land take and vegetation clearance. Following further design analysis, a modified option was provided that uses two separate ramps, one for cyclists and one for pedestrians, on the approaches to the bridge. This has resulted in less land take and vegetation removal, while providing for all users.
- Along the rail corridor, batter slopes have been changed from a 1:4 (25%) to a steeper 1:2 (50%) slope. While this has been a departure from QR standards for the treatment of batter slopes, this will result in less land take and impacts to adjacent vegetation.
- Solutions were reviewed at Eden's Landing which included alternatives such as Retaining wall structures to further reduce vegetation clearing, loss of koala and grey-headed flying fox habitat, maintain riparian fauna movement pathways, and control erosion and sedimentation to the Logan River, including an approximate 15 m buffer between the construction boundary and the Logan River. Although retaining walls were incorporated into the Refined Reference Design – which enabled a considerable footprint reduction in comparison to the initial design – throughout the Procurement Phase solutions were further verified to apply more traditional and cost-efficient rail earthworks option (i.e. cut-fill embankment) in this area. Importantly, this change has been able to maintain the footprint that the Retaining wall approach required, as such there is no change to the required footprint between retaining wall and traditional earthworks option in this area.
- Temporary construction laydown areas have been re-evaluated to look at further opportunities to minimise vegetation clearing, and avoid mapped and ground truthed biodiversity corridors, conservation significant flora, fauna and community habitat. As an example, this has occurred at Logan River: two large temporary works areas have been removed after targeted assessments with the tenderers and considering feedback from surrounding stakeholders. Note, it is likely that impacts to MNES habitat will be further reduced during detailed design however given that Detailed Design is yet to commence, impacts have been conservatively assessed.

6.2 Pre-construction (design) management measures

Section 3.9 describes the terrestrial fauna corridors across, within and adjacent to the Impact area. As such, it is critical as an avoidance and mitigation measure that connectivity be retained in specific areas within the Impact area.

To achieve this connectivity, TMR will incorporate permanent connectivity structures in the design of the proposed action. These permanent connectivity structures maintain or improve the current ecological connectivity for fauna across the proposed action's Impact area and existing rail line and rail corridor.

The impact assessment within Section 5.0 of this document and Significant Impact Assessments (Appendix F) have been based on confirmed permanent connectivity structures for the proposed action, however additional connectivity structures will be further considered during the Detailed Design phase.

TMR are currently proposing to construct wildlife movement solutions based on the known requirements for the target species, the current design of the proposed action and results of the landscape connectivity modelling. These will be fully assessed as part of the Detailed Design phase.

Most connectivity solutions are associated with bridge underpasses (e.g. log rail) and culverts and will be designed and constructed consistent with *Fauna Sensitive Transport Infrastructure Delivery manual* (TMR, 2024).

In the case where the proposed wildlife movement solutions are culverts and underpasses, the wildlife movement solutions will:

- Provide dry passage clear of batters/rock abutments/scour protection to ensure long term viability
- Provide connectivity and shelter
- Maintain natural streamflow
- Fauna furniture will be installed in culverts to allow refuge from predators for arboreal species where reasonable and feasible.

Provision has been made for revegetation of the new rail corridor within the vicinity of Compton Road, Logan River, Edens Landing Station and Holmview Station to enhance habitat values and movement corridors which are currently sparsely vegetated. The revegetation of these areas will enhance east-west movement opportunities for fauna, specifically targeting koalas across the broader landscape.

While the dimensions (length and width) of vegetated corridors vary between fauna species (Department of Transport and Main Roads, 2000), a comprehensive literature review of species movement was undertaken to inform landscape connectivity modelling (Appendix G) for the proposed action. The modelling identifies suitable locations to maintain or improve fauna movement corridors, based on the size and types of permanent fauna movement infrastructure for the proposed action.

When considering the suitability of fauna movement infrastructure and revegetation to enhance fauna movement, the following approach was undertaken for the proposed action:

- The design needs of the target species
- Existing landscape connectivity including composition and structure
- Current and future land use adjacent to the proposed action
- Physical design constraints such as topography, accessibility and drainage.

Design requirements (including these mitigation measures) will be documented in the Environmental Design Report (EDR), to be completed during the Detailed Design phase. Additionally, landscaping and revegetation of fauna passage surroundings will be in accordance with TMR's MRTS16 Landscape and Revegetation Works and guidance from the *Fauna Sensitive Transport Infrastructure Delivery manual* (TMR, 2024). Installation of Overhead line equipment (OHLE) will be implemented as per MRTS331 Overhead Line Equipment (OHLE) (Transport and Main Roads, 2024; Queensland Rail, 2016) (Plate 8). The fauna movement corridors presented in Table 34 represents indicative locations and mitigation measures. Further assessment of these mitigation measures for targeted species will be undertaken during the Detailed Design phase.

Table 34 Mitigation measures to retain or improve connectivity for investigation/refinement through Detailed Design

Location	Mitigation measure	Anticipated benefit
Beenleigh Road, Kuraby	• Fauna exclusion fencing • Fauna escape pole • OHLE electrostatic wildlife guard • Wildlife road signage • Barbed-wire hierarchical treatment	• Reduce risk of vehicle/train collision • Reduce risk of injury or mortality to fauna from OHLE (particularly for gliders)

Location	Mitigation measure	Anticipated benefit
Beenleigh Road to Compton Road	• Fauna fencing • Fauna escape pole • Fauna passage – new underpass (e.g. log rail bridge) and/or replacement of existing culvert retrofitted with fauna furniture • OHLE electrostatic wildlife guard • Wildlife road signage • Revegetation • Barbed-wire hierarchical treatment	• Reduce risk of vehicle/train collision • Direct fauna to fauna passage increasing east to west movement • Culvert retrofitted and/or new underpass to increase connectivity/fauna movement potential from east to west • Reduce risk of injury or mortality to fauna from OHLE (particularly for gliders) • Improve habitat values
Smith Road /Acacia Forest Park	• Fauna fencing • Fauna escape pole • Glider poles • New dedicated fauna underpass retrofitted with fauna furniture and/or replacement of existing culvert retrofitted with fauna furniture • Wildlife road signage • Barbed-wire hierarchical treatment	• Reduce risk of vehicle/train collision • Direct fauna to fauna passage increasing east to west movement • Culvert retrofitted to increase connectivity/fauna movement potential from east to west • Glider poles increase species movement potential from east to west
Trinder Park	• Fauna fencing • Fauna escape pole • OHLE electrostatic wildlife guard • Barbed-wire hierarchical treatment	• Reduce risk of vehicle/train collision • Reduce risk of injury or mortality to fauna from OHLE (particularly for gliders)
Woodridge (east of station)	• OHLE electrostatic wildlife guard • Barbed-wire hierarchical treatment	• Reduce risk of injury or mortality to fauna from OHLE (particularly for gliders)
Kingston (west of station)	• Fauna fencing • Fauna escape pole • OHLE electrostatic wildlife guard • Barbed-wire hierarchical treatment	• Reduce risk of vehicle/train collision • Reduce risk of injury or mortality to fauna from OHLE (particularly for gliders)
Scrubby Creek	• Fauna fencing • Fauna escape pole • Fauna passage – new underpass (e.g. log rail bridge) • OHLE electrostatic wildlife guard • Barbed-wire hierarchical treatment	• Reduce risk of vehicle/train collision • Direct fauna to fauna passage increasing east to west movement • Culvert retrofitted and/or new underpass to increase connectivity/fauna movement potential from east to west • Reduce risk of injury or mortality to fauna from OHLE (particularly for gliders)
Loganlea / Logan River	• Fauna fencing • Fauna escape pole • Fauna passage – new underpass (e.g. log rail bridge) and/or replacement of existing culvert retrofitted with fauna furniture • OHLE electrostatic wildlife guard • Revegetation • Barbed-wire hierarchical treatment	• Reduce risk of vehicle/train collision • Direct fauna to fauna passage increasing east to west movement • Reduce risk of injury or mortality to fauna from OHLE (particularly for gliders) • Culvert retrofitted and/or new underpass to increase connectivity/fauna movement potential from east to west • Improve habitat values
Edens Landing Station	• Fauna fencing • Fauna escape pole	• Reduce risk of vehicle/train collision • Direct fauna to fauna passage increasing east to west movement

Location	Mitigation measure	Anticipated benefit
	• Fauna passage – new underpass (e.g. log rail bridge) and/or replacement of existing culvert retrofitted with fauna furniture • OHLE electrostatic wildlife guard • Revegetation • Barbed-wire hierarchical treatment	• Reduce risk of injury or mortality to fauna from OHLE (particularly for gliders) • Culvert retrofitted and/or new underpass to increase connectivity/fauna movement potential from east to west • Improve habitat values
Holmview Station	• Fauna exclusion fencing • Fauna escape pole • Fauna passage – new underpass (e.g. log rail bridge) • OHLE electrostatic wildlife guard • Revegetation • Barbed-wire hierarchical treatment	• Reduce risk of vehicle/train collision • Direct fauna to fauna passage increasing east to west movement • Culvert retrofitted and/or new underpass to increase connectivity/fauna movement potential from east to west • Reduce risk of injury or mortality to fauna from OHLE (particularly for gliders) • Improve habitat values
Beenleigh, Kokoda Street	• Fauna exclusion fencing • Fauna passage – replacement of existing culvert retrofitted with fauna furniture • Barbed-wire hierarchical treatment	• Direct fauna to fauna passage increasing east to west movement • Culvert retrofitted and/or new underpass to increase connectivity/fauna movement potential from east to west

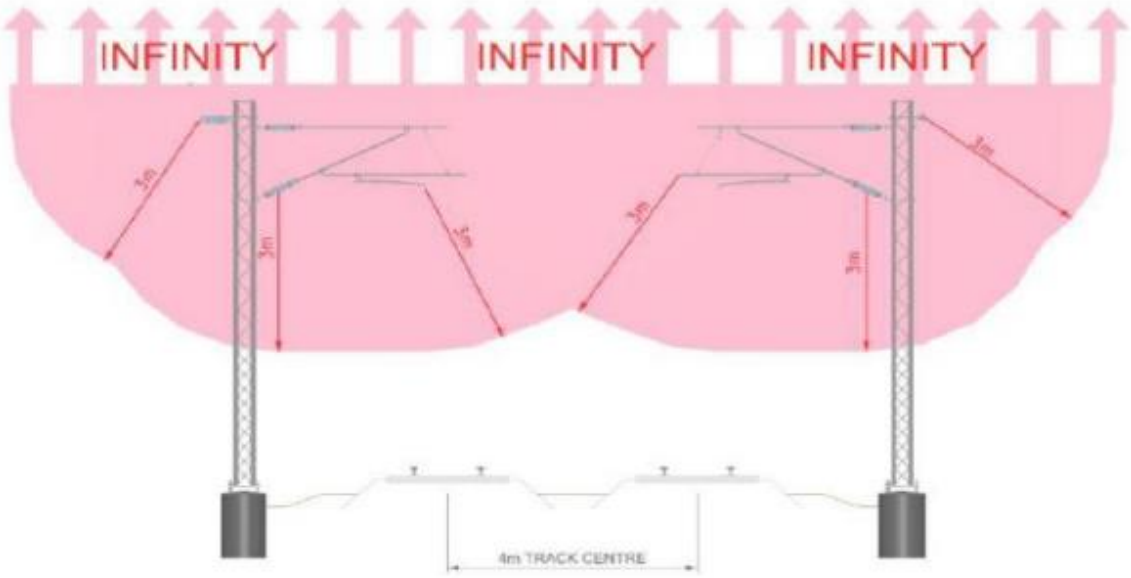


Plate 8 Overhead Line Equipment Exclusion Zone source: (Queensland Rail, 2016)

6.3 Mitigation measures

Despite avoid and minimise principles being applied; the nature and size of the proposed action means that impacts to vegetation and habitat will occur. As such, rehabilitation and mitigation measures will be prepared, implemented and audited as outlined in the OEMP. Species-specific mitigation measures are also provided in Table 37. General best practice environmental management measures are considered as part of the risk assessment process within Section 7.0 of this report. Please refer to the OEMP for full details of all best practice environmental management measures.

6.4 Buffer zones

Buffer zones have been prescribed for conservation species and communities to assess potential for indirect impacts and where the provision of buffer zones is considered ecologically relevant.

Approximately 21.83 ha of habitat for the following relevant conservation significant species / communities have been considered for buffer zones.

- Breeding and roosting habitat for grey-headed flying-fox
- Breeding habitat for greater glider and yellow-bellied glider
- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions.

These species and communities have been considered ecologically relevant for the provision of buffer zones given:

- The greater glider (southern and central) and yellow-bellied glider may have limited mobility opportunities. In particular, greater glider (southern and central) is highly sensitive to fragmentation (Eyre, 2006). Therefore, a buffer zone is recommended to facilitate movement opportunities and mitigate against indirect impacts such as introduced weeds, pests, pathogens and dust resulting in compromised vegetation quality of foraging resources. In addition, a buffer zone will reduce

disturbance to individuals (if they were to occur) from indirect impacts such as noise, light and vibration.

- Grey-headed flying-fox camp (including juveniles) were observed within the Impact area at Voyager Drive, Kuraby and Jacaranda Avenue, Kingston. Therefore a buffer zone is recommended to reduce disturbance to the breeding cycle of the species (Ecosure, 2021) and mitigate against indirect impacts such as weeds, pests, pathogens, dust, noise, light and vibration. A third camp located at Ridgewood Reserve, Edens Landing is 158 m outside of the Impact area. Indirect impacts are unlikely however, pre and during construction monitoring and adaptive management is recommended to be undertaken within the buffer zone. In addition, December 2024 monitoring of the Ridgewood Reserve, Edens Landing camp did not observe grey-headed flying-fox individuals.
- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions TEC is located within and adjacent to the Impact area and a buffer zone is recommended to protect the integrity of the remaining TEC and absorb indirect impacts such as erosion, sedimentation and the introduction / spread of introduced flora, fauna and pathogens.

Buffer zone areas are displayed in Table 35.

Table 35 Buffer zone area

MNES	Buffer zone (m)	Buffer zone area (ha)
Greater glider and yellow-bellied glider	100	7.26
Grey-headed flying fox	300	9.77
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions TEC	50	4.80

Table 36 below summarises the justification for the application of buffer zones for ecologically relevant species and communities and outlines control measures applied to reduce indirect impacts from construction activities, with buffer zones displayed in Appendix B Figure 14, Appendix B Figure 15 and Appendix B Figure 19.

Table 36 also provides summary as to why other species have not been considered ecologically relevant species in relation to application of buffers.

Table 36 Justification and control for buffer zones

Species	Justification and controls
Grey-headed flying-fox	**Justification:** • A 300 m buffer zone to assess potential indirect impacts to breeding/roosting habitat is based on a review of scientific literature and statutory documentation including *Chapter 10, Section 8 of the TMR Fauna Sensitive Transport Infrastructure Delivery manual* (Department of Transport and Main Roads, 2024) and *Draft National Recovery Plan for the Grey-headed Flying-fox Pteropus poliocephalus* (Eby, 2009). • The full direct impact to grey-headed flying-fox habitat – including the camps within the direct impact area – were incorporated into the significant impacts assessments • Revised Impact area has reduced the extent of potential indirect impacts to 2.20 ha at Voyager Drive, Kuraby and Jacaranda Avenue, Kingston. Indirect impacts area unlikely at the camp at Ridgewood Reserve, Edens Landing, since no grey-headed flying-fox were observed in December 2024 and January 2025 monitoring events, works are approximately 150-200 m from the camp, vegetation immediately surrounding the camp will be retained, works will be temporary (ie. 3-4 months), no high impact activities will be undertaken within 100 m of a camp, and will generally be undertaken at night when grey-headed flying-fox are likely to be absent (when foraging). • The full direct and indirect impact to grey-headed flying-fox habitat has been fully acquitted in the offset package • Impacts likely to be temporary in nature

Species	Justification and controls
	• As per Section 4.8 flying fox camps are likely to be temporary due to the low numbers (that is, generally < 100) and intermittent occurrence during the targeted field surveys. These camps are not listed on the National Flying fox Monitoring Viewer and are unlikely to meet the criteria of a 'nationally important camp'[30] as defined in the National Recovery Plan (Commonwealth of Australia, 2021) **Controls:** • Site inductions and pre-start meetings to convey specific information to construction personnel and raise awareness/identification of species on site, as well as protocols relating to the protection of species and their habitat. For example, habitat tree inspection and management requirements; contact lists of nearby veterinary centres/wildlife hospitals and procedures for sick or injured fauna requiring rescue to be provided at induction. • EMP (C) to outline roost information and relevant management procedures as stated in the OEMP • Areas where grey-headed flying-fox roosts occur within the Impact area or within a 300m buffer zone, light management controls and compliance monitoring will be undertaken, for the period between dusk and dawn, in accordance with the "Bat light mitigation toolbox" section outlined in the *DCCEEW National Light Pollution Guidelines for Wildlife, Appendix I – Bats* (Department of Climate Change Energy the Environment and Water, 2023) • Noise and vibration indirect impacts are considered low given the existing urban environment – specifically alongside a functioning rail corridor - and it is likely camps have developed a tolerance to the existing noise, light and human activity disturbances. Nonetheless, noise and vibration controls will be implemented across the entire Impact area in accordance with the following guidelines: - Queensland *Environmental Protection (Noise) Policy 2019*, Schedule 1 - Acoustic quality objectives; - TMR's *Volume 2 - Transport Noise Management Code of Practice,* and, - TMR's *MRTS51 Environmental Management Technical Specification* section 8.5 - TMR's *Interim Guideline Operational Railway Noise and Vibration, Section 2, Section 3 and Section 4.* • Dust controls will be implemented within entire Impact area and during construction phase through various control measures including dust suppression (e.g. soil binders, watercarts), speed restrictions, appropriate erosion and sediment measures, and progressive stabilisation / revegetation of temporary disturbance areas. • Prior to vegetation clearing within the Impact area, disturbance boundary to be clearly delineated and demarcated with high-visibility flagging tape • Vegetation clearing across entire Impact area to be supervised by a suitably qualified fauna spotter catcher with knowledge and experience relevant to management of flying-foxes and their habitat, who can identify dependent young and is aware of climatic extremes (i.e. heat stress or cyclone event) and food stress events. • For any clearing activities, a fauna spotter catcher will undertake a pre-clearing fauna inspection which will check for presence of new camps as well as verify the presence / abundance at known/previously identified camps • Prior to works commencing within 300m buffer zone from camps, the fauna spotter catcher will assess the presence of any grey-headed flying-foxes, including checking for breeding activity (pregnant females, creched young and/or dependent young). Based on this assessment, the fauna spotter catcher will advise whether vegetation clearing can commence. • If a new flying-fox camp is found within 300 m of the proposed Impact area (other than at Voyager Drive, Kuraby, Jacaranda Avenue, Kingston and Ridgewood

[30] Those that have contained ≥ 10,000 Grey-headed Flying-foxes in more than one year in the last 10 years or have been occupied by more than 2,500 Grey-headed Flying-foxes permanently or seasonally every year for the last 10 years criteria of a 'nationally important camp' as defined in the National Recovery Plan (Commonwealth of Australia, 2021).

Species	Justification and controls
	Reserve, Edens Landing), the suitably qualified fauna spotter catcher will review the proposed construction activities, including timing and appropriate management measures in accordance with the *Referral guideline for management actions in grey-headed and spectacled flying fox camps* (Department of the Environment, 2015) • Other than under exceptional circumstances[31], vegetation clearing activities within 300m buffer zone surrounding known grey-headed flying-fox camps (i.e. Voyager Drive, Kuraby, Jacaranda Avenue, Kingston and Ridgewood Reserve, Edens Landing): - To occur in low-risk times (i.e. outside of August – November breeding / creche periods). Works required under exceptional circumstances will be guided by a fauna spotter catcher. - Should be prioritised at night, as this is when individuals are less likely to be present - Will not occur during or immediately after climatic extremes (heat stress[32] or cyclone events[33]), or during or immediately after a period of significant food stress[34] . - Will be sequentially staged to commence at maximum distance away from the camp, and then proceed towards camp to enable the individuals to become accustomed to the activities and to allow them to self-disperse / retract into adjoining vegetation. - The flying-fox heat stress forecaster and Bureau of Meteorology weather forecast will be reviewed within 24 hours when vegetation clearing proposed within 300m of a camp. Where forecasts indicate daily ambient temperatures $\geq$ 38^{o} C AND clearing proposed within 300 m buffer zone from camp, fauna spotter catcher to complete hourly temperature check and assess if camps contain notable signs of stress (such as excessive fanning or flyouts). Vegetation clearing works to immediately cease if temperatures exceed 38^{o} C within 300m of camp, or notable signs of stress are observed within camps. • Other than under exceptional circumstances, high impact activities[35] within 100 m of camps: - To occur in low-risk times (ie. outside of August – November breeding / creche periods), Works required under exceptional circumstances will be guided by a fauna spotter catcher. - Should be to be prioritised at night, as this is when individuals are less likely to be present - Will not occur during or immediately after climatic extremes (heat stress or cyclone events), or during or immediately after a period of significant food stress. - Will be staged to commence at maximum distance away from the camp, and then proceed towards camp to enable the individuals to become accustomed to the activities and to allow them to self-disperse / retract into adjoining vegetation. - The flying-fox heat stress forecaster and Bureau of Meteorology weather forecast will be reviewed within 24 hours when high impact activities proposed within 100m of a camp. Where forecasts indicate daily ambient temperatures $\geq$ 38^{o} C AND high impact activities proposed within 100 m buffer zone from camp, fauna spotter catcher to complete hourly temperature check and assess

[31] Exceptional circumstances may include, but are not limited to, preparation for severe/inclement weather; maintaining public safety; and responding to emergencies or incidents.
[32] A 'heat stress event' is defined as a day on which the maximum temperature does (or is predicted to) meet or exceed 38°C (Department of the Environment, 2015) .
[33] A cyclone event is defined as a cyclone that is identified by the Australian Bureau of Meteorology (www.bom.gov.au/cyclone/index.shtml) (Department of the Environment, 2015).
[34] Food stress events may be apparent if large numbers of low body weight animals are being reported by wildlife carers in the region (Department of the Environment, 2015).
[35] Impact pile driving, impact guard rail installation or removal, saw cutting, rock / concrete breaking (hammering), rock removal or placement

Species	Justification and controls
	if camps contain notable signs of stress (such as excessive fanning or flyouts). High impact works to immediately cease if temperatures exceed 38° C within 100m of camp, or notable signs of stress are observed within camps • Vegetation outside the Impact area and adjacent to camps will be retained to maintain vegetation integrity, allowing individuals to naturally move/retract to cooler areas reducing heat-related stress/mortality and support the persistence of the camp • Only a qualified and suitable fauna spotter catcher or wildlife carer with up-to-date Lyssavirus vaccines are to handle bats. Personnel must not attempt to touch or handle a flying fox. If interaction with a flying-fox is required, a FSC must be contacted. This information will also be conveyed to all construction personnel during site inductions. Fauna handling will be in accordance with: - 'Code of Practice: Care of Sick, Injured or Orphaned Protected - Animals in Queensland, Nature Conservation Act 1992', - Relevant approvals, licences, permits • Any injured fauna are to be taken to: 139 Wacol Station Road, WACOL QLD 4076, 1300 ANIMAL (1300-264-625) • Domestic dogs are to be prohibited on the construction site at all times. • Rehabilitation of disturbed habitat to be undertaken in suitable locations (i.e. outside railway corridor) using native species in accordance with the proposed action's MRTS16 Landscape and Revegetation, Rehabilitation will be considered against the landscape and maintenance requirements of the future asset owner. • Installation of electrostatic wildlife guards on Overhead Line Equipment (OHLE) to minimise electrocution Plate 8 • Voyager Drive, Kuraby & Jacaranda Avenue, Kingston camps: given the camps exist within the Impact area, 1.78 ha at Voyager Drive, Kuraby and 0.42 ha at Jacaranda Avenue, Kingston of breeding/roosting habitat within the buffer zone have the potential to be indirectly impacts. As such, this area is assessed in the significant impact assessments and has been acquitted in offsets. In the instance these camps remain populated at the advancement of vegetation clearing, clearing works will comply with the below guideline, except to the extent where trimming is constrained to annual limits: - *Code of Practice: Low impact activities affecting flying-fox roosts, Nature Conservation Act 1992* (Department of Environment & Science 2020) https://www.des.qld.gov.au/policies?a=272936:policy_registry/cp-wl-ff-low-impact-roosts.pdf • Ridgewood Reserve, Edens Landing camp: Indirect impacts are unlikely to 7.57 ha of breeding/roosting habitat within the buffer zone at Ridgewood Reserve, Edens Landing, and as such offsets are not proposed. • A Fauna Monitoring Plan (FMP) (refer to Appendix C OEMP, Appendix C) has been developed including monitoring of camps prior and during construction to determine the status and extent of the camp to inform timing of works to minimise impacts as per *Chapter 10, Section 8 of the TMR Fauna Sensitive Transport Infrastructure Delivery manual* (Department of Transport and Main Roads, 2024). • See Appendix C OEMP, Appendix C for details on monitoring and management measures for indirect impact areas for this species.
Greater glider (southern and central) & yellow-bellied glider (south-eastern)	**Justification:** • Revised Impact area has reduced the extent of buffer zone to 7.26 ha for each species, and it has been assessed that indirect impacts are unlikely to occur (see Appendix F for full details). • Given greater glider and yellow-bellied glider habitat is already located adjacent to a currently operational line, vegetation is already subject to indirect impacts such as edge effects, weeds, pests and pathogens, dust and noise light and vibration. • A high level of conservatism has been applied to habitat mapping, whereby habitat mapping was based off habitat features (i.e. breeding habitat mapped as all vegetation (i.e. remnant, non-remnant, high value regrowth (HVR), regrowth)

Species	Justification and controls
	with a mature eucalypt canopy that contains trees over 30 cm DBH) instead of individual feature approach. This approach includes large areas of fragmented landscape (despite the fact the species is highly sensitive to fragmentation (Eyre, 2006), including scattered Eucalypt species. **Controls:** • Greater gliders can glide approximately 40 m between trees (Queensland Government, 2024) between trunks of > 30 cm DBH estimated glide distance is 1.2 times the canopy height or less to allow gliders to move between trees (DCCEEW pers. comm). Assuming an angle of 40 o and allowing gliders to land on trunks at least 2. 5 m above ground, gaps should not be greater than 18 m for 15 m canopy, 24 m for 20 m canopy, 36 m for 30 m canopy and 48 m for 40 m canopy (DCCEEW pers. comm). Given majority of large trees within Key Biodiversity Areas do not exceed a canopy of 40 m, a 50 m buffer (as outlined in the New South Wales Environment Protection Authority - New protections for endangered southern gliders (Environment Protection Authority, 2018)) will be applied to breeding habitat within large patches of contiguous vegetation (i.e. Acacia Forest Park and Gould Adams Park/Nealdon Park) located within key fauna biodiversity areas. • The FMP includes monitoring of proposed glider poles and scat detection as per recommendations outlined in Appendix A, Table A2(a)) of the TMR Fauna Sensitive Transport Infrastructure Delivery manual (Department of Transport and Main Roads, 2024). • Barbed wire occurrences in Key Biodiversity Areas based on the Asset Owner's Security Risk requirements, will apply the following hierarchy: - Remove hazard through avoidance of using barbed-wire wherever possible - Replacement of the top strand barbed-wire with plane wire (as per greater glider Conservation Advice); - Enhance visibility through plastic strand-wrapping or addition of electrical fence tape of similar; - Affixing reflective / bat tags at suitable spacings. - As a minimum requirement, fencing in all Key Biodiversity Areas will be fauna exclusion fencing and incorporate reflective discs / bat tags (generally in accordance Bat Conservation & Rescue QLD Inc guidance document Mitigating Barbed Wire Risk For Wildlife) [controls in this document will have suitability for gliders as well as bats in regards to barb-wire fencing] (Bat Conservation & Rescue, 2021). • Installation of electrostatic wildlife guards on Overhead Line Equipment (OHLE) to avoid electrocution • Dust will be controlled throughout the construction phase within direct and indirect impact areas through dust suppression (e.g. soil binders, watercarts), speed restrictions, appropriate erosion and sediment measures, and progressive stabilisation / revegetation of temporary disturbance areas. • Appropriate weed, pathogen and disease hygiene practices and management to be implemented for the species as per the OEMP (this report). • Domestic dogs are to be prohibited on the construction site at all times. • See Appendix C in the OEMP for details on monitoring and management measures for buffer areas for these species.
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East	**Justification:** • Indirect impacts from the Project are not expected to exacerbate current levels due to the existing operating rail line • Revised Impact area has reduced the extent of direct impact areas to 1.30 ha and buffer zone to 4.80 ha. **Controls:** • Clearly delineate a 50 m buffer zone from the boundary of clearing (that is direct impact area) as per the Approved Conservation Advice (Department of Climate

Species	Justification and controls
Queensland bioregions	Change Energy the Environment and Water, 2022) with high visibility flagging to minimise indirect impacts and ensure vegetation removal is not undertaken outside Impact area. • Indirect impacts will be managed through dust, water quality, erosion and sediment controls, with their performance validated through monitoring and observations. • Monitoring will occur within the buffer zone at Gould Adams Park/Nealdon Park, to assess quality and species composition, and monitor if erosion and sediment control and dust suppression is compliant with standards and/or commensurate with pre-construction ambient conditions. Monitoring will include: - **Pre-construction**: A BioCondition survey will be undertaken by a suitably qualified ecologist prior to construction commencing, and include baseline (pre-construction) dust, erosion and sediment monitoring. - **During-construction**: Ongoing dust deposition monitoring will occur as well as rainfall event-triggered water quality monitoring and review of performance of erosion and sediment controls. - **Post-construction:** Where dust, water quality, erosion and sediment controls are compliant with standards and/or commensurate with pre-construction ambient conditions, and no signs of TEC degradation are evident, ongoing monitoring (if required) will be determined by a suitably qualified ecologist. • Dust will be controlled throughout the construction phase within direct TEC areas and buffer zones through dust suppression (e.g. soil binders, watercarts), speed restrictions, appropriate erosion and sediment measures, and progressive stabilisation / revegetation of temporary disturbance areas. • Implementation of effective sediment and erosion control measures prior to / during vegetation clearing and civil works to control runoff and prevent movement of weeds and pathogens entering waterways and into adjoining ecological communities outside of the Impact area. • Acid sulfate soil testing, monitoring and management will occur across the entire Impact area, and in accordance with *Queensland Acid Sulfate Soil Technical Manual (Department of Resources and Department of Environment, Science and Innovation 2024), National Acid Sulfate Soils Guidance (Department of Agriculture and Water Resources, 2018) (Department of Resources and Department of Environment, Science and Innovation 2024)* and *Best Practice Erosion and Sediment Control Guidelines* (International Erosion Control Association (IECA), 2019) so that there is no impact on the TEC. Based on this, the risk of PASS impacting the TEC is considered low. See Table 11 of the OEMP for additional information. • Weed and seed certificates and regular weed hygiene inspections to be undertaken for all machinery entering the Project area to prevent introduction of new weed infestations within TEC. Machinery will be suitably cleaned prior to working within the TEC area to avoid introduction of any new weed species. • Strict control of ignition sources to minimise the risk of accidental fires (Department of Climate Change Energy the Environment and Water, 2022). • Rehabilitation of disturbed habitat to be undertaken in suitable locations (i.e. outside railway corridor) using native species in accordance with the proposed action's MRTS16 Landscape and Revegetation. • Rehabilitation will be considered against the landscape and maintenance requirements of the future asset owner. • Rehabilitation of temporarily disturbed habitat using species that meet the Regional Ecosystem indicator relevant to the TEC. • See Section 9.0, Table 9 in the OEMP for details on monitoring and management measures for this TEC.
Consideration for the provision of buffer zones were assessed to compensate for indirect impacts on the species. Buffers were **not** considered ecologically relevant for the following species	
Koala	**Justification:**

Species	Justification and controls
	• Koalas are highly mobile, have a wide-ranging distribution and are known to disperse across distances of 1 to 3 km but sometimes over 10 km (Youngentob, Marsh and Skewes, 2021), therefore are able to disperse into the broader landscape avoiding indirect impacts. • Koalas are adapted to living in urban environments which includes exposure to indirect impacts such as increased noise, light and vibration and the introduction or weeds, pests and pathogens. The Impact area is located within an urban environment and has largely been co-located or adjacent to the existing railway corridor, habitats have already been subjected to disturbance, fragmentation, weed incursion and edge effects, increased activity, light, noise, weeds, pests, pathogens and dust • Refer to Section 3.3.9 of Appendix F for full justification. **Controls:** Refer to Table 8 and Table 9 of the OEMP for general and species-specific controls.
South-eastern glossy black-cockatoo, regent honey eater and swift parrot	**Justification:** • Species are highly mobile and capable of travelling large distances • It is considered that individuals, if they were to occur within the locality would be able to disperse into the broader landscape avoiding indirect impacts. • Refer to Section 2.1.9, 2.29 and 4.1.9 of Appendix F for full justification. **Controls:** Refer to Table 8 and Table 9 of the OEMP for general and species-specific controls.

6.5 Species-specific mitigation measures

Mitigation measures specific to relevant[36] conservation significant flora, fauna and communities are detailed in Table 37 below. Please refer to the OEMP for structured breakdown of species-specific mitigation for the Detailed Design and construction phases of proposed action.

[36] Based on the conservation significant flora, fauna and communities with a potential risk as per risk assessment in Section 7.0.

Table 37 Specific mitigation measures to manage potential impacts to conservation significant flora, fauna and communities

MNES	Controls	Performance criteria	Location	Timing
Subtropical floodplain eucalypt TEC	**Detailed design phase:** • Exhaust all opportunities to avoid and minimise the clearing footprint of TEC. • Construction footprints will be strictly limited to the smallest required in order to facilitate bridge construction at the Scrubby creek location. As such, all other temporary disturbances such as siting of laydown areas, site offices and access tracks are prohibited from within the TEC area. **Construction phase:** • Site-inductions and toolbox talks to convey specific information to construction personnel and raise awareness/identification of the TEC, as well as protocols relating to the protection of the TEC. • Pre-clearance searches within TEC to be undertaken by a suitably qualified fauna spotter catcher, with habitat features identified and searched for fauna presence. • Habitat features such as mature trees or stags with hollows adjacent to the Impact area will be retained. • Clearly delineate a 50 m buffer zone from the boundary of clearing (that is direct impact area) as per the Approved Conservation Advice (Department of Climate Change Energy the Environment and Water, 2022) with high visibility flagging to minimise indirect impacts and ensure vegetation removal is not undertaken outside Impact area. • Indirect impacts will be managed through dust, water quality, erosion and sediment controls, with their performance validated through monitoring and observations. • Monitoring will occur within the buffer zone at Gould Adams Park/Nealdon Park, to assess quality and species composition, and monitor if erosion and sediment control and dust suppression is compliant with standards and/or commensurate with pre-construction ambient conditions. Monitoring will include:	• Final design provides a reduced footprint from the reference design • No unauthorised clearing of TEC • Topsoil records show topsoil containing WONS or declared pests was treated or appropriately disposed. • No new Phytophthora dieback infestations identified in the buffer zone or TEC adjacent to the impact area, attributable to the proposed action • No fires in the buffer zone or TEC adjacent to the impact area, attributable to the proposed action • Full adherence to the ESCP within the EMP(C) • Rehabilitation to include species that meet Regional Ecosystem indicator species relevant to the TEC • Significant weed impacts to the TEC as a result of the proposed action is unlikely to occur given that the proposed action will clear TEC edges rather than dissect patches, and environmental management plans developed prior to works commencing will prescriptively outline the controls needed to manage weed, pests and disease.	Within known locations as per Appendix B Figure 14	Prior, during and after vegetation clearing

MNES	Controls	Performance criteria	Location	Timing
	- **Pre-construction**: A BioCondition survey will be undertaken by a suitably qualified ecologist prior to construction commencing, and include baseline (pre-construction) dust, erosion and sediment monitoring. - **During-construction**: Ongoing dust deposition monitoring will occur as well as rainfall event-triggered water quality monitoring and review of performance of erosion and sediment controls. - **Post-construction:** Where dust, water quality, erosion and sediment controls are compliant with standards and/or commensurate with pre-construction ambient conditions, and no signs of TEC degradation are evident, ongoing monitoring (if required) will be determined by a suitably qualified ecologist. • Dust will be controlled throughout the construction phase within direct TEC areas and buffer zones through dust suppression (e.g. soil binders, watercarts), speed restrictions, appropriate erosion and sediment measures, and progressive stabilisation / revegetation of temporary disturbance areas. • Put in place effective sediment and erosion control methods prior to / during vegetation clearing and civil works to control runoff and prevent movement of weeds and pathogens entering waterways and into adjoining ecological communities outside of the Impact area. • Potential acid sulfate soils (PASS) may be present in the Impact area. As such, acid sulfate soil (ASS) testing, monitoring and management will occur across the entire Impact area, including soil management plans, soil treatment (where necessary), erosion and sediment control and monitoring, inspections and audits. See Section 9.1 and Table 11 of Appendix C, OEMP for additional information.			

MNES	Controls	Performance criteria	Location	Timing
	• PASS encountered during construction will be managed in accordance with relevant Federal and State guidelines, including *Queensland Acid Sulfate Soil Technical Manual (Department of Resources and Department of Environment, Science and Innovation 2024), National Acid Sulfate Soils Guidance (Department of Agriculture and Water Resources, 2018)* and *Best Practice Erosion and Sediment Control Guidelines* (International Erosion Control Association (IECA), 2019) so that there is no impact on the TEC. Based on this, the risk of PASS impacting the TEC is considered low. • Weed and seed certificates and regular weed hygiene inspections to be undertaken for all machinery entering the Project area to prevent introduction of new weed infestations within TEC. Machinery will be suitably cleaned prior to working within the TEC area to avoid introduction of any new weed species. Strict control of ignition sources to minimise the risk of accidental fires (Department of Climate Change Energy the Environment and Water, 2022). • Strict control of ignition sources to minimise the risk of accidental fires (Department of Climate Change Energy the Environment and Water, 2022). • Rehabilitation of disturbed habitat to be undertaken in suitable locations (i.e. outside railway corridor) using native species in accordance with the proposed action's MRTS16 Landscape and Revegetation. • Rehabilitation will be considered against the landscape and maintenance requirements of the future asset owner. • Rehabilitation of temporarily disturbed habitat using species that meet the Regional Ecosystem indicator relevant to the TEC.			
Angle-stemmed myrtle	**<u>Construction phase:</u>** • No clearing of angle-stemmed myrtle habitat will occur. Vegetation clearing will be restricted to the Impact area	• Final design provides a reduced footprint from the reference design	Within known locations as per Appendix B Figure 17	Prior, during and after vegetation clearing

MNES	Controls	Performance criteria	Location	Timing
	• Establish exclusion zone fencing to exclude pedestrian and machinery access as far as possible from the angle-stemmed myrtle – exclusion zone to include the full extent of the tree protection zone, but no less than 10 m from the individual. • The Design & Construction (D&C) Contractor must engage a suitably qualified and experienced ecologist to undertake a pre-construction survey within 100 m of individual plant location to inspect for Myrtle Rust (high risk of disease-induced death to species). • Should Myrtle rust be positively identified, and it is assessed as having a high-risk of spread to the region immediately surrounding the individual, a biosecurity hygiene program is to be established. • Rehabilitation of disturbed habitat to be undertaken in suitable locations (i.e. outside railway corridor) using native species in accordance with the proposed action's MRTS16 Landscape and Revegetation. • Rehabilitation will be considered against the landscape and maintenance requirements of the future asset owner.	• No unauthorised clearing of habitat within the exclusion zone • No new WONS or myrtle rust infestations identified within the exclusion zone • Environmental management plans developed prior to works commencing will prescriptively outline the controls needed to manage weed, pests and disease, including early eradication of new weed incursions. • Topsoil records show topsoil containing WONS or declared pests was treated or appropriately disposed. • Pre-clearance surveys to confirm the presence of seedling recruitment		
Hollow dependent fauna – south-eastern glossy black cockatoo, greater glider and yellow-bellied glider	**Detailed design phase:** • Exhaust all opportunities for design refinement to avoid areas where species-specific hollows occur • Design to embody pre-construction management measures (i.e. fauna movement infrastructure opportunities) outlined in Section 6.2. **Construction phase:** • Site inductions and pre-start meetings to convey specific information to construction personnel and raise awareness/identification of species on site, as well as protocols relating to the protection of species and their habitat. For example, habitat tree inspection and management requirements; contact lists of nearby veterinary centres/wildlife hospitals and procedures for sick or injured fauna requiring rescue to be provided at induction.	• Final design provides a reduced footprint from the reference design • No unauthorised clearing of hollow dependent fauna habitat • No records of hollow dependent fauna impacted by project works • Surveys of hollow-bearing trees carried out within 1-2 weeks prior to clearing events • Environmental management plans developed prior to works commencing will prescriptively outline the controls needed to manage weed, pests and disease, including control of feral cats in Key Biodiversity Areas • A list of contact details of local wildlife rescue organisations and carers maintained on site at all times. • No fires in MNES species habitat	Within potential habitat, as per Appendix B Figure 15,Appendix B Figure 18 and Appendix B Figure 20	Prior, during and after vegetation clearing

MNES	Controls	Performance criteria	Location	Timing
	• Fauna spotter catcher will provide targeted advice in relation to additional controls throughout known fauna breeding periods where clearing works cannot be scheduled to avoid these times. • Qualified and experienced fauna spotter catchers to undertake pre-clearance surveys in suitable habitat prior to planned vegetation clearance. • The pre-clearance survey will be undertaken in advance of clearing activities (e.g. 1-2 weeks) to identify MNES occupation and breeding places to allow for any associated permits and programming to ensure that hollow-bearing trees / habitat features containing MNES fauna and/or breeding places are managed suitably. Where necessary, additional pre-clearing inspections will occur immediately in advance of clearing activities to re-check for presence. • Pre-clearance surveys will: - Survey and assess areas of potential habitat for conservation significant fauna - Identify mark and map potential and known foraging and breeding places for to direct fauna spotter catchers to appropriate manage during clearing - Identify opportunities for salvage of relevant microhabitat (such as tree hollows) features prior to clearing - Where hollows / habitat features have been identified, best attempts will be made to salvage and preserve these (acknowledging age / decay / structural damage may constrain this). Salvaged features will be reinstalled or placed within / alongside the impact area where safety and access allow. Adjoining areas – including Acacia Forest Park based on acceptance by landholder – may be used to re-site habitat features. - Felled timber from the clearing process will be reviewed for suitability in terms of carved hollows – either at the Impact area (greater glider (southern and central), yellow-bellied glider and glossy black-	• MNES habitat species endemic to the region included in species lists in landscape and revegetation plan.		

MNES	Controls	Performance criteria	Location	Timing
	cockatoo (south-eastern), or at the offset property for south-eastern glossy black cockatoo. - All hollow-bearing trees will be inspected by a suitably qualified fauna spotter catcher prior to clearing to identify any denning or nesting individuals - Encourage fauna to leave hollows of their own accord through tree tapping and other measures - MNES species will be removed from active denning/nesting trees within the clearance footprint immediately prior to clearing and translocated to suitable habitat adjacent to the Impact area. Gliders are to be released 2 hours after sunset into trees that contain suitable hollows. - Where species need to be physically removed from hollows, trees will be dismantled (in sections if necessary) under the direction of trained and experienced fauna spotter catchers. - Trees will be felled immediately after removing wildlife to prevent animals from returning to hollows. - Fauna spotter catcher to undertake a ground inspection once the hollow bearing tree has been felled to identify presence of young or injured fauna. • Rehabilitation of disturbed habitat to be undertaken in suitable locations (i.e. outside railway corridor) using native species in accordance with the proposed action's MRTS16 Landscape and Revegetation, Rehabilitation will be considered against the landscape and maintenance requirements of the future asset owner. • For the yellow-bellied glider and greater glider, barbed wire occurrences in Key Biodiversity Areas based on the Asset Owner's Security Risk requirements, will apply the following hierarchy: - Remove hazard through avoidance of using barbed-wire wherever possible - Replacement of the top strand barbed-wire with plane wire (as per greater glider Conservation Advice);			

MNES	Controls	Performance criteria	Location	Timing
	- Enhance visibility through plastic strand-wrapping or addition of electrical fence tape of similar; - Affixing reflective / bat tags at suitable spacings. - As a minimum requirement, fencing in all Key Biodiversity Areas will be fauna exclusion fencing and incorporate reflective discs / bat tags (generally in accordance Bat Conservation & Rescue QLD Inc guidance document Mitigating Barbed Wire Risk For Wildlife) [controls in this document will have suitability for gliders as well as bats in regards to barb-wire fencing] (Bat Conservation & Rescue, 2021). • Installation of electrostatic wildlife guards on Overhead Line Equipment (OHLE) to avoid electrocution • Dust will be controlled throughout the construction phase within direct and indirect impact areas through dust suppression (e.g. soil binders, watercarts), speed restrictions, appropriate erosion and sediment measures, and progressive stabilisation / revegetation of temporary disturbance areas. • Appropriate weed, pathogen and disease hygiene practices and management to be implemented for the species as per the OEMP. • Domestic dogs are to be prohibited on the construction site at all times.			
Grey-headed flying-fox	**Detailed Design phase:** • Exhaust all opportunities for design refinement to avoid, or otherwise minimise impacts where camps occur • Eliminate the use of barbed wire fencing in areas of known breeding/roosting habitat (Appendix B Figure 19) in accordance with the Fauna Sensitive Transport Infrastructure Delivery manual (Department of Transport and Main Roads, 2024) • Design to apply the considerations within the National Recovery Plan for Grey-headed Flying-fox (DAWE, 2021) (specifically Recovery Objective 9) to account for Flying-	• Final design provides a reduced footprint from the reference design • No unauthorised clearing of grey-headed flying-fox habitat • Grey-headed flying-fox habitat species endemic to the region included in species lists in landscape and revegetation plan. • No records of GHFF impacted by project works	Within known and potential habitat, as per Appendix B Figure 19	Prior, during and after vegetation clearing

MNES	Controls	Performance criteria	Location	Timing
	fox friendly design principles including removal of barbed/razor wire • For the Grey-headed flying-fox as per conservation advice, barbed wire occurrences in Key Biodiversity Areas based on the Asset Owner's Security Risk requirements, will apply the following hierarchy: - Remove hazard through avoidance of using barbed-wire wherever possible; - Replacement of the top strand barbed-wire with plane wire; - Enhance visibility through plastic strand-wrapping or addition of electrical fence tape of similar; - Affixing reflective / bat tags at suitable spacings. • As a minimum requirement, fencing in all Key Biodiversity Areas will be fauna exclusion fencing and incorporate reflective discs / bat tags (generally in accordance Bat Conservation & Rescue QLD Inc guidance document Mitigating Barbed Wire Risk For Wildlife) (Bat Conservation & Rescue, 2021). • Roost Activity Observations (i.e. monitoring) to be undertaken in advance of activity commencing to visually verify grey-headed flying-fox presence and estimated roost abundance at the previously identified roost locations, being: • Voyager Drive, Kuraby • Jacaranda Avenue, Kingston; and, • Ridgewood Reserve, Edens Landing. **Construction phase:** • Site inductions and pre-start meetings to convey specific information to construction personnel and raise awareness/identification of species on site, as well as protocols relating to the protection of species and their habitat. For example, habitat tree inspection and management requirements; contact lists of nearby veterinary centres/wildlife hospitals and procedures for			

MNES	Controls	Performance criteria	Location	Timing
	sick or injured fauna requiring rescue to be provided at induction. • EMP (C) to outline roost information and relevant management procedures as stated in the OEMP • Areas where grey-headed flying-fox roosts occur within the Impact area or within a 300m buffer zone, light management controls and compliance monitoring will be undertaken, for the period between dusk and dawn, in accordance with the “Bat light mitigation toolbox” section outlined in the *DCCEEW National Light Pollution Guidelines for Wildlife, Appendix I – Bats* (Department of Climate Change Energy the Environment and Water, 2023) • Noise and vibration indirect impacts are considered low given the existing urban environment – specifically alongside a functioning rail corridor - and it is likely camps have developed a tolerance to the existing noise, light and human activity disturbances. Nonetheless, noise and vibration controls will be implemented across the entire Impact area in accordance with the following guidelines: - Queensland *Environmental Protection (Noise) Policy 2019*, Schedule 1 - Acoustic quality objectives; - TMR’s *Volume 2 - Transport Noise Management Code of Practice,* and, - TMR’s *MRTS51 Environmental Management Technical Specification* section 8.5 - TMR’s *Interim Guideline Operational Railway Noise and Vibration, Section 2, Section 3 and Section 4.* • Dust controls will be implemented within entire Impact area and during construction phase through various control measures including dust suppression (e.g. soil binders, watercarts), speed restrictions, appropriate erosion and sediment measures, and progressive stabilisation / revegetation of temporary disturbance areas.			

MNES	Controls	Performance criteria	Location	Timing
	• Prior to vegetation clearing within the Impact area, disturbance boundary to be clearly delineated and demarcated with high-visibility flagging tape • Vegetation clearing across entire Impact area to be supervised by a suitably qualified fauna spotter catcher with knowledge and experience relevant to management of flying-foxes and their habitat, who can identify dependent young and is aware of climatic extremes (i.e. heat stress or cyclone event) and food stress events. • For any clearing activities, a fauna spotter catcher will undertake a pre-clearing fauna inspection which will check for presence of new camps as well as verify the presence / abundance at known/previously identified camps • Prior to works commencing within 300m buffer zone from camps, the fauna spotter catcher will assess the presence of any grey-headed flying-foxes, including checking for breeding activity (pregnant females, creched young and/or dependent young). Based on this assessment, the fauna spotter catcher will advise whether vegetation clearing can commence. • If a new flying-fox camp is found within 300 m of the proposed Impact area (other than at Voyager Drive, Kuraby, Jacaranda Avenue, Kingston and Ridgewood Reserve, Edens Landing), the suitably qualified fauna spotter catcher will review the proposed construction activities, including timing and appropriate management measures in accordance with the *Referral guideline for management actions in grey-headed and spectacled flying fox camps* (Department of the Environment, 2015) • Other than under exceptional circumstances[37], vegetation clearing activities within 300m buffer zone surrounding known grey-headed flying-fox camps (i.e. Voyager Drive,			

[37] Exceptional circumstances may include, but are not limited to, preparation for severe/inclement weather; maintaining public safety; and responding to emergencies or incidents.

MNES	Controls	Performance criteria	Location	Timing
	Kuraby, Jacaranda Avenue, Kingston and Ridgewood Reserve, Edens Landing): - To occur in low-risk times (i.e. outside of August – November breeding / creche periods). Works required under exceptional circumstances will be guided by a fauna spotter catcher. - Should be prioritised at night, as this is when individuals are less likely to be present - Will not occur during or immediately after climatic extremes (heat stress[38] or cyclone events[39]), or during or immediately after a period of significant food stress[40] . - Will be sequentially staged to commence at maximum distance away from the camp, and then proceed towards camp to enable the individuals to become accustomed to the activities and to allow them to self-disperse / retract into adjoining vegetation. - The flying-fox heat stress forecaster and Bureau of Meteorology weather forecast will be reviewed within 24 hours when vegetation clearing proposed within 300m of a camp. Where forecasts indicate daily ambient temperatures $\geq$ 38^{o} C AND clearing proposed within 300 m buffer zone from camp, fauna spotter catcher to complete hourly temperature check and assess if camps contain notable signs of stress (such as excessive fanning or flyouts). Vegetation clearing works to immediately cease if temperatures exceed 38^{o} C within 300m of camp, or notable signs of stress are observed within camps.			

[38] A 'heat stress event' is defined as a day on which the maximum temperature does (or is predicted to) meet or exceed 38°C (Department of the Environment, 2015) .
[39] A cyclone event is defined as a cyclone that is identified by the Australian Bureau of Meteorology (www.bom.gov.au/cyclone/ index.shtml) (Department of the Environment, 2015).
[40] Food stress events may be apparent if large numbers of low body weight animals are being reported by wildlife carers in the region (Department of the Environment, 2015).

MNES	Controls	Performance criteria	Location	Timing
	• Other than under exceptional circumstances, high impact activities[41] within 100 m of camps: - To occur in low-risk times (ie. outside of August – November breeding / creche periods), Works required under exceptional circumstances will be guided by a fauna spotter catcher. - Should be to be prioritised at night, as this is when individuals are less likely to be present - Will not occur during or immediately after climatic extremes (heat stress or cyclone events), or during or immediately after a period of significant food stress. - Will be staged to commence at maximum distance away from the camp, and then proceed towards camp to enable the individuals to become accustomed to the activities and to allow them to self-disperse / retract into adjoining vegetation. - The flying-fox heat stress forecaster and Bureau of Meteorology weather forecast will be reviewed within 24 hours when high impact activities proposed within 100m of a camp. Where forecasts indicate daily ambient temperatures $\geq$ 38^{o} C AND high impact activities proposed within 100 m buffer zone from camp, fauna spotter catcher to complete hourly temperature check and assess if camps contain notable signs of stress (such as excessive fanning or flyouts). High impact works to immediately cease if temperatures exceed 38^{o} C within 100m of camp, or notable signs of stress are observed within camps • Vegetation outside the Impact area and adjacent to camps will be retained to maintain vegetation integrity, allowing individuals to naturally move/retract to cooler areas			

[41] Impact pile driving, impact guard rail installation or removal, saw cutting, rock / concrete breaking (hammering), rock removal or placement

MNES	Controls	Performance criteria	Location	Timing
	reducing heat-related stress/mortality and support the persistence of the camp • Only a qualified and suitable fauna spotter catcher or wildlife carer with up-to-date Lyssavirus vaccines are to handle bats. Personnel must not attempt to touch or handle a flying fox. If interaction with a flying-fox is required, a FSC must be contacted. This information will also be conveyed to all construction personnel during site inductions. Fauna handling will be in accordance with: - 'Code of Practice: Care of Sick, Injured or Orphaned Protected - Animals in Queensland, Nature Conservation Act 1992', - Relevant approvals, licences, permits • Any injured fauna are to be taken to: 139 Wacol Station Road, WACOL QLD 4076, 1300 ANIMAL (1300-264-625) • Installation of electrostatic wildlife guards on Overhead Line Equipment (OHLE) to minimise electrocution • Domestic dogs are to be prohibited on the construction site at all times. • Rehabilitation of disturbed habitat to be undertaken in suitable locations (i.e. outside railway corridor) using native species in accordance with the proposed action's MRTS16 Landscape and Revegetation, Rehabilitation will be considered against the landscape and maintenance requirements of the future asset owner.			
Koala	**Design phase:** • Design to embody pre-construction management measures (i.e fauna movement infrastructure opportunities) outlined in Section 6.2 **Construction phase:** • Site inductions and pre-start meetings to convey specific information to construction personnel and raise awareness/identification of species on site, as well as and protocols relating to the protection of species and their habitat. For example, Pre-clearing inspection and	• Final design provides a reduced footprint from the reference design • No unauthorised clearing of koala habitat • No records of koala impacted by project works • Koala habitat species endemic to the region included in species lists in landscape and revegetation plan. • Design of temporary koala exclusion fencing will maximise its effectiveness in preventing access	Within known and potential habitat, as per Appendix B Figure 16	Prior to vegetation clearing, During vegetation clearing

MNES	Controls	Performance criteria	Location	Timing
	management requirements; contact lists nearby of veterinary centres/wildlife hospitals and procedures for sick or injured fauna requiring rescue to be provided at induction. • During the construction phase, impacts due to increased human presence and domestic dog attacks will be mitigated by installing temporary koala exclusion fencing around the perimeter of Key Biodiversity Areas. Where applicable, permanent fencing will be installed as a priority including the provision of fauna crossing structures to limit human and dog interactions. • Install refuge poles along easements to facilitate rapid escape into treed habitat areas. • Domestic dogs are to be prohibited on the construction site at all times. • Works near high-risk koala habitat areas should be avoided during early morning, dusk and night (i.e. prior to 6am and after 6pm), which are high koala activity periods. Where works cannot be avoided (i.e. based on corridor access / safety constraints) during early morning, dusk and night temporary koala exclusion fencing will be erected to avoid koalas entering the Impact area. Additionally, pre-start meetings will convey information to construction personnel noting works are being undertaken in a high-risk koala habitat area which requires increased vigilance. Pre-start meeting will relay procedures in the event a koala is identified within the Impact area. • Where early morning, dusk or night works are required, lights will be directed away from fauna sensitive habitat to minimise light spill into adjacent habitats. • To reduce noise and vibration all construction vehicles to comply with maintenance schedules and operational restrictions designed to limit noise impact during construction. Vehicles and machinery to be switched off when not in use.	to the rail corridor and minimise impacts on native vegetation (i.e. locate fauna fencing as close to the rail infrastructure as possible).		

MNES	Controls	Performance criteria	Location	Timing
	• During the clearing phase prior to vegetation clearing, trees (or areas) with koalas present are clearly flagged (e.g. individual tree marked with a specific colour; signage / flagging tape for larger areas containing many trees), and an exclusion zone set in place, and all personnel notified of location. • In the event a koala is identified within proposed construction areas, works are to stop within 50 m of the koala or where the canopy of any other tree overlaps (whichever is greater). • Works should not resume until the koala(s) leave the area on its own accord. • To avoid potentially blocking the movement of koalas, temporary laydown areas for equipment/infrastructure (i.e. culverts, rail track and machinery) must be located within cleared areas as to not impede koala movement into suitable habitat outside of the Impact area. • Install signs on the tracks and go-slow points where koalas are known to occur and enforce speed limits. • Temporary koala exclusion fencing shall be installed around the perimeter of known key fauna biodiversity areas to minimise the emigration of koalas from the site into the clearing works. Key fauna biodiversity areas are summarised in Section 8 and displayed in OEMP, Figure 3 • Where temporary fencing is required, it will replicate the TMR Standard Drawing SD1603 (Transport and Main Roads, 2024), unless TMR Standard Drawing SD1615 fencing design (Transport and Main Roads, 2021) or other suitable alterative as informed by an appropriately qualified and experienced ecologist can be applied. • Temporary koala exclusion fencing will be inspected weekly to ensure fencing is in good condition and maintained so there are no points of egress for koalas into the construction site. If fencing is in poor condition, it			

MNES	Controls	Performance criteria	Location	Timing
	should be rectified as soon as possible to reduce the potential of koala emigration into developed areas. • Notwithstanding that trenches/excavations/pits will be located within temporary koala exclusion fencing areas, prior to works commencing trenches/excavations/pits will be visually checked for koala entrapment/injury. Where trenches/excavations/pits are required to remain open for extended periods unsupervised (e.g. over weekends, holiday-shutdowns, extended poor weather) suitable exclusion zones (e.g. barriers, fencing, covers, or similar will be applied to avoid fauna entrapment / injury. • In the instance a koala (or other fauna) is observed within trenches/excavations/pits a suitably qualified fauna spotter catcher will be engaged to respond to the situation. • In the event a sick or injured koala is found within or adjacent to the Impact area, an appropriately qualified koala spotter catcher[42] is to be contacted for observation and potential medical intervention. • The release of koalas to the wild must be conducted in accordance with the relevant provisions outlined in Queensland Nature Conservation (Koala) Conservation Plan 2017 (Koala Plan). • Clearing of koala habitat trees is to comply with the sequential clearing requirements prescribed in Part 3, Section 10 of the Koala Plan. These include: - Clearing of koala habitat trees carried out in a way that ensures koalas within the clearing site have enough time to move out without human intervention, including in particularly clearing sites with an area of more than 3 ha, specifically in the following locations: ▪ Karawatha/Acacia Forest Park (20.10 ha)			

[42] As per the *Nature Conservation (koala) Conservation Plan 2017* a suitably qualified koala spotter catcher means a person who has qualifications and experience or demonstrated skills and knowledge in locating koalas or koala habitats or conducting arboreal fauna surveys.

MNES	Controls	Performance criteria	Location	Timing
	▪ Kuraby (Spring Creek) (11.90 ha). • Clearing of koala habitat trees is to comply with the sequential clearing requirements prescribed in Part 3, Section 10 of the Koala Plan. These include: - Clearing of koala habitat trees carried out in a way that ensures koalas within the clearing site have enough time to move out without human intervention, including in particularly clearing sites with an area of more than 3 ha, specifically in the following locations: ▪ Karawatha/Acacia Forest Park (20.10 ha) ▪ Kuraby (Spring Creek) (11.90 ha). - Clearing of koala habitat trees in the aforementioned areas must be cleared in accordance with the Koala Plan (Queensland Government, 2023) including: ▪ Carrying out the clearing in stages; and ▪ Ensuring not more than the following is cleared in any one stage either a) For a clearing site with an area of 6 ha or less- 50% of the site's area or b) For a clearing site with an area of more than 6 ha-3 ha or 3% of the site's area, whichever is greater; and ▪ Ensuring that between each stage and the next there is at least one period of 12 hours starting at 6pm on a day and ending at 6 am on the following day and during this time no trees are cleared on the site. ▪ Clearing of the koala habitat trees are carried out in a way that ensures, while the clearing is being carried out, that appropriate habitat links are maintained within the clearing site and between the site and its adjacent area, to allow koalas living on the site to move out of the site. ▪ No koala habitat tree in which a koala is present and no koala habitat tree with a crown			

MNES	Controls	Performance criteria	Location	Timing
	overlapping a tree in which a koala is present is cleared until such time the koala has dispersed to a safe area at its own accord, as deemed by a suitably qualified koala fauna spotter catcher. ▪ Clearing of koala habitat trees within mapped koala habitat areas to be undertaken in the presence of a koala spotter. The koala spotter's primary role is to locate koalas in the trees to be removed. The koala spotter must have qualifications and experience or demonstrated skills and knowledge in: - Locating koalas in koala habitats - Conducting arboreal fauna surveys. • Retrofit existing culverts and underpass at appropriate locations to include fauna ledges to aid koala movement. • Install speed reduction signs, road signage and road pavement stencils to reduce speed limits, alert drivers to speed and allow detection of koalas during construction. • Rehabilitation of disturbed habitat to be undertaken in suitable locations (i.e. outside railway corridor) using native species in accordance with the proposed actions MRTS16 Landscape and Revegetation. • Rehabilitation will be considered against the landscape and maintenance requirements of the future asset owner.			
Swift parrot and regent honeyeater	**Construction phase:** • Site inductions and pre-start meetings to convey specific information to construction personnel and raise awareness/identification of species on site, as well as and protocols relating to the protection of species and their habitat. For example, a contact list of nearby veterinary centres/wildlife hospitals and procedures for sick or injured fauna requiring rescue to be provided at induction. • Prior to construction works commencing, the fauna spotter catcher will confirm the presence of individuals with potential to be disturbed by the activity.	• Final design provides a reduced footprint from the reference design • No unauthorised clearing of swift parrot or regent honeyeater habitat • Swift parrot and regent honeyeater species endemic to the region included in species lists in landscape and revegetation plan.	Within known and potential habitat, as per Appendix B Figure 12 and Figure 13	Prior to vegetation clearing, During vegetation clearing

MNES	Controls	Performance criteria	Location	Timing
	• Rehabilitation of disturbed habitat to be undertaken in suitable locations (i.e. outside railway corridor) using native species in accordance with the proposed action's MRTS16 Landscape and Revegetation • Rehabilitation will be considered against the landscape and maintenance requirements of the future asset owner. • Domestic dogs are prohibited on the construction site at all times.			

7.0 Screening assessment

7.1 Conservation significant species considered in the screening assessment

Potential impacts have been conservatively assessed for conservation significant species and communities that have either been observed within the Impact area or assessed as potentially present. Conservation significant species and communities subject to a screening assessment are summarised in Table 38 below.

The likelihood of occurrence assessment is provided in Appendix C.

Table 38 Conservation significant species and communities subject to a screening assessment

MNES	EPBC Act status	Likelihood of occurrence
CONSIDERED IN IMPACT ASSESSMENT PROCESS		
Angle-stemmed myrtle (*Gossia gonoclada*)	E	Known
Australian painted snipe (*Rostratula australis)*	E	Potential
Greater glider (southern and central) (*Petauroides volans)*	E	Potential
Grey-headed flying fox (*Pteropus poliocephalus)*	V	Known
Koala *(Phascolarctos cinereus)*	E	Known
Macadamia nut (*Macadamia integrifolia)*	V	Known
Mary River cod (*Maccullochella mariensis)*	E	Potential
Regent honeyeater (*Anthochaera Phrygia)*	CE	Potential
Scrub turpentine (*Rhodamnia rubescens)*	CE	Known
South-eastern glossy black cockatoo (*Calyptorhynchus lathami lathami)*	V	Potential
Spotted-tailed quoll (southern sub-species) (*Dasyurus maculatus maculatus)*	E	Potential
Subtropical eucalypt floodplain forest and woodland of the New South Wales north coast and South East Queensland bioregions	E	Known
Swift parrot (*Lathamus discolor)*	CE	Potential
White-throated needle tail (*Hirundapus caudacutus)*	V, Mi	Likely
Yellow-bellied glider (south-eastern) (*Petaurus australis australis)*	V	Potential

[1]Conservation status of migratory fauna under the EPBC Act: CE=Critically Endangered, E= Endangered, [V] = Vulnerable, Mi = Migratory

7.2 Screening assessment

MNES values within the Impact area have potential to be significantly impacted by the development of the proposed action. However, the overall risk to MNES values, that is the risk of the proposed action's impact constituting an impact which is "*important, notable, or of consequence, having regard to its context or intensity*", will differ based on a combination of factors including the community or species' ecological characteristics and the likely consequence of such impacts. As such, a screening assessment was undertaken in accordance with the risk framework and the approach outlined in Section 2.6.1 to identify MNES at low risk, and MNES that are at potential risk as a result of the proposed action. MNES that are low risk have not been assessed further, and MNES that are at potential risk are recommended for further assessment with a significant impact assessment (SIA).

Findings of the screening assessment outlined in Table 39 below identified the following ten (10) MNES for further assessment against the SIA criteria:

- Angle-stemmed myrtle (*Gossia gonoclada)*
- Greater glider (southern and central) (*Petauroides volans)*
- Grey-headed flying fox (*Pteropus poliocephalus)*
- Koala (*Phascolarctos cinereus)*
- Macadamia nut (*Macadamia integrifolia)*
- Regent honeyeater (*Anthochaera phrygia)*
- South-eastern glossy black cockatoo (*Calyptorhynchus lathami lathami)*
- Subtropical floodplain eucalypt TEC
- Swift parrot (*Lathamus discolor)*
- Yellow-bellied glider (south-eastern) (*Petaurus australis australis).*

References to support the risk screening assessment as per each species' conservation advice, listing advice and recovery plan have been reviewed from the SPRAT database as per Section 2.3.4 of this report.

Table 39 Screening assessment

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
Critically Endangered and Endangered Species					
Australian painted snipe	They are distributed along Murray-Darling Basin (particularly the Riverina of Victoria and New South Wales), Queensland Channel Country, Fitzroy Basin of Central Queensland, south-eastern South Australia and adjacent parts of Victoria. Within Queensland, records are most common in coastal areas however also occur at scattered locations inland (Department of Sustainability, Environment, Water, 2013). **Habitat** Australian painted snipe inhabits in shallow terrestrial freshwater habitats within wetlands, including temporary and permanent lakes, swamps and claypans. Nesting habitats were recorded near small islands with a combination of very shallow water, exposed mud, dense low cover and sometimes some tall dense cover (Department of Sustainability, Environment, Water, 2013). **Threat** The main identified threat to the Australian painted snipe is the habitat modification and habitat loss due to degradation of wetlands, through drainage and the diversion of water for agriculture and reservoirs. In addition, predation by feral animals on their eggs and young birds have impacted their population size (Department of Sustainability, Environment, Water, 2013).	The species is considered to potentially occur within the Impact area due to the presence of suitable habitat and 8 records occurring within 5 km of the Impact area. A maximum of 0.98 ha of potential habitat is proposed to be impacted by the proposed action. The remaining habitat is considered marginal or of low value due to the absence or minimal presence of bare muddy margins, steep banks, little or no open water with tall or dense ground cover present including a high weed incursion predominantly consisting of Singapore daisy (*Sphagneticola trilobata).* No individuals were observed during targeted field surveys. As such, it is likely that only a small number of dispersing individuals would utilise potential habitat on a transitory basis. Furthermore, areas of higher quality habitat occur in the wider area including State significant wetlands which are more likely to be utilised. For the above reasons, it is considered low risk, and no further assessment is required.	2	Possible	**Low risk – no further assessment required**
Swift parrot	Swift parrots are distributed in Victoria and New South Wales and small numbers are observed in the Australian Capital Territory and in south-eastern Queensland. Species disperse widely to forage on flowers and psyllid lerps in *Eucalyptus* species. Thus, their distribution fluctuates with food availability. Non-breeding birds preferentially feed in inland box-ironbark and grassy woodlands, and coastal swamp mahogany (*Eucalyptus robusta*) and spotted gum (*Corymbia maculata*) woodland when in flower. The Swift parrot breeds in Tasmania during the summer and the entire population migrates north to mainland Australia for the winter (Department of Climate Change, Energy, the Environment and Water, 2024). **Habitat** They inhabit in woodlands and breed in tree-hollows in old-growth or other forest with suitable hollows, in proximity to the main food source, flowering Tasmanian blue gum. Non-breeding birds preferentially feed in inland box-ironbark and grassy woodlands, and coastal swamp mahogany (*E. robusta*) and spotted gum (*C. maculata*) woodland when in flower (Department of Climate Change, Energy, the Environment and Water, 2024). **Threats** Species is vulnerable to predation by Sugar-gliders. Swift parrots are threatened due to the habitat loss, habitat alteration because of wildfire, collision with wire netting and mesh fences, competition for resources and pathogen infection causing beak and feather disease (Department of Climate Change, Energy, the Environment and Water, 2024).	A maximum of 42.28 ha of potential habitat is proposed to be impacted by the proposed action. According to the species' National Recovery Plan (Department of Climate Change, Energy, the Environment and Water, 2024), key tree species in the mainland include Yellow Gum (*Eucalyptus leucoxylon*); Red Ironbark (*Eucalyptus tricarpa*); Mugga Ironbark (*Eucalyptus sideroxylon*); Grey Box (*Eucalyptus macrocarpa*); White Box (*Eucalyptus albens*); Yellow Box (*Eucalyptus melliodora*); Swamp Mahogany (*Eucalyptus robusta);* Forest Red Gum (*Eucalyptus tereticornis*); Blackbutt (*Eucalyptus pilularis*); and Spotted Gum (*Corymbia maculata*). DCEEW also states *"Corymbia Citriodora* is a regionally relevant substitution of *C. maculata"* (LGC Adequacy Review V1.0, 2024)*,* however is not referenced as such in the superseded or updated recovery plan (Department of Climate Change, Energy, the Environment and Water, 2024). Subsequently, given the presence of suitable habitat, this species may sporadically use the Impact area to forage when seasonal conditions are suitable. Whilst, rare occurrences of this species are seen in southern Queensland, 2 ALA records have been recorded approximately 537 m from the Impact area, suggesting this species may utilise the vegetation within the Impact area. In contrast, given the existing disturbances in the surrounding area, the proposed action will not result in habitat fragmentation in the context of this species. All other key threats to this species are unlikely to be increased beyond current levels. The species is a migrant and is expected to be highly mobile and able to utilise habitats outside the Impact area based on available resources. As there is potential risk of this species being present, a SIA is recommended.	3	Possible	**Potential risk – further assessment required**
Greater glider (southern and central)	Greater glider (southern and central) are distributed across eastern Australia where it has a broad distribution around Queensland. Also, its distribution spreads to south through across NSW, ACT, to Wombat State Forest in central Victoria (Threatened Species Scientific Committee, 2016a) **Habitat**	The species potentially occurs within the Impact area based on the presence of suitable foraging and breeding habitat including records within 5 km of the Impact area. This species was not recorded during targeted field surveys.	3	Possible	**Potential risk – further assessment required**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	The Greater glider (southern and central) occurs in Eucalyptus forests and woodlands. They inhabit in hollow-bearing trees (Threatened Species Scientific Committee, 2016a). **Threats** Loss of habitat due to the removal of hollow-bearing trees during logging and repeated burning is a key threat to the species in Queensland. Other key threats include habitat fragmentation due to the species low dispersal ability, climate change and hyper predation by owls (Threatened Species Scientific Committee, 2016a)	A maximum of 34.89 ha direct impacts of potential habitat is proposed to be impacted by the proposed action. The failure to detect the species during targeted surveys, suggests the species is present at low abundance and/or habitat within the Impact area and it is used on an occasional or intermittent basis only. The paucity of records of greater glider (southern and central) within the desktop search extent support this view suggesting the species is generally scarce within the surrounding landscape. Due to isolation from existing linear infrastructure in between patches of habitat the Impact area is unlikely to support dispersal and emigration from surrounding landscapes. Given the exception of Karawatha Forest Park where glider populations are known and considering that multiple eucalypt species with a DBH > 30 cm and 50 cm were observed within the Impact area, As DCCEEW relies on the presence of trees with a DBH > 30 cm to be used as proxy indicator for breeding habitat for greater glider (southern and central) in Queensland (DCCEEW, 2022) a SIA is recommended.			
Koala	The Koala is a wide-ranging marsupial endemic to Australia. It typically occurs in eastern Australian forests and woodlands of predominantly *Eucalyptus* species. The koala has a large but patchy distribution that spans the coastal and inland areas of Queensland north to the Herberton area, extending westwards into hotter and dryer semi-arid climates of central Queensland, NSW and the ACT (Department of Agriculture Water and the Environment, 2022b). It must be noted that the koala listing was upgraded to Endangered in February 2022. The Conservation Advice identifies the action to update the EPBC Act referral guidelines for koala. This action is yet to be completed, and the current Conservation Advice still references the 2014 referral guidelines as the source on how to 'navigate the complexity of koala habitat to identify significant impacts and standards for mitigating impacts. **Habitat** Koalas inhabit in coastal and inland areas that typically characterised with *Eucalyptus* woodlands. Key habitat types identified as important to species recovery are large contiguous tracts of vegetation that buffer and provide connectivity to riparian corridors – all dominated by koala food trees (i.e. *Eucalyptus* trees) (Department of Agriculture Water and the Environment, 2022b). **Threats** Vegetation clearance from activities including urbanisation, grazing, agriculture and mining have significantly reduced the Koala's distribution. Other known threats to this species include habitat loss, fragmentation, collision with vehicles and predation by dogs. Loss of climatically suitable habitat due to climate change(Department of Agriculture Water and the Environment, 2022b).	Koalas are known to occur within the Impact area. The species will breed, forage and disperse throughout non-remnant and remnant vegetation within the Impact area. Moreover, these vegetation communities may act as a refuge for dispersing individuals. Whilst majority of the habitat is poor quality, large patches of high-quality habitat occur in remnant areas specifically Karawatha Forest Park and Nealdon and Gould Adams Park. A maximum of 107.74 ha of habitat is proposed to be impacted by the proposed action. Given the peri-urban context of the Impact area, where it is noted that koalas rely on small patches of vegetation, there is a risk of notable habitat loss occurring. Therefore, a SIA is recommended.	3	Possible	**Potential risk – further assessment required**
Spotted-tailed quoll (southern)	The spotted-tailed quoll historically occurred across eastern Australia, from south-east Queensland to Tasmania. The mainland distribution of this sub-species was, however, reduced significantly in the latter half of the 20th century (Department of Climate Change Energy the Environment and Water, 2023a) The Spot-tailed Quoll occurs in south-east Queensland: coastally from Bundaberg to the border and inland to Monto and Stanthorpe. Occurrences from five broad geographic areas are known: four from coastal ranges and the Great Dividing Range from the NSW border to Gladstone. The fifth is centred on the eastern Darling Downs-Inglewood Sandstone provinces of the Brigalow Belt South Bioregion (Department of Climate Change Energy the Environment and Water, 2023a) **Habitat** The spotted-tailed quoll prefers relatively undisturbed mature wet forest, with potential den sites. It inhabits a variety of vegetation communities, including temperate and subtropical	This species is considered a potential occurrence within the Impact area due to the presence of marginal suitable habitat, mainly within the Karawatha Forest Park and a record (2004) occurring approximately 8.93 km from the Impact area. A maximum of 26.20 ha of potential habitat is proposed to be impacted by the proposed action. All potential habitat is considered marginal due to the lack of structural diversity and complexity as well as potential denning sites. All potential habitat is functionally disconnected to protected areas in the wider region, separated by the existing railway corridor and/or motorways. No evidence of this species including potential scats and signs were observed during the reconnaissance surveys and targeted habitat assessments. Field surveys conducted across 2023 included the recommended methodologies and effort is sufficient as per the species referral guidelines (see Section 2.5.2.3). Furthermore, cane toads were commonly recorded, which attributes to poisoning	2	Unlikely	**Low risk – no further assessment required**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	rainforests, wet sclerophyll forest, lowland forests, open and closed eucalypt woodlands, inland riparian and River Red Gum (*Eucalyptus camaldulensis*) forests and coastal heathlands. Spotted-tailed quolls shelter in fallen logs, boulder piles, burrows, tree hollows and occasionally under dwellings during the day (Department of Climate Change Energy the Environment and Water, 2023a)(Department of Climate Change Energy the Environment and Water, 2023a)(Department of Climate Change Energy the Environment and Water, 2023a). **Threats** Identified threats to the spotted-tailed quoll include habitat loss and modification, predation by feral cats (*Felis catus*) and foxes (*Vulpes vulpes)*, competition and predation by wild dogs (*Canis lupus familiaris)*, poisoning by cane toads (*Rhinella marina*), mortality associated with poison control for non-native predators, purposeful killing related to spotted-tailed quoll predation on domestic chickens, mortality associated with road traffic, and increase in fire frequency and intensity related to climate change (Department of Climate Change Energy the Environment and Water, 2023a).	and in some cases death of the spotted-tail quoll. Due to the highly modified and disturbed urban landscape, the majority of remnant vegetation is considered to be unlikely important habitat and is not located within an area of important populations (Department of the Environment, 2009). Given the narrow, linear nature of the proposed action and the species high mobility, fragmentation impacts are likely to be minor. Given the above, the findings of the field surveys, and that no habitat was found within the Impact area that is considered habitat critical to the survival of the species, it is considered low risk, and no further assessment is required.			
Regent honeyeater	The Regent honeyeater is endemic to mainland south-eastern Australia, with a patchy but wide distribution extending from south-east Queensland to central Victoria. It is only found regularly at a few localities in NSW and Victoria where most of the sightings have been recorded. According to the species' recovery plan found on the SPRAT database (Department of Climate Change, Energy, the Environment and Water, 2024), it is thought that the regent honeyeater comprises a single population, with some exchange of individuals between regularly used areas. There are four known key breeding areas: three in NSW and one in Victoria. The species range and numbers have contracted greatly since about the 1940s. It previously ranged from near Rockhampton in Queensland to Wilmington in South Australia (Department of Climate Change, Energy, the Environment and Water, 2024). Within its current distribution there are four known key breeding areas where the species is regularly recorded. These are the Bundarra-Barraba, Capertee Valley and Hunter Valley districts in New South Wales, and the Chiltern area in north-east Victoria. Breeding has also been regularly recorded in the Cement Mills-Durakai area west of Warwick, southern Queensland and in the Australian Capital Territory (Department of the Environment, 2016). **Habitat** According to the species' recovery plan found on the SPRAT database (Department of the Environment, 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. Other forest types regularly utilised by regent honeyeaters include wet lowland coastal forest dominated by swamp mahogany (*Eucalyptus robusta*), spotted gum-ironbark associations and riverine woodlands (where it is known to feed on nectar from *Amyema cambagei*). This riparian habitat is also selected as breeding habitat in some years. Often this is adjacent to box-ironbark woodland. Remnant stands of timber, roadside reserves, travelling stock routes and street trees also provide important habitat for regent honeyeaters at certain times (Department of the Environment, 2015). According to the species' recovery plan found on the SPRAT database (Department of the Environment, 2016) the species' movement patterns are thought to be governed by the flowering of select eucalypt species. It prefers taller and larger diameter trees for foraging, as these typically produce more nectar. Foraging trees are rarely used as roosting or nesting sites, with one nest recorded 700 m from the nearest resource tree. Regent honeyeater nests are usually placed in the canopy of mature trees with rough bark. The species roosts communally, in trees with dense foliage. Key tree and mistletoe species for the regent honeyeater include: • Mugga (or Red) Ironbark (*Eucalyptus sideroxylon*) • Yellow Box (*Eucalyptus melliodora*) • White Box (*Eucalyptus albens*)	One ALA record dated 2020 occurs within 5 km of the Impact area. The record has high spatial uncertainty (2000 m) and occurs 1 km east of the Impact area located on Overlord Place. Four WildNet records occur within 5 km of the Impact area, the most recent dated 1994. While the Impact area has been modelled as 'likely to occur' for the species according to its recovery plan (Department of the Environment, 2016), it is considered the species has the 'potential to occur' due to marginal habitat occurring within the Impact area and one record from four (4) years ago which occurs within 5 km of the Impact area. Habitat is considered marginal, due to the low densities of key foraging mistletoe resources, lack of box-ironbark woodland and no woodlands dominated by key trees species as outlined within the species' recovery plan. Eucalypt woodlands and riparian areas that do occur are generally scattered throughout the Impact area in a highly degraded and urbanised environment. No evidence of this species was observed during targeted field surveys. Field surveys conducted included the recommended methodologies and the effort is sufficient as per the species referral guidelines (Section 2.5.2.3). A maximum of 42.28 ha of potential marginal habitat is proposed to be impacted by the proposed action. In a regional context, this reduction in available habitat may be considered notable. Due to this, it is recommended further assessment with a Significant Impact Assessment is undertaken for the species.	3	Possible	**Potential risk – further assessment required**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	• Yellow Gum (*Eucalyptus leucoxylon*) • Spotted Gum (*Corymbia maculata*) • Swamp Mahogany (*Eucalyptus robusta*) • Needle-leaf Mistletoe (*Amyema cambagei*) on River Sheoak (*Casuarina cunninghamiana*) • Box Mistletoe (*Amyema miquelii*) Long-flower Mistletoe (*Dendropthoe vitellina*) (Department of Climate Change, Energy, the Environment and Water, 2024). As per the species' recovery plan found on the SPRAT database ((Department of the Environment, 2016), habitat critical to the survival of the species includes: • Any breeding or foraging areas where the species is likely to occur. • Any newly discovered breeding or foraging locations. **Threats** Main threats to the Regent honeyeater include habitat loss, fragmentation and degradation, competition for resources with other, more aggressive honeyeaters, nest predation by natives such as pied currawongs (*Strepera graculina*), and the rapid decline of a once-large population causing a loss of genetic diversity (Department of the Environment, 2015).				
Mary River cod	The Mary River cod is endemic to the Mary River system of southeast Queensland. It currently inhabits Tinana-Condoo Creek upstream from Tinana Barrage, Six Mile Creek downstream from Lake Macdonald, and upper Obi Obi Creek. The species historically occurred across the Brisbane-Stanley, Albert-Logan and Coomera River systems (Threatened Species Scientific Committee, 2016). **Habitat** The Mary River cod occurs from high gradient, rocky streams in upland areas, to large, slow-flowing lowland pools. They appear to prefer deep, shaded, slow flowing pools with plenty of snags and log-piles, and may utilise hollow logs as nest sites. The species is known to have a home range where they may stay for large proportion of time, and to which they may return after long absences. Mary River cod often migrate into smaller tributaries from main rivers in late winter, sometimes moving over 30 km up or down stream. They form pairs and spawn annually around spring. **Threats** Impoundment of streams, changes in flow regimes, disturbance of banks by cattle, and loss of riparian vegetation are key threats to the Mary River cod. Other threats include predation by, or competition with, introduced native and non-native species such as the guppy (*Poecilia reticulata*), swordtail (*Xiphophorus helleri*), mosquitofish (*Gambusia holbrooki*), golden perch (*Macquaria ambigua*), silver perch *(Bidyanus bidyanus*) and saratoga (*Scleropages leichardti*). The Mary River cod is also subject to overfishing by recreational fishers.	The species is considered as potential to occur due to marginal habitat occurring within the Impact area. No records occur within 5 km of the Impact area and no individuals were observed during targeted field surveys. A maximum of 0.65 ha of potential habitat is proposed to be impacted by the proposed action. The likelihood of Mary River cod breeding at sites within the Impact area is highly unlikely given the distance of the sites from any known Mary River cod locations and an absence of suitable breeding habitat (large woody debris and undercut banks). The nearest stocking location to the Impact area is approximately 20km upstream of one site, however all other stocking locations were 60-160 km upstream with numerous hydrological impoundments between stocking and surveyed locations. Given this, it was determined that Mary River cod presence at most sites was unlikely as there was not suitable habitat. In addition, the presence of exotics is likely to predate on Mary River cod fingerlings and compete for resources. The notable scarcity if not total absence of large woody debris and undercut banks at many of the study sites further decreases the chance of successful breeding within the Impact area. For the above reasons, it is considered low risk and no further assessment is required.	2	Unlikely	**Low risk – no further assessment required**
Angle-stemmed myrtle	The angle-stemmed myrtle is endemic to south-east Queensland, occurring along the lower reaches of the Brisbane and Logan rivers. The species formerly occurred around Moggill and New Farm in Brisbane, but there have been no recent discoveries in these areas. There are currently eight known populations totalling 72 individual wild plants, located at sites within Tanah Merah, Daisy Hill, Loganholme, Corinda, Fig Tree Pocket and Long Pocket. The species flowers from October to December and produces fruit from January to early April. The unspecialized flowers, similar to those of many species in the Myrtaceae, suggest the angle-stemmed myrtle is pollinated by insects. **Habitat** The angle-stemmed myrtle inhabits sloping metamorphic or flat alluvial terraces of largely permanent waterways, with tidal influence, at an elevation of 5 to 70 m. The species prefers well-drained clay soils derived from metamorphosed sediments and Cainozoic or alluvial deposits.	One (1) individual was recorded during targeted flora surveys, located in Lot 9 on SP307207 approximately 14 m west of the Impact area. The individual is not proposed to be impacted by the proposed action. Although this species is known from the surrounding area, the location of this individual does not meet the described habitat for these species. The species profile description describes the habitat as steep slopes often in lowland riparian rainforest and notophyll vine forest, along permanent watercourses. This individual is unlikely to become part of a self-sustaining 'relatively natural ecological community' given it is located within a restricted area situated in between residential dwellings and a cleared manicured lawn comprising of the existing rail corridor. This individual was located outside of the Impact area and is unlikely to be impacted by the proposed action.	3	Possible	**Potential risk – further assessment required**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	Threats Myrtle rust disease (*Puccinia psidii*), habitat loss and degradation, and the impact of invasive species such as hiptage (*Hiptage benghalensis*), cats-claw creeper (*Macfadyena unguis-cati*), balloon vine (*Cardiospermum grandiflorum*) and climbing asparagus (*Asparagus africanus*) pose threats to the angle-stemmed myrtle population.	Furthermore, habitat is already degraded as a result of ongoing development and land clearing, indicating that any population present is likely already impacted. These land practices are recognised as a threatening process and are likely to continue regardless of the proposed action. The proposed action's infrastructure may be micro-sited to ensure no direct impacts to known individuals or populations occur. Given the Impact area is located within the known distribution of the species (along the lower reaches of the Brisbane and Logan Rivers) and an individual was observed within the Impact area, a SIA is recommended.			
Scrub turpentine	Scrub turpentine occurs in coastal districts between Bundaberg in Queensland and Batemans Bay in NSW. The species occasionally extends inland onto the escarpment to elevations of up to 600m, in areas with rainfall of 1,000 to 1,600 mm. Scrub turpentine flowers from late winter through spring, peaking in October, and fruits in summer. It is known to resprout from rootstock after fire and can produce suckers which may develop into thickets. The species is characterised as a common understory tree. **Habitat** Scrub turpentine inhabits all rainforest sub-forms except cool temperate rainforest and is a common pioneer species in eucalypt forests and adjacent transition zones of dry sclerophyll and grassy woodlands. The species occupies a range of volcanically derived and sedimentary soils and can be found in creekside riparian areas. **Threats** Land clearing and habitat fragmentation, including weed invasion, threatens the scrub turpentine population. The species is subject to mortality from infection by the fungus *Austropuccinia psidii.*	One individual was recorded by GHD (2021) as planted outside of its naturally occurring habitat and not considered 'in the wild'. The individual was juvenile within a tree guard and in very poor health. The species is very susceptible to *Austropuccinia psidii* (Myrtle rust) with the impact evident on this individual with only a few leaves remaining. Habitat for this species is recorded littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. Based on this, habitat within the Impact area is limited to riparian zones on alluvial soils. This species is unlikely to become part of a self-sustaining 'relatively natural ecological community'. Therefore, the proposed action is not anticipated to impact the species or suitable habitat and no further assessment is required.	1	Highly unlikely	**Low risk – no further assessment required**
Vulnerable species					
South-eastern glossy black cockatoo	**Habitat** South-eastern glossy black cockatoos feed almost exclusively on the seeds of she oaks (*Allocasuarina spp*. and *Casuarina spp*.), usually relying on one or two species within a region. South-eastern glossy black cockatoos are hollow nesters, utilising large hollows in both living and dead Eucalyptus trees. The species usually occurs in pairs or in groups of three (made up of a breeding pair and their offspring), in woodlands **Threat** The main threat causing the decline of south-eastern glossy black cockatoo is a result of habitat, loss, degradation, and fragmentation. Historic land clearance was the main cause of decline in the past; however, wildfires cause further habitat loss and degradation.	The species potentially occurs within the Impact area based on the presence of suitable breeding, foraging and dispersal habitat including a record (1993) occurring 200 m west of the Impact area. No evidence of this species including ort chewings were observed during targeted field surveys. However previous ecological surveys (GHD, 2021)observed ort chewings within the Impact area. Given this, and the presence of *Allocasuarina* and *Casuarina* spp, waterbodies and eucalypt trees > 30 cm and 50 cm DBH observed during field surveys, further assessment is recommended. A maximum of 41.74 ha of potential breeding, foraging and dispersal habitat is proposed to be impacted. Due to the modified environment habitat is already degraded as a result of ongoing development and land clearing, indicating that any population present is likely already impacted. These land practices are recognised as a threatening process and are likely to continue regardless of the proposed action. Therefore, a SIA is recommended.	3	Possible	**Potential risk – further assessment required**
Grey-headed flying fox	**Habitat** The Grey-headed flying fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, *Melaleuca* spp. swamps and *Banksia* spp. woodlands. It also feeds on commercial fruit crops and on introduced tree species in urban areas. However, the primary food source is blossom from Eucalyptus and related genera. Habitat critical to the survival of the Grey-headed Flying fox includes winter and spring flowering vegetation communities. Habitat critical to the survival of the Grey-headed	The species was confirmed present within the Impact area and surrounds during targeted field surveys. Suitable foraging habitat was widely observed within the Impact area with known mixed species flying fox colonies also located within the Impact area. As the species is known to disperse up to 20 km to forage the Impact area is considered to represent likely foraging habitat and requires further assessment. A maximum of 45.33 ha (43.14 ha direct impacts, 2.20 ha indirect impacts) of potential habitat is proposed to be impacted. Therefore, a SIA is recommended.	3	Possible	**Potential risk – further assessment required**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	Flying fox may also be vegetation communities not containing the above tree species but which: • Contain native species that are known to be productive as foraging habitat during the final weeks of gestation, and during the weeks of birth, lactation and conception (August to May) • Contain native species used for foraging and occur within 20 km of a nationally important camp as identified on the DCCEEW interactive flying fox web viewer, or • Contain native and or exotic species used for roosting at the site of a nationally important Grey-Headed Flying fox camp as identified on the DCCEEW interactive flying fox web viewer. **Threats** Known threats to the species include habitat loss, fragmentation exploitation, competition, hybridisation, pollutants, electrocution, and pathogens.				
White-throated needle tail	The White-throated needletail breeds in the northern hemisphere and migrates in the austral summer months to Australia. While in Australia, this species is widespread and predominately aerial. There is no current accurate population estimate, however the global population is estimated at greater than 10,000 birds. **Habitat** Important populations are not defined, however important habitat includes large tracts of native vegetation, particularly forest. The species usually roosts in tall trees on cliffs or steep slopes that have vantage points, amongst dense foliage in the canopy or in hollows. **Threats** Identified threats to this species whilst in Australia include habitat loss and fragmentation, mortality due to collision with wind turbines and overhead wires, poisoning and pesticides.	This species may potentially occur in the airspace above the Impact area and multiple records occur within 5 km. A maximum of 51.70 ha of potential habitat is proposed to be impacted. As habitat requirements for the species are not well-understood, all eucalypt woodland and forest within the Impact area is considered important habitat. However, as this species has a very large distribution across Australia and is constantly moving, only small numbers are expected to utilise the Impact area at one time. Furthermore, this species is predominately aerial and has broad habitat requirements, impacts are unlikely to affect the persistence of the species. In addition, it is likely vast areas of important habitat occur within the wider local area. For the above reasons, it is considered low risk and no further assessment is required.	2	Possible	**Low risk– no further assessment required**
Yellow-bellied glider (south-eastern)	**Habitat** The Yellow-bellied glider (south-eastern) occurs in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests. The subspecies shows a preference for large patches of mature old growth forest that provide suitable trees for foraging and shelter. There is also a clear preference for forests with a high proportion of winter-flowering and smooth-barked eucalypts. The subspecies is social and lives in family groups of two to six individuals, throughout an exclusive home range of approximately 50–65 ha. Hollow-bearing trees used by the species are primarily living, smooth-barked eucalypts of multiple species. Habitat critical to the survival of the species may be broadly defined as areas containing the following attributes (noting that geographic areas containing habitat critical to survival needs to be defined by forest type on a regional basis): • Large contiguous areas of floristically diverse eucalypt forest, which are dominated by winter-flowering and smooth-barked eucalypts, including mature living hollow-bearing trees and sap trees • Areas identified as refuges under future climate change scenarios • Short or long-term post-fire refuges (i.e., unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas • Habitat corridors required to facilitate dispersal of the subspecies between fragmented habitat patches and/or that enable recolonization or movement away from threats • Areas in which some trees have evidence of use for sap extraction by Yellow-bellied glider (south-eastern). Populations important to the survival of the species include stronghold populations, ecologically or genetically distinct populations, research populations, captive populations, and other populations where recovery actions are being implemented.	The species potentially occurs within the Impact area based on the presence of suitable habitat. No individuals or evidence of sap extraction were observed during targeted field surveys. However, since multiple eucalypt species with a DBH over 30cm and 50 cm were observed during field surveys including the presence of flowering eucalypt species, further assessment is recommended as DCCEEW relies on the presence of trees with a DBH > 30 cm to be used as a proxy indicator for breeding habitat for gliders in Queensland Furthermore, riparian habitat may provide areas of refuge in times of natural disasters (i.e. fire and drought). The Impact area is not listed as a stronghold for important populations listed in the conservation advice (Department of Agriculture Water and the Environment, 2022). A maximum of 34.89 ha of habitat is proposed to be impacted by the proposed action. Only a small number of individuals are likely to utilise these areas and there will be availability of equally or greater quality suitable habitat remaining in the local area, specifically within Karawatha Forest Park. However, as this species is known to be susceptible to habitat fragmentation and have a low dispersal ability a SIA is recommended.	3	Possible	**Potential risk – further assessment required**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	Threats The Yellow-bellied glider (south-eastern) is primarily threatened by climate change, altered fire regimes, clearing, fragmentation and timber harvesting.				
Macadamia nut	Macadamia Nut occurs from Mount Bauple near Gympie to Currumbin Valley in the Gold Coast hinterland. The species historically occurred in north-east New South Wales. It is typically a scattered rare to occasional tree, and population sizes are difficult to estimate. Populations in the south-east Queensland Regional Forest Agreement region (area of 10,000 km²) are estimated at 2,500 mature individuals in 20 populations. These populations were formerly declining but are presently stable. **Habitat** Macadamia nut is conserved in at least four small reserves in south-east Queensland. This species grows in remnant rainforest, including complex mixed notophyll forest, and prefers partially open areas such as rainforest edges. Macadamia nut occurs within the Northern Rivers (NSW) and South East Queensland Natural Resource Management Regions. **Threats** The main identified threats to the species are habitat fragmentation from urban and agricultural clearing, weed invasion by species such as lantana (*Lantana camara*) and camphor laurel (*Cinnamomum camphora*), and Inappropriate fire regimes.	The species is considered known to occur due to the confirmed presence of two individuals observed within the Impact area. However, both species were located in residential areas and considered 'not in the wild'. A maximum of 0.0.16 ha of potential habitat occurs within the Impact area. Furthermore, habitat is already degraded as a result of ongoing development and land clearing, with a high density of *Lantana camara* present indicating that any population present is likely already impacted. The presence of *Lantana camara* is recognised as a threatening process and is likely to persist regardless of the proposed action. Based on the above a SIA is recommended.	3	Possible	**Potential risk – further assessment required**
Threatened Ecological Communities					
Subtropical floodplain eucalypt TEC	**Habitat** The habitat or areas most critical to the survival of the ecological community are those patches that are in the best condition. These represent those parts of the ecological community that retain the highest diversity and most intact structure and ecological function and have the highest chance of persisting in the long-term. However, areas that otherwise meet the minimum condition thresholds are also important for the functioning and survival of the ecological community. These areas are critical to the survival of the ecological community: if they occur in locations or landscape positions that are particularly important for biodiversity or function; and/or contain suites of species, or habitat features, which are important in a regional or local context. They also have the potential to recover, or be restored, to a higher condition. **Threats** The ecological community has primarily been impacted by clearing and the selective harvesting of the dominant canopy tree species; altered fire and hydrological regimes; livestock grazing; weeds; invasive fauna (pests); climate change; disease, pathogens and dieback (e.g., bell miner associated dieback (BMAD)); and human disturbance. **Regional context** The Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions is the assemblage of native plants, animals and other organisms that comprise forests and woodlands dominated by trees from five myrtaceous genera that occurs on alluvial landforms, including floodplains, riparian zones, alluvial flats, floodplain terraces and periodically flooded depressions, within the New South Wales North Coast and South Eastern Queensland bioregions, and on Curtis Island in the Brigalow Belt North bioregion. It generally occurs at elevations below 50 m above sea-level (ASL), although it can occur up to 250 m ASL. The ecological community generally occurs on alluvial soils, with more limited occurrences on in-situ soils within localised depressions, which may be at least occasionally saturated, water-logged, or inundated. The ecological community does not typically occur on soils that are primarily marine or aeolian sand but may occur on such substrates after they have been modified by fluvial activity.	Field surveys verified two (2) REs occurring within the Impact area (REs 12.3.3, 12.3.3d) which potentially constitutes the TEC. However, targeted BioCondition field surveys were undertaken within the Impact area to assess vegetation condition and biodiversity values. Based off the BioCondition results patches of this TEC were identified within and/or in proximity to the impact. A maximum of 1.30 ha of potential TEC is proposed to be directly impacted and 4.80 ha is located within the buffer zone. Based on the initial selection of sites for this TEC and the extent of clearing within the rail corridor, it is unlikely there are suitable patches of the TEC outside of the field survey sites. However, given the extent of survey effort a SIA is recommended.	3	Possible	**Potential risk – further assessment required**

7.3 Summary of significant impact assessment

SIAs were undertaken for conservation significant species and communities with a potential risk as a result of the proposed action, provided in detail in Appendix F. A summary of the SIA results is outlined below in Table 40. Despite the implementation of mitigation measures, the proposed action has the potential to have significant impacts to koala, south-eastern glossy black cockatoo, grey-headed flying fox. Due to the presence of potential foraging and dispersal habitat within the Impact area considered habitat critical to the survival of the species, DCCEEW considers the proposed action may have a significant impact on the swift parrot and regent honeyeater.

While the Proponent remains of the view that such an impact is unlikely, to ensure DCCEEW's response is adequately addressed, the Proponent has considered these species as if the proposed action will have a significant impact. This commitment is reflected within all relevant documents within the revised Preliminary Documentation.

Table 40 Results of the significant impact assessment

Common name	SIA Result
Greater glider (southern and central)	Unlikely
Koala	**Likely**
Yellow-bellied glider (south-eastern)	Unlikely
South-eastern glossy black cockatoo	**Potential**
Grey-headed flying fox	**Potential**
Regent honeyeater	Unlikely[27]
Swift parrot	Unlikely[43]
Subtropical floodplain eucalypt TEC	Unlikely
Angle-stemmed myrtle	Unlikely
Macadamia Nut	Unlikely

The area of significant impact for each of these species is provided below in Table 41.

Table 41 Area of significant impact to Matters of National Environmental Significance

Common Name	Potential habitat utilisation	Maximum Impact area (ha) per habitat	Total Impact area (ha) per species
Grey-headed flying-fox	Breeding/Roosting	0.54	**45.33**
	Foraging/Dispersal	42.60	
	Breeding/Roosting (Indirect Impact)	2.20	
Koala	Breeding/Foraging	25.54	**107.74**
	Dispersal	80.27	
	Functionally lost (Breeding/Foraging)	1.94	
Regent honeyeater	Foraging and dispersal	42.28	**42.28**
Swift parrot	Foraging and dispersal	42.28	**42.28**

[43] Due to the presence of potential foraging and dispersal habitat within the Impact area considered habitat critical to the survival of the species, DCCEEW considers the proposed action may have a significant impact on the swift parrot and regent honeyeater. While the Proponent remains of the view that such an impact is unlikely, to ensure DCCEEW's response is adequately addressed, the Proponent has considered these species as if the proposed action will have a significant impact.

Common Name	Potential habitat utilisation	Maximum Impact area (ha) per habitat	Total Impact area (ha) per species
South-eastern glossy black-cockatoo	Breeding	18.91	**41.74**
	Breeding and foraging	7.13	
	Foraging	2.19	
	Dispersal	13.51	

7.4 Offset requirements

TMR is committed to reducing potential impacts to conservation significant flora, fauna and communities through avoidance and mitigation measures. However, despite these measures, significant impacts are expected to occur to koala, south-eastern glossy black cockatoo grey-headed flying fox, regent honeyeater and swift parrot. As such, biodiversity offsets in accordance with the Environmental Offsets Policy will be delivered through an offset portfolio compensating the loss of potential habitat for the MNES listed in Table 41.

The particulars of the offset portfolio are provided in Offset Area Management Plans (OAMPs).

8.0 Conclusion

This report was developed to support the PD submission for the proposed action for assessment under the EPBC Act. Using a combination of previous ecological assessments, desktop information and targeted field survey data, the potential presence and extent of conservation significant species and communities within the Impact area was assessed. During the targeted field surveys, subtropical floodplain TEC and three listed threatened flora species, macadamia nut, scrub turpentine and angle-stemmed myrtle, were observed within or directly adjacent to the Impact area. Two listed threatened fauna species, koala and grey-headed flying fox were observed within or directly adjacent to the Impact area. Three migratory species, glossy ibis, Latham's snipe and spectacled monarch, were observed within the Impact area. In addition, potential habitat for an additional nine (9) conservation significant fauna was assessed to occur within the Impact area.

A screening assessment was undertaken to assess the proposed action's nature, likelihood, consequence and extent of potential impacts to conservation significant species and communities that were known or have the potential to occur. A Significant Impact Assessment was undertaken for conservation significant species and communities that have a potential risk as a result of the proposed action.

Based on the findings of the risk assessment, significant impact assessments were undertaken in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance* (Department of the Environment, 2013) for ten (10) conservation significant species and communities:

- Angle-stemmed myrtle
- Greater glider (southern and central)
- Grey-headed flying fox
- Koala
- Macadamia nut
- Regent honeyeater
- South-eastern glossy black cockatoo
- Subtropical floodplain eucalypt TEC
- Swift parrot
- Yellow-bellied glider.

A landscape connectivity model was undertaken for koala, greater glider (southern and central) and yellow-bellied glider (south-eastern) to identify diffuse, channelled, and impeded movement patterns before the proposed action is undertaken (current state) and as a result of the proposed action (future state). Areas identified during landscape connectivity modelling to show potential impedance to koala and glider movement as a result of the proposed action are proposed to be mitigated with fauna connectivity infrastructure to be considered as part of Detailed Design for the proposed action and are provided as part of pre-construction (design) management measures.

A range of measures have and will be implemented to avoid, minimise, mitigate, rehabilitate and remediate potential direct, indirect and facilitated impacts to all known or potentially occurring conservation significant species and communities.

An OEMP provided as part of this PD submission outlines consolidated mitigation measures for all known or potentially occurring conservation significant species and communities. The intent of the OEMP is to take place of post-approval management plans and provide consolidated mitigations for all relevant staff and contractors during further stages of the proposed action.

Despite proposed avoidance and mitigation measures, significant impacts are expected to occur to koala, south-eastern glossy black cockatoo, grey-headed flying fox, swift parrot and regent honeyeater.

As such, biodiversity offsets in accordance with the Environmental Offsets Policy will be implemented for these species and their habitat.

To address the proposed action's offset requirements, OAMPs provided as part of this PD submission outline TMR's approach for offsets within two properties at Undullah and Benobble. This offset portfolio will be delivered to counterbalance significant impacts from the proposed action and demonstrate compliance under the EPBC Act and EPBC Act Environmental Offsets Policy. TMR will continue to progress offset requirements with consideration of conservation outcomes throughout the design and procurement phase.

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