

Appendix B

MNES Report



Haughton Pipeline Stage 2 Project

MNES Report

Townsville City Council

21 October 2022

→ **The Power of Commitment**



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Executive summary

Overview

The Houghton Pipeline Stage 2 (HPS2) Project, proposed by Townsville City Council (TCC), will include the construction of a pump station, pipeline and associated ancillary works. The HPS2 will transfer 364 ML/day of raw water from the Burdekin River (at the Clare Weir Storage) to Ross River Dam. The Project includes a 28.5 km pipeline running South from the Upper Houghton Irrigation Channel (Stage 1.1 works) to a new pump station that will be constructed adjacent the Burdekin River. The proposed action, along with the previously constructed Stage 1 and Stage 1.1, are collectively known as the Houghton Pipeline Duplication Project (HPDP).

The Project is located approximately 60 km southeast of Townsville, North Queensland, between the Houghton River and Burdekin River and the small townships of Clare and Millaroo in the Burdekin. The Project is a joint funding arrangement between the Queensland Government (the State) and TCC (the Proponent). The Project is proposed over a mixture of freehold, State controlled land and local government owned land.

This report has been prepared to identify and assess matters of national environmental significance (MNES) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) which are likely to be impacted by the proposed action.

Existing environment

The Project area intersects a landscape that has been subject to extensive historical land clearing and decades of cattle grazing. Wherever practicable, the Project area has been sited within areas of existing disturbance. Despite this, the Project area will impact areas of remnant vegetation providing resources for native flora and fauna.

Targeted surveys were undertaken for MNES over three survey events, with surveys undertaken by ecologists from NRA Environmental Consultants in April/May 2021, Ecological Interpretations in March 2022 and GHD in October 2021 and March 2022. Four threatened species that are MNES were confirmed present within the Project area:

- Black-throated finch (southern) (*Poephila cincta cincta*): two birds observed at the south of the Project area
- Squatter pigeon (southern) (*Geophaps scripta scripta*): 19 birds observed in eight locations
- Black ironbox (*Eucalyptus raveretiana*): 13 adult trees recorded on the lower bank of the Burdekin River at the south of the Project area, adjacent to the proposed pump station
- Bare-rumped sheath-tail bat (*Saccolaimus saccolaimus nudicluniatatus*): 168 calls reliably attributed to *S. saccolaimus*.

Two threatened species that are MNES were considered likely to occur due to the presence of suitable habitat:

- Koala (*Phascolarctos cinereus*)
- White-throated needletail (*Hirundapus caudacutus*).

Potential impacts and mitigation measures

The construction of the Project will result in the removal of vegetation and ground disturbance to construct and bury the pipeline. A 4 m wide access track will be permanently cleared and maintained through the operation phase. The remainder of the 40 m wide corridor will be rehabilitated through spreading of topsoil and hydromulching with native food grasses for the black-throated finch (southern), together with planting of tubestock in areas of higher ecological sensitivity adjacent to watercourses. The Project will result in a total disturbance footprint of 153.9 ha, comprising, permanent impact of 15.64 ha and a construction disturbance footprint to 138.26 ha.

The assessment of impacts to MNES determined that the following impacting processes are those that pose most risk to MNES, and thus will be the focus of mitigation and management:

- Loss of habitat

- Injury or mortality
- Fragmentation of habitat and loss of connectivity
- Disturbance to habitat from noise, light, and vibration
- Habitat degradation and increased erosion
- Spread of invasive species.

Substantial avoidance has been achieved by locating the Project area within areas of existing disturbance wherever possible. Other mitigation measures to reduce the impacts of habitat fragmentation and help to maintain habitat connectivity include:

- The only permanent infrastructure remaining will be an access track, intake structure and pump station, substation and power supply works
- Land clearing will be restricted to the minimal amount necessary for the construction of the Project and will not extend outside of the Project area
- Removal of all temporary fencing after completion of construction works.

In addition to the abovementioned mitigation and management measures that will be implemented to minimise the impacts of the Project's construction, rehabilitation following construction is proposed, and will include:

- Revegetation with tubestock and hydromulch with endemic grass species in areas that currently support remnant vegetation and are located within 400 m from a watercourse depicted on the Department of Resources (DoR) Vegetation Management Watercourse and Drainage Feature Map. This excludes a 10 m wide zone of influence above the pipeline which shall only be hydromulched to enable future maintenance of the pipeline, and also excludes the 4 m wide permanent access track that will not be vegetated.
- Hydromulching for remaining areas.

A detailed suite of management and mitigation measures to address (e.g. avoid, minimise, mitigate) these impacts has been identified in this assessment.

Residual significant impacts arising from the Project – that is, impacts caused by the loss/disturbance of habitat for MNES that remain after application of mitigation and management measures (but not rehabilitation), and that constitute a 'significant impact' as assessed against the Commonwealth's 'Significant Impact Guidelines 1.1 – Matters of National Environmental Significance' (Commonwealth Significant impact guidelines) (DoE 2013), are proposed to be offset. Offset requirements are outlined in the 'Offset Management Strategy' which forms part of this submission.

Impacts are unlikely to be unknown, unpredictable or irreversible. Mitigation and management measures for known, predictable or reversible impacts are proposed and will be implemented through a Construction Environmental Management Plan (CEMP), Conceptual Erosion and Sediment Control Plan (CESCP), site and stage specific Erosion and Sediment Control Plans (ESCPs) for the Project.

Significant impact assessment

The significance of the Project's potential impacts on MNES that have been confirmed present or are considered likely to occur within the Project area was examined. The assessment was made against the Commonwealth Significant impact guidelines (DoE 2013), and the 'Significant impact guidelines for the endangered black-throated finch (southern)' (DEWHA 2009a).

The Project is considered unlikely to have a significant impact on the following MNES species that are confirmed present or likely to occur :

- Confirmed present:
 - Black ironbox – due to the minor impact (maximum loss of four individuals)
 - Squatter pigeon (southern) – due to the Project not impacting an 'important population', small quantum of habitat loss and the extent of suitable habitat present within the wider landscape
- Likely to occur:
 - White-throated needletail – due to the species' aerial nature and absence of roosting habitat.

The Project is considered likely to result in significant impacts on the following species that are MNES:

- Koala – due to impacts to habitat critical to the survival of the species
- Bare-rumped sheath-tail bat – due to the impact on habitat critical to the survival of the species, notably loss of potential roosting trees including loss of 10 large and 27 moderate-sized *E. platyphylla* hollows
- Black-throated finch (southern) – due to the impact on habitat critical to the survival of the species associated with localised indiscriminate loss of trees within 1 km of water.

Mitigation measures have been identified to manage the impacts of the proposed pipeline's construction on these species (noting these measures, including post-construction rehabilitation) have not been accounted for when determining the quantum of residual impact (i.e. unavoidable loss) from the Project):

- **Weed management:** Given the extensive weed coverage that currently exists in the Project area, there are substantial opportunities to improve the habitat values for the southern black-throated finch through removal and ongoing management of weeds in all rehabilitation areas.
- **Revegetation of remnant vegetation areas within 400 m from a DoR Vegetation Management Watercourse:** Remnant areas within 400 m from a DoR Vegetation Management Watercourse will be revegetated (with the exception of the 4 m wide gravel access road and the 10 m wide zone of influence) to establish future areas of suitable habitat for the species. Specifically, these rehabilitation areas will be replanted with tubestock of species that characterise the endemic riparian open forest and woodland communities.
- **Sowing food grass species:** Rehabilitation areas will be subject to sowing of native grasses that are documented to be food species for the southern black-throated finch.
- **Avoiding direct impact to potential roost trees:** Potential large roost trees will be protected from direct and indirect impact by avoiding the removal of these potential roost trees where possible. Where avoidance is not possible in the remnant watercourse areas, these areas will be replanted with *E. platyphylla* tubestock to increase the availability of future roosting habitat.

The Project is still likely to have a significant residual impact on the black-throated finch (southern) and bare-rumped sheath-tail bat. An Offset Area Management Strategy (OAMS) has been prepared for residual significant impacts to MNES.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.3 and the assumptions and qualifications contained throughout the Report.

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Acronyms

Acronym	Definition
ABLV	Australian Bat Lyssavirus
ALA	Atlas of Living Australia
CESCP	Conceptual Erosion and Sediment Control Plan
CEMP	Construction Environmental Management Plan
DAF	Department of Agriculture and Fisheries
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DES	Queensland Department of Environment and Science
DoR	Department of Resources
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESCP	Site and stage specific Erosion and Sediment Control Plans
MNES	Matters of National Environmental Significance
NC Act	Queensland <i>Nature Conservation Act 1992</i>
PMST	Protected Matters Search Tool
RE	Regional Ecosystem
SAT	Spot Assessment Technique
SPRAT	Species Profile and Threats database
TEC	Threatened Ecological Community

1. Introduction and background

Townsville City Council (TCC) are undertaking the Detailed Design for the proposed Stage 2 of the Haughton Pipeline (HPS2) Project. The HPS2 Project is required to accommodate increased water demand due to regional population growth. The HPS2 Project includes a new pump station, pipeline and associated ancillary works (hereon referred to as the 'Project area'), connecting to the constructed Stage 1 and Stage 1.1 Haughton Pipeline Duplication Project (HPDP). The HPS2 will transfer 364 ML/day of raw water over a 22-hour period from the Burdekin River (at the Clare Weir Storage) to Ross River Dam. The Project includes a 28.5 km pipeline running South from the Upper Haughton Irrigation Channel (Stage 1.1 works) to a new pump station that will be constructed adjacent to the Burdekin River between the Tom Fenwick pump station and the Clare Weir. The proposed action, along with the previously constructed Stage 1 and Stage 1.1, are collectively known as HPDP. The Project is located approximately 60 km southeast of Townsville, North Queensland, between the Haughton River and Burdekin River and the small townships of Clare and Millaroo in the Burdekin.

The HPDP includes the following stages:

- Stage 1 of the Project was completed in 2020 and comprises approximately 33 km of DN1800 pipeline constructed from the Haughton River to Toonpan Creek at the head of Ross River Dam
- Stage 1.1 of the Project was completed in 2021 and is an extension of the Stage 1 pipeline works by 4 km from the Haughton River, directed towards the Stage 2 pipeline alignment. The Stage 1.1 works end with an isolation valve pit and is the connection point for Stage 2
- Stage 2 (this Project) comprises construction of new pump station and construction of a new 28.5 km water pipeline from the pump station to Stage 1.1 to provide an integrated water transfer system and associated ancillary works. Construction for the pipeline is due to begin in April 2023, with completion of the construction phase by the July 2025.

The Project is a joint funding arrangement between the Queensland Government (the State) and TCC (the Proponent).

The Project location is shown on Figure 1.1.

GHD has been commissioned by TCC to undertake targeted ecological surveys along the pipeline alignment, as well as additional surveys within the proposed pump station site, access roads and stockpile areas, as shown in Figure 1.1.

1.1 Purpose of this report

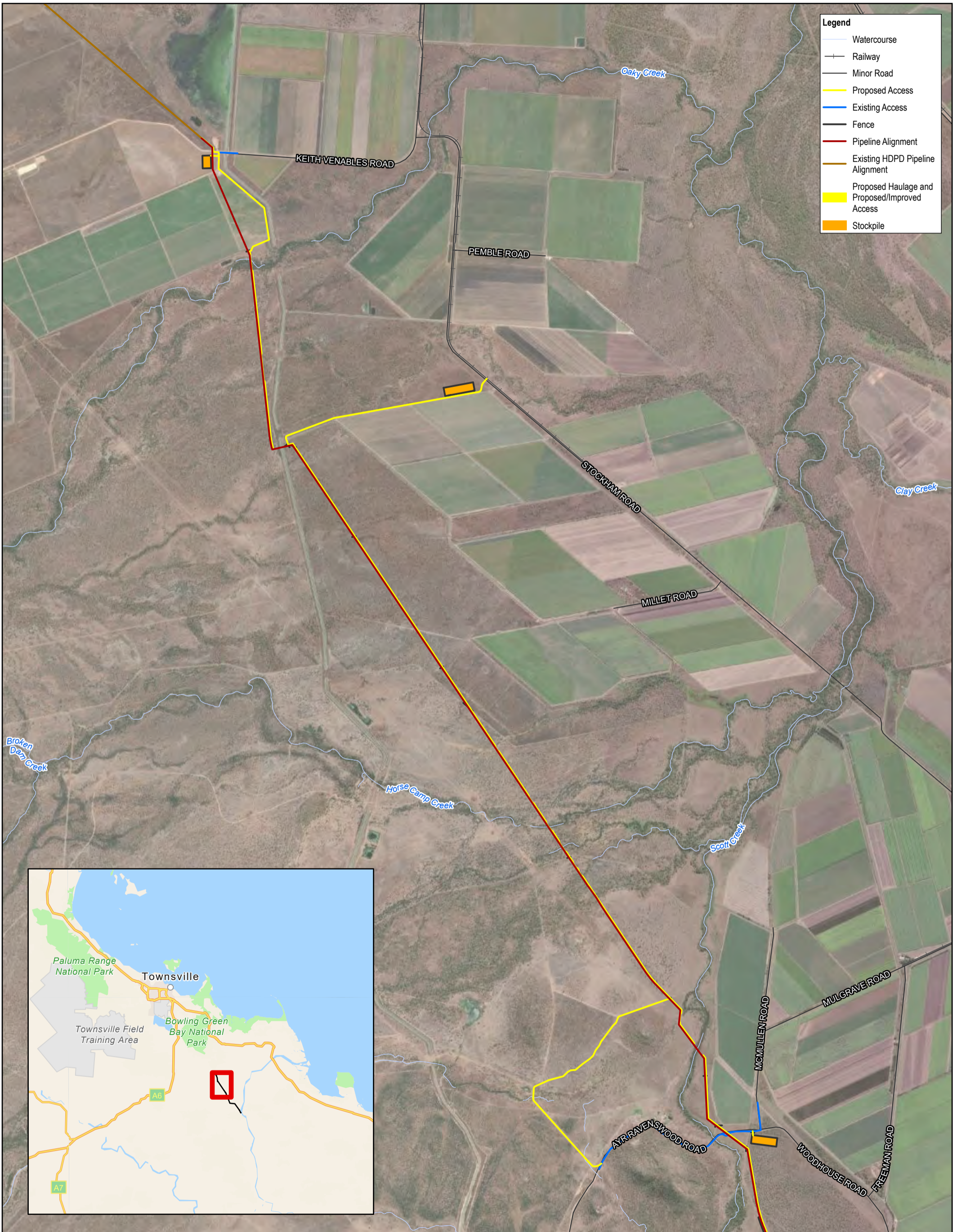
This report has been prepared to identify and assess matters of national environmental significance (MNES) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) which have the potential to be impacted by the Project. Specifically, this report presents the findings of desktop and field-based ecological assessments undertaken to determine the type and extent of impacts, and how any such impacts to MNES will be avoided, minimised and mitigated, including:

- Listed threatened species and communities (sections 18 and 18A).

The assessment presented in this report included the following items:

- Identifying the ecological values of the Project area, including vegetation communities and terrestrial flora and fauna through desktop and field-based methods
- Assessing the likelihood of occurrence of EPBC Act listed flora, fauna and TECs
- Assessing the potential impacts of the Project on EPBC Act listed flora, fauna and TECs
- Identifying actions to avoid, minimise, mitigate and rehabilitate impacts on EPBC Act listed flora, fauna and TECs.

Where an MNES species or ecological community was confirmed present or considered 'likely to occur', a significance of impact assessment was undertaken in accordance with the Commonwealth's 'Significant Impact Guidelines 1.1 – Matters of National Environmental Significance' (Commonwealth Significant impact guidelines) (DoE 2013), or species-specific guidelines where these were available.



Legend

- Watercourse
- Railway
- Minor Road
- Proposed Access
- Existing Access
- Fence
- Pipeline Alignment
- Existing HDPD Pipeline Alignment
- Proposed Haulage and Proposed/Improved Access
- Stockpile

Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



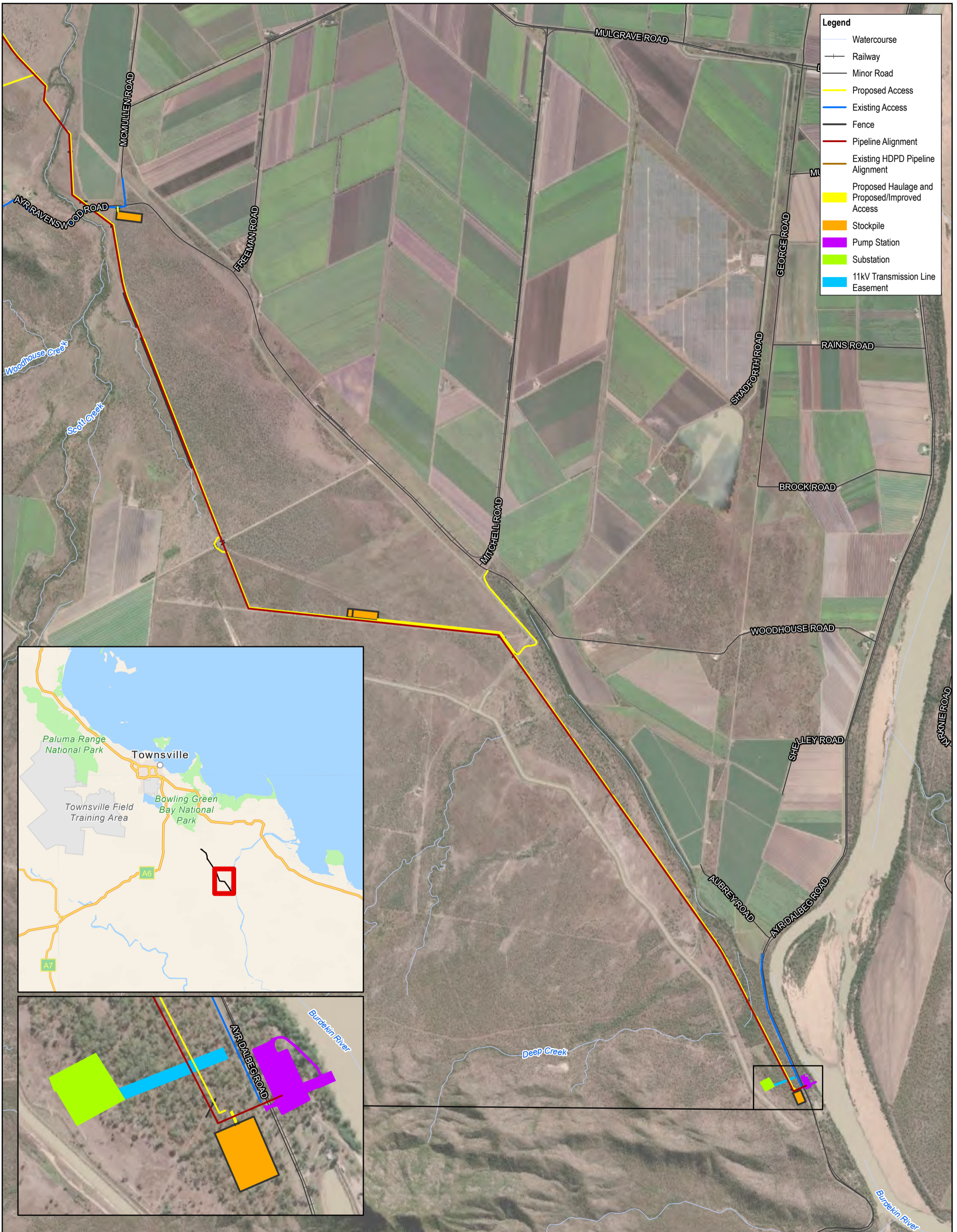
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Houghton Pipeline Stage 2 - MNES Assessment

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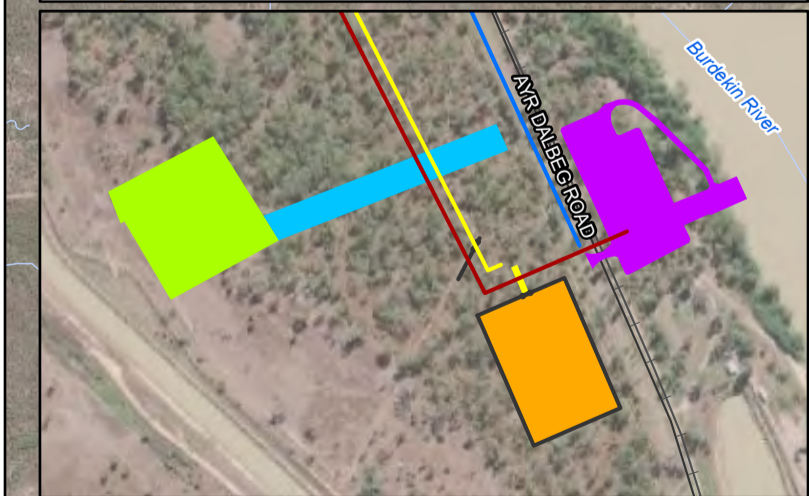
Houghton Pipeline Stage 2 project area

FIGURE 1-1

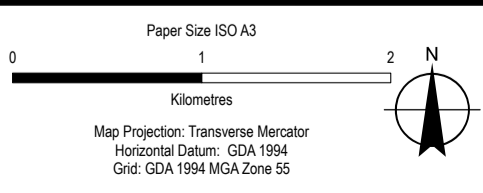
\\ghdnet\ghd\AU\Townsville\Projects\4212537606\GIS\Map\APRX\12537606_12537606_Ecology.aprx_12537606_MNES_001_ProjectArea_PAGE1_Rev2 Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout (2022); World Navigation Map: Department of Resources, Dept of Environment and Science, Esri, HERE, Garmin, FAO, NOAA, USGS World Imagery: Maxar. Created by: shar2



- Legend**
- Watercourse
 - Railway
 - Minor Road
 - Proposed Access
 - Existing Access
 - Fence
 - Pipeline Alignment
 - Existing HDPD Pipeline Alignment
 - Proposed Haulage and Proposed/Improved Access
 - Stockpile
 - Pump Station
 - Substation
 - 11kV Transmission Line Easement



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Townsville City Council
Houghton Pipeline Stage 2 - MNES Assessment

Project No. 12537606
Revision No. 2
Date 7/14/2022

Houghton Pipeline Stage 2 project area

FIGURE 1-1

1.2 Applicable MNES

Ecological assessments undertaken for the Project identified that MNES require assessment in accordance with the provisions of the EPBC Act:

- Listed threatened species and ecological communities (sections 18 and 18A).

The likelihood of occurrence assessment (Section 2.4 and Appendix A) that was informed by desktop and field studies indicated the following:

- Four EPBC Act threatened species were **confirmed present** in the Project area
- Two EPBC Act threatened species were considered **likely to occur** in the Project area
- Five EPBC Act threatened species **may occur** in the Project area
- The remaining 21 threatened species and communities identified in desktop searches were considered **unlikely to occur** based on the absence of suitable habitat and nearby recent historical records.

The EPBC Act threatened species **confirmed present** within the Project area were:

- Black-throated finch (southern) (*Poephila cincta cincta*) (Endangered)
- Squatter pigeon (southern) (*Geophaps scripta scripta*) (Vulnerable)
- Black ironbox (*Eucalyptus raveretiana*) (Vulnerable)
- Bare-rumped sheath-tail bat (*Saccolaimus saccolaimus nudicluniatus*) (Vulnerable).

Two other EPBC Act listed conservation significant species were considered **likely to occur** based on the proximity to recent historical records and the presence of suitable habitat. These included:

- Koala (*Phascolarctos cinereus*) (Endangered)
- White-throated needletail (*Hirundapus caudacutus*) (Vulnerable, Migratory).

1.3 Scope and limitations

This report has been prepared by GHD for Townsville City Council TCC and may only be used and relied on by Townsville City Council TCC for the purpose agreed between GHD and Townsville City Council TCC as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Townsville City Council TCC arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and monitoring undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of natural features, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

GHD has prepared this report on the basis of information provided by Townsville City Council TCC and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Methodology

2.1 Approach

The ecological assessment for the Project included a desktop review of environmental databases, mapping layers, a review of previous field survey reports prepared for the Project, and field surveys undertaken for the Project by GHD. The desktop and field methodologies are detailed in Sections 2.2 and 2.3 respectively.

2.2 Desktop assessment

A desktop review was undertaken to identify and collate existing information on the ecological values within the Project area and surrounding landscape. For most database sources, the Haughton Pipeline desktop search extent encompassed areas within a 30 km buffer of the approximate centre of the pipeline, to provide context about potential presence of mobile or cryptic species that are known to occur in similar habitats within the region.

Desktop results are presented in Appendix B.

The desktop assessment used the following information sources:

Protected Matters Search Tool

The Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST) was used to identify TECs and conservation significant flora and fauna, listed under the EPBC Act as MNES that have the potential to occur within the vicinity of the Project area. The search was undertaken within a 30 km radius of the approximate centre of the Project area (- 19.83293,147.13819).

Wildlife Online database

The Queensland Department of Environment and Science (DES) Wildlife Online database was searched to retrieve historical records of flora and fauna species previously recorded within the vicinity of the Project area. The search was undertaken for a 30 km radius of the approximate centre of the Project area (-19.83293,147.13819).

Species Profile Search database

The DES Species Profile Search was undertaken to obtain spatial data records for conservation significant species responsible for generating high risk trigger areas intersecting the Project area and to identify the location and collection date of any conservation significant flora or fauna recorded in proximity to the Project area.

Atlas of Living Australia database

The Atlas of Living Australia (ALA) database was searched to retrieve historical records of flora and fauna species previously observed within a 30 km radius of the approximate centre of the Project area.

Biomaps

This mapping tool was used to review specific locations, collection date and details of records of species of conservation significance within a 30 km radius of the approximate centre of the Project area.

Regulated Vegetation Mapping

The Queensland Department of Resources (DoR) Vegetation Management Regional Ecosystem and Remnant Map spatial layer (version 11) was viewed to determine the extent and type of Regional Ecosystems (REs) mapped within the Project area.

Essential Habitat Mapping

The DES Essential Habitat Map spatial layer (version 4.29) was viewed to determine if vegetation within the Project area has been identified as essential habitat for a conservation significant species of wildlife listed under provisions of the *Nature Conservation Act 1992* (NC Act).

Protected Plants Flora Survey Trigger Map

The DES Protected Plants Flora Survey Trigger Map spatial layer was viewed to identify the location of any high risk trigger areas occur within the Project area, indicating previous records of conservation significant flora species.

2.2.1 Previous assessments

An ecological assessment report prepared for the Project by NRA was reviewed. The report presented the results of preliminary field surveys undertaken for the Project, as detailed in Section 2.3.1. The NRA report has been used primarily to provide information on the likelihood of occurrence of EPBC Act listed flora and fauna and seasonality in the local flora and fauna assemblage.

An ecological assessment prepared for the Project by Ecological Interpretation was reviewed. This report has been used to provide information on the BioCondition of the REs within the proposed pipeline alignment and pump station site.

2.2.1.1 NRA ecological assessment report

NRA consultants prepared an environmental analysis report (EAR) which included desktop and field assessments within the proposed pipeline alignment and pump station site. The field surveys were undertaken on 21 April 2021 and 25 to 26 May 2021. Table 2-1 summarises NRA's survey effort.

One conservation significant species was potentially recorded using acoustic bat detectors – several *Saccolaimus* sp. calls were recorded in suitable habitat for the bare-rumped sheath-tail bat, however the recordings were unable to be distinguished between the bare-rumped sheath-tail bat or the yellow-bellied sheath-tail bat (*Saccolaimus flaviventris*).

NRA concluded that four threatened EPBC Act species were likely to occur within the Project area, including:

- White-throated needletail
- Squatter pigeon (southern)
- Black-throated finch (southern)
- Bare-rumped sheath-tail bat.

2.2.1.2 Ecological Interpretation report

Ecological Interpretation prepared a BioCondition report (Appendix C) which included desktop and field surveys within the proposed pipeline alignment and pump station site. The field surveys were undertaken between 15 - 28 March 2022 and RE mapping conducted within a 40 m buffer of the proposed pipeline alignment and pump station site.

Desktop assessments included a number of REs in the area (see Table 2 of Appendix C), with the following REs located during the field surveys:

- RE 11.3.4a
- RE 11.3.7
- RE 11.3.31
- RE 11.3.25b
- RE 11.3.35.

Eighteen BioCondition sites were surveyed (see Table 4 of Appendix C). RE mapping figures are included in Appendix G of the Information Response.

2.3 Field assessment

2.3.1 Summary of survey effort

Four ecological field surveys have been undertaken within the Project area, including one by NRA (2021), one by Ecological Interpretation (2022) and two by GHD (2021 and 2022).

Table 2-1 Summary of ecological survey effort undertaken for the Project

Survey dates	Ecologists	Days	Methodology and survey effort
Baseline surveys – NRA 2021			
21 April 2021 25 – 26 May 2021	2	3	<ul style="list-style-type: none"> – Quaternary RE vegetation assessments – 32 sites – Acoustic bat detectors – 3 deployed – Habitat assessments – Targeted flora and fauna searches
Targeted surveys for EPBC listed species – GHD 2021			
25 – 30 October 2021	3	6	<ul style="list-style-type: none"> – Quaternary RE verification – 8 sites – Targeted flora searches for <i>Eucalyptus raveretiana</i> – 11 sites – Fauna and habitat assessments for black-throated finch (southern) – 35 sites – Koala habitat assessments and targeted koala scat searches using the Spot Assessment Technique (SAT) method – 30 sites – Daytime waterbody watch surveys – 14 sites – Recording location of all hollow-bearing trees including large hollows that represent potential roost sites for bare-rumped sheathtail bat – Driving/flushing surveys for the squatter pigeon (southern) – 464 km (based on two vehicles driving around the Project area over 6 days) – Vigilant bird surveys over 6 x 10 hr days including targeted survey for squatter pigeon (southern) and black-throated finch (southern)
Targeted surveys for EPBC listed species – GHD 2022			
28 March – 1 April 2022	2	5	<ul style="list-style-type: none"> – Area searches around waterbodies in suitable nesting habitat for the black-throated finch (southern), searching for the species and their nests – 14 sites – Targeted koala scat searches using the SAT method – 25 sites – Daytime waterbody watch surveys – 14 sites – Dusk roost watch surveys – 6 sites – Active reptile searches – 24 sites – Vigilant bird surveys over 4 x 10 hr days including targeted survey for black-throated finch and grey falcon – Deployment of four remote cameras for northern quoll – 7 sites – Deployment of two anabat detectors for bare-rumped sheathtail bat – 5 sites
BioCondition surveys – Ecological Interpretation 2022			
15 – 28 March 2022	1	14	<ul style="list-style-type: none"> – Field observations: both quaternary level observations and BioCondition surveys – Land unit mapping derived from air photo interpretation, internal report to Burdekin Dry Tropics – CSIRO land unit mapping from 1952, precursor and foundation to RE mapping in Queensland – Soils mapping Projects (Reid and Baker 1984, Thompson et al. 1990)

Flora and fauna survey methods employed by GHD are described further in Section 2.3.3 and Section 2.3.4, respectively. Surveys were undertaken at representative locations across the Project area to provide appropriate survey coverage within each vegetation community type, habitat and geographic location present. Areas of high ecological value corresponding with areas of mapped remnant vegetation, waterways and waterbodies were subject to more intensive survey effort.

The distribution of flora and fauna survey effort within the Project area is summarised in Figure 2.1 and Figure 2.2, respectively.

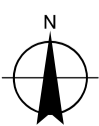
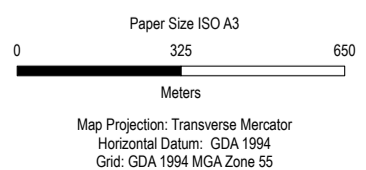
2.3.2 Survey guidelines

Fauna and flora surveys were designed to meet the survey guidelines for conservation significant species with potential to occur, as detailed in the following guidelines:

- *Significant impact guidelines for the endangered black-throated finch (southern) 3.13* (DEWHA 2009a)
- *EPBC Act referral guidelines for the vulnerable koala* (DoE 2014a) – noting that these guidelines are no longer applicable post February 2022
- *Survey Guidelines for Australia's Threatened Bats* (DEWHA 2010a)
- *Flora Survey Guidelines – Protected Plants v 2.01 Nature Conservation Act 1992* (DES 2020a).



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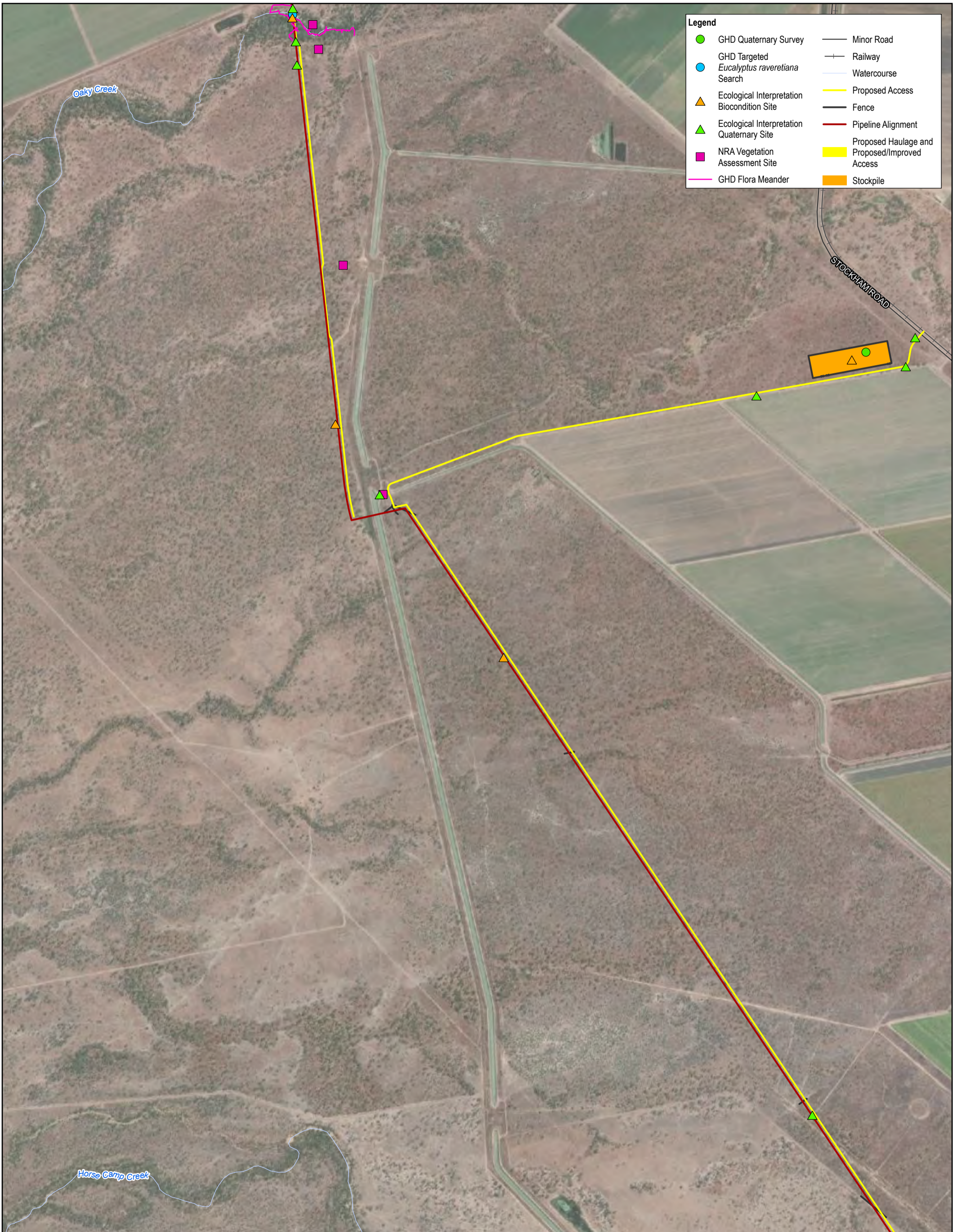


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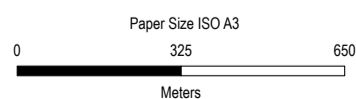
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Distribution of flora survey effort

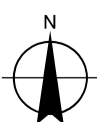
FIGURE 2-1



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Grid: GDA 1994 MGA Zone 55

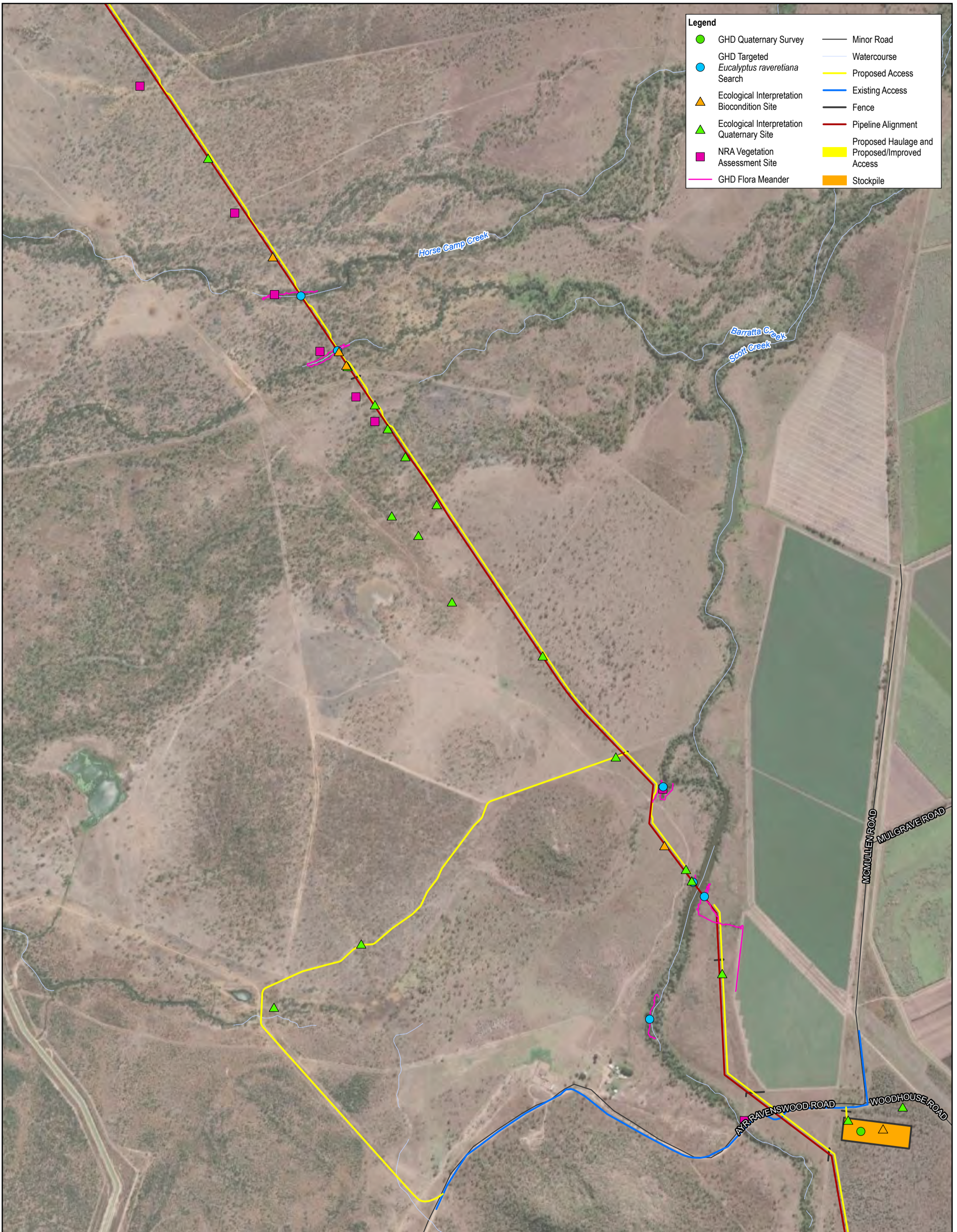


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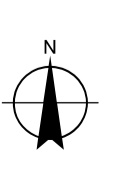
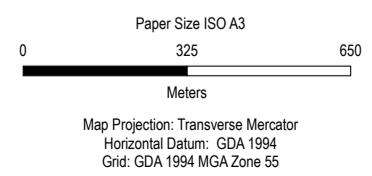
Distribution of flora survey effort

FIGURE 2-1



- Legend**
- GHD Quaternary Survey
 - GHD Targeted *Eucalyptus raveretiana* Search
 - ▲ Ecological Interpretation Biocondition Site
 - ▲ Ecological Interpretation Quaternary Site
 - NRA Vegetation Assessment Site
 - GHD Flora Meander
 - Minor Road
 - Watercourse
 - Proposed Access
 - Existing Access
 - Fence
 - Pipeline Alignment
 - Proposed Haulage and Proposed/Improved Access
 - Stockpile

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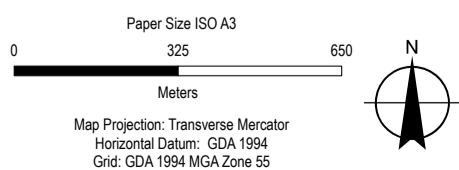
Distribution of flora survey effort

FIGURE 2-1



Legend	
	Ecological Interpretation Biocondition Site
	Ecological Interpretation Quaternary Site
	NRA Vegetation Assessment Site
	Minor Road
	Watercourse
	Proposed Access
	Fence
	Pipeline Alignment

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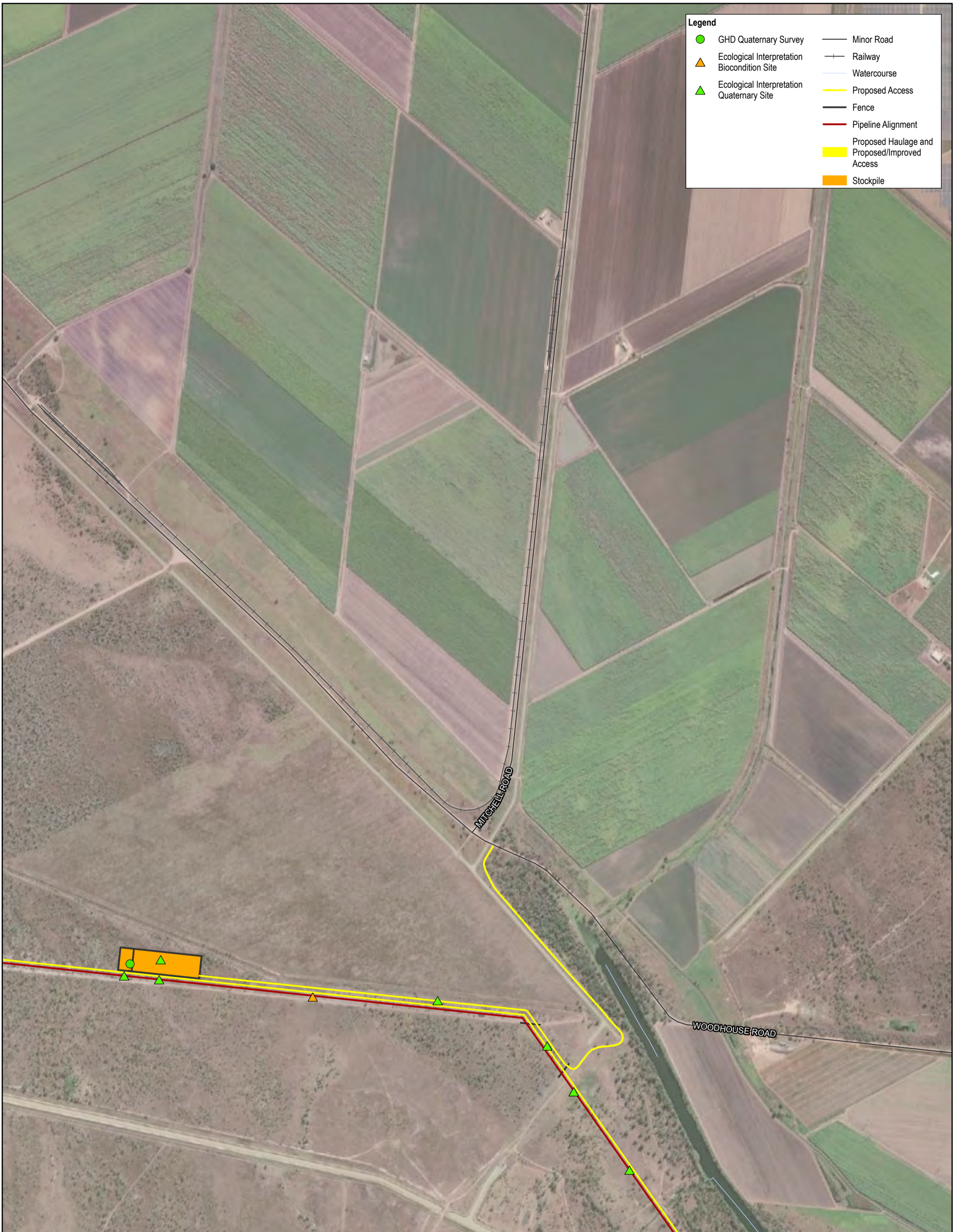


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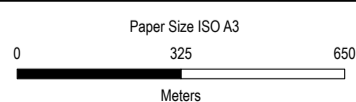
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Distribution of flora survey effort

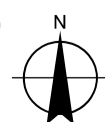
FIGURE 2-1



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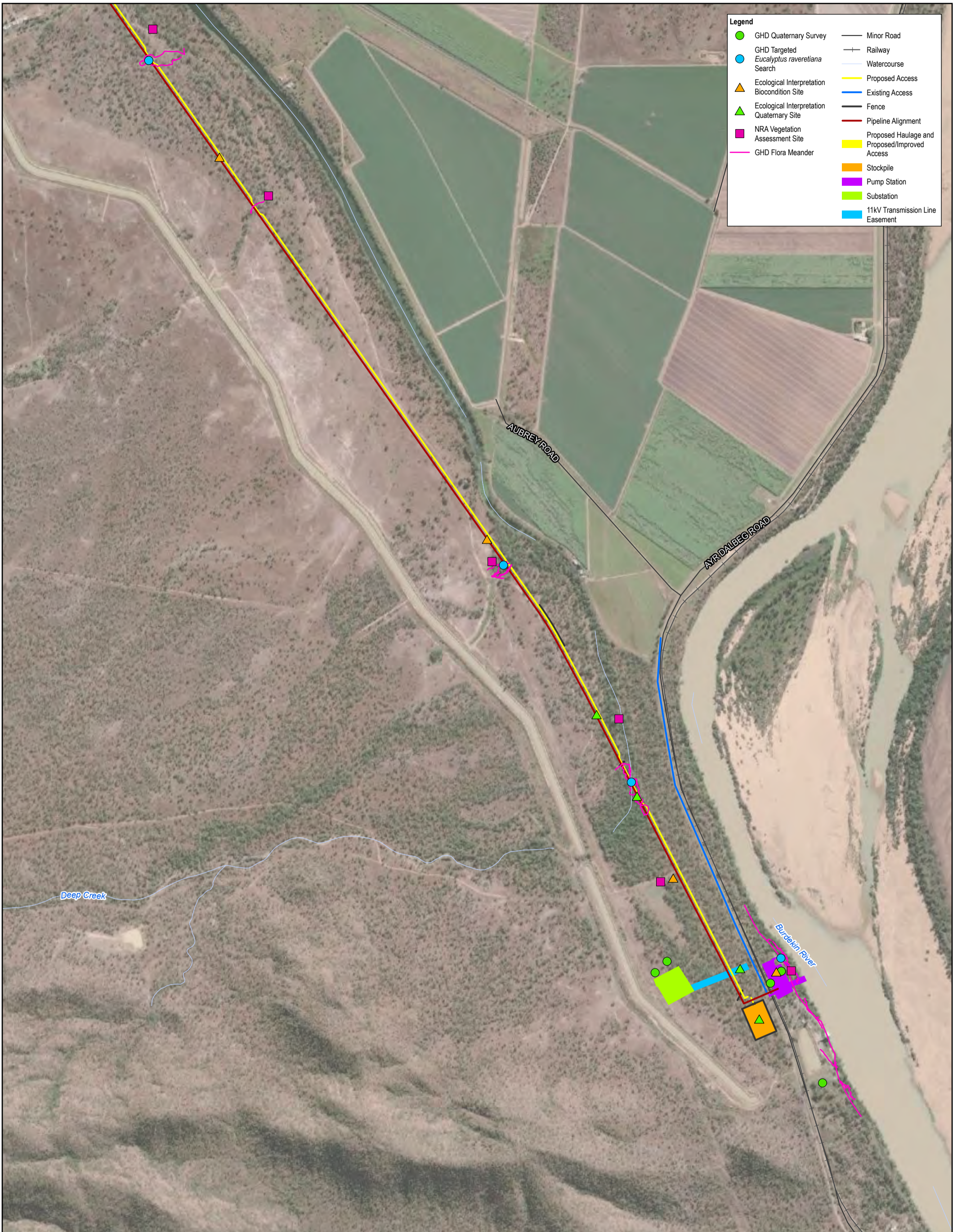


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Distribution of flora survey effort

FIGURE 2-1



- Legend**
- GHD Quaternary Survey
 - GHD Targeted *Eucalyptus raveretiana* Search
 - ▲ Ecological Interpretation Biocondition Site
 - ▲ Ecological Interpretation Quaternary Site
 - NRA Vegetation Assessment Site
 - GHD Flora Meander
 - Minor Road
 - Railway
 - Watercourse
 - Proposed Access
 - Existing Access
 - Fence
 - Pipeline Alignment
 - Proposed Haulage and Proposed/Improved Access
 - Stockpile
 - Pump Station
 - Substation
 - 11kV Transmission Line Easement

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Paper Size ISO A3

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Meters

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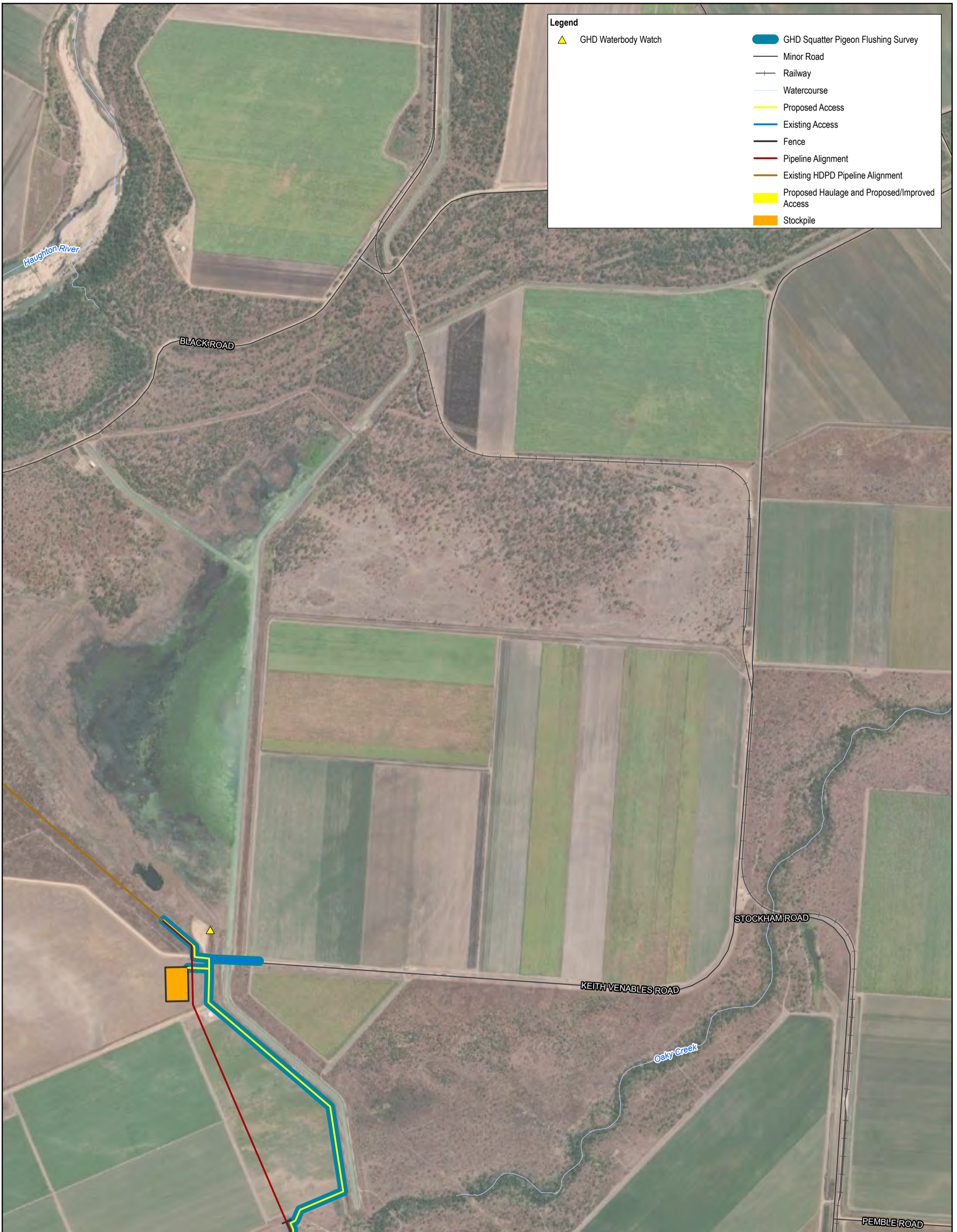


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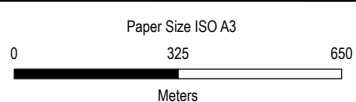
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Distribution of flora survey effort

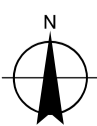
FIGURE 2-1



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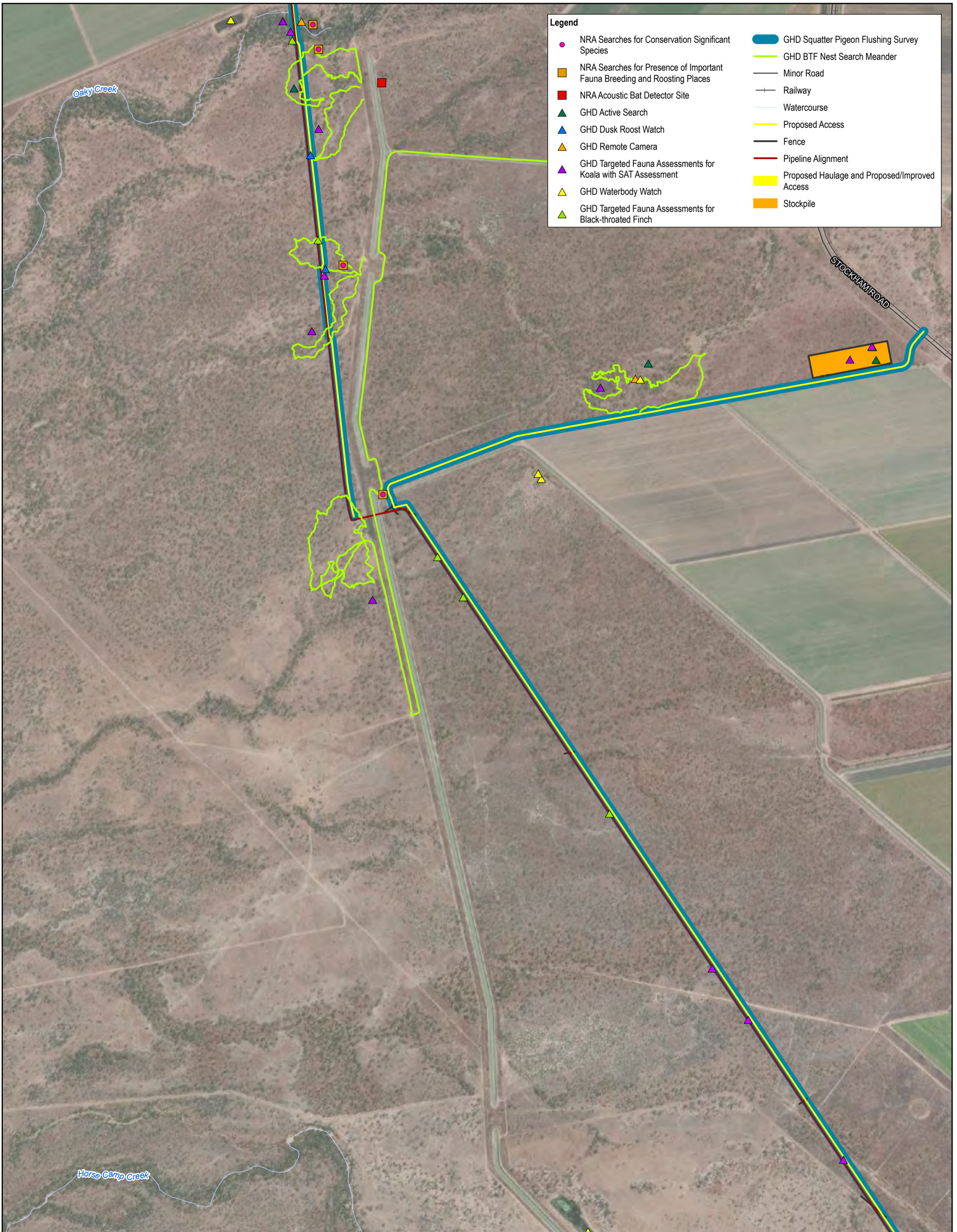


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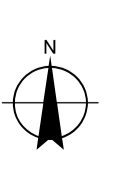
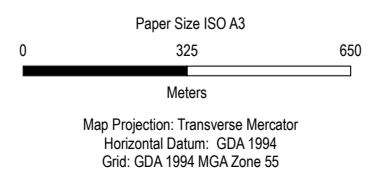
Distribution of fauna survey effort

FIGURE 2-2



- Legend**
- NRA Searches for Conservation Significant Species
 - NRA Searches for Presence of Important Fauna Breeding and Roosting Places
 - NRA Acoustic Bat Detector Site
 - ▲ GHD Active Search
 - ▲ GHD Dusk Roost Watch
 - ▲ GHD Remote Camera
 - ▲ GHD Targeted Fauna Assessments for Koala with SAT Assessment
 - ▲ GHD Waterbody Watch
 - ▲ GHD Targeted Fauna Assessments for Black-throated Finch
 - GHD Squatter Pigeon Flushing Survey
 - GHD BTF Nest Search Meander
 - Minor Road
 - Railway
 - Watercourse
 - Proposed Access
 - Fence
 - Pipeline Alignment
 - Proposed Haulage and Proposed/Improved Access
 - Stockpile

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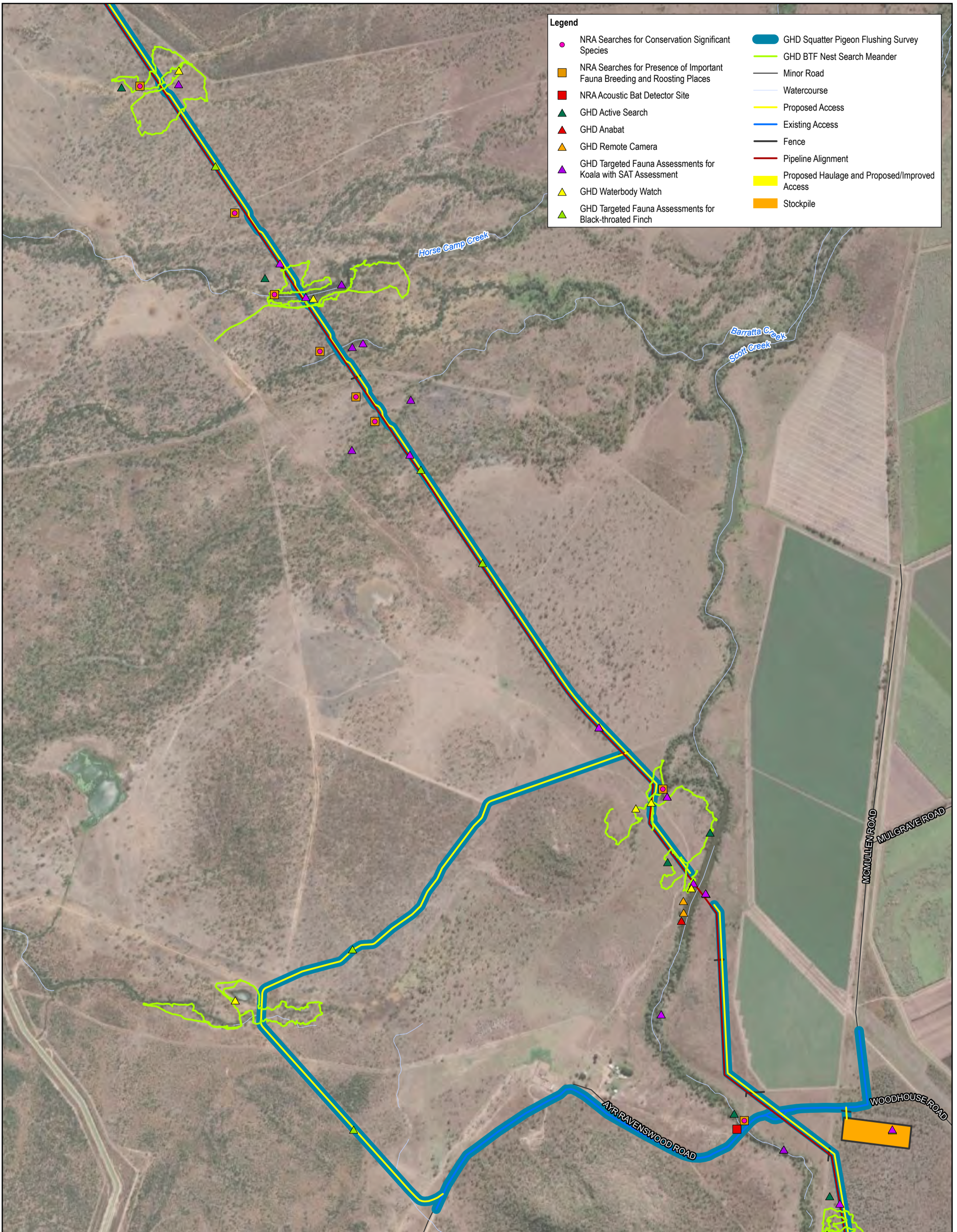


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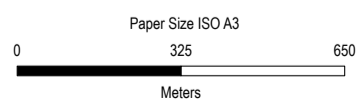
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Distribution of fauna survey effort

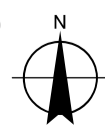
FIGURE 2-2



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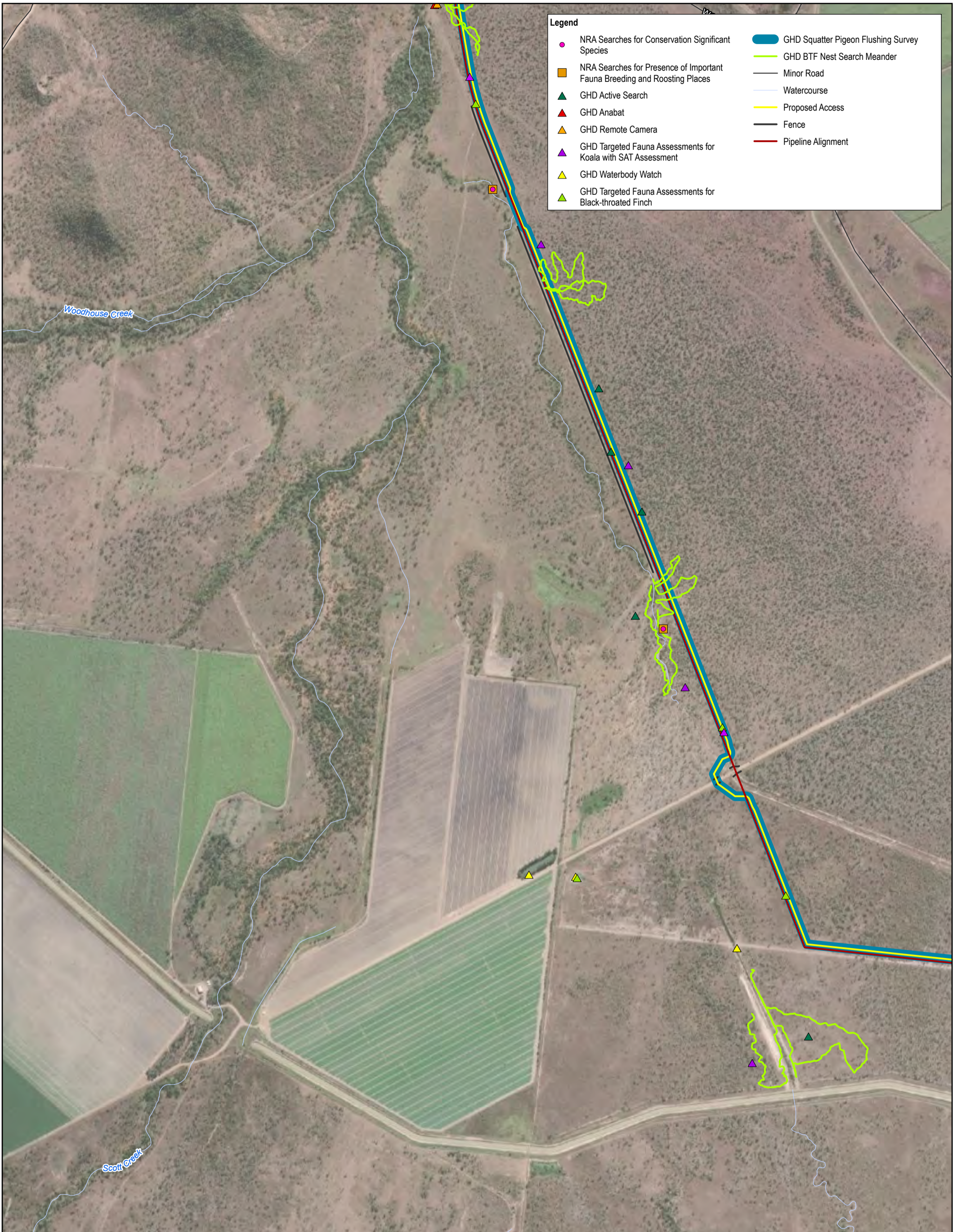


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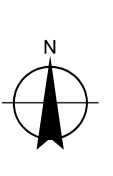
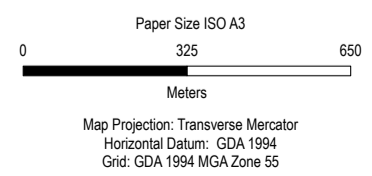
Distribution of fauna survey effort

FIGURE 2-2



- Legend**
- NRA Searches for Conservation Significant Species
 - NRA Searches for Presence of Important Fauna Breeding and Roosting Places
 - ▲ GHD Active Search
 - ▲ GHD Anabat
 - ▲ GHD Remote Camera
 - ▲ GHD Targeted Fauna Assessments for Koala with SAT Assessment
 - ▲ GHD Waterbody Watch
 - ▲ GHD Targeted Fauna Assessments for Black-throated Finch
 - GHD Squatter Pigeon Flushing Survey
 - GHD BTF Nest Search Meander
 - Minor Road
 - Watercourse
 - Proposed Access
 - Fence
 - Pipeline Alignment

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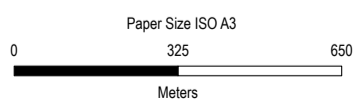
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Revision No. 2
Date 7/15/2022

Distribution of fauna survey effort

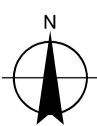
FIGURE 2-2



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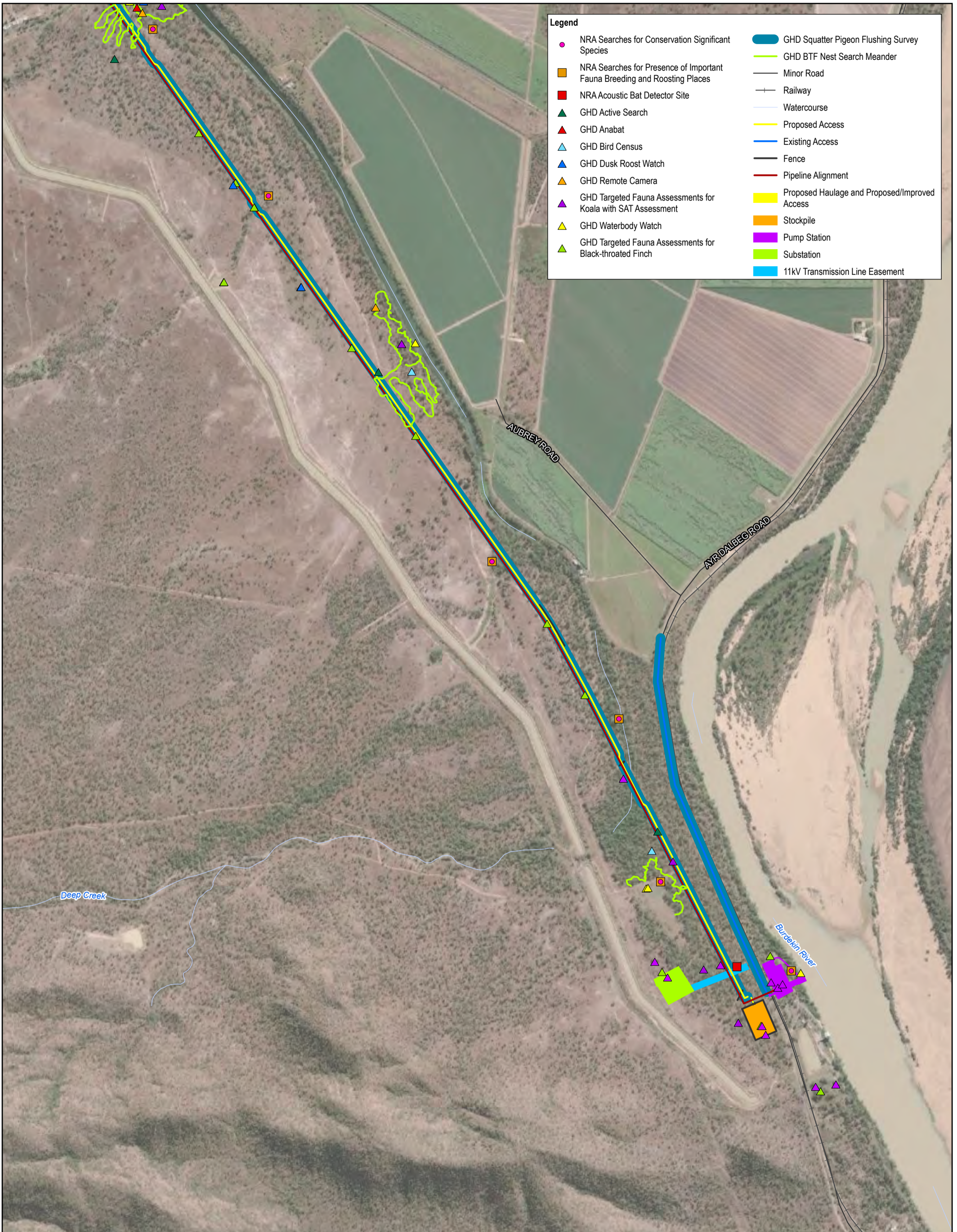


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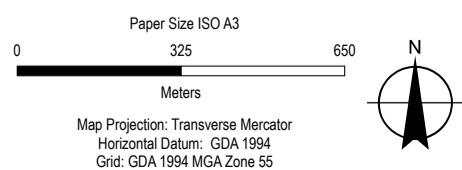
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Distribution of fauna survey effort

FIGURE 2-2



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Haughton Pipeline Stage 2 - MNES Assessment

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Distribution of fauna survey effort

FIGURE 2-2

2.3.3 Description of GHD terrestrial flora survey methods

Flora surveys involved a combination of quaternary vegetation assessments and targeted surveys for conservation significant species. Quaternary vegetation assessments were undertaken at eight sites across the Project area (Figure 2.1). At these sites, one or more of the survey methods described below were applied:

RE verification

Verification of mapped RE communities was undertaken using quaternary level assessments in accordance with the methods detailed in Neldner et al. (2022). Verification of RE communities was undertaken within the Project area by NRA. Accordingly, the RE confirmations undertaken by GHD only targeted additional footprint areas (i.e. additional stockpile, pump station areas and access routes added after the NRA survey). Data collection included species and structural composition along with geology and landscape attributes. Verification of REs was used to refine habitat mapping for MNES.

Targeted searches for threatened flora species

Searches for EPBC and NC Act threatened flora species, including *Eucalyptus raveretiana* was undertaken within the proposed pipe stockpile sites, access roads and pump station area using random meander searches methodology outlined in the Flora Survey Guidelines (DES 2020). Table 2-2 outlines the survey effort in relation to Commonwealth survey guidelines.

Table 2-2 Summary of survey effort for conservation significant flora species

Species	Status		Recommended surveys and conditions	Surveys effort undertake
	EPBC Act	NC Act		
<i>Eucalyptus raveretiana</i> (black ironbox)	V	LC	Surveys should target semi-permanent or permanent creeks and rivers (DAWE 2022a)	Quaternary vegetation assessments at 40 sites Targeted flora searches for <i>Eucalyptus raveretiana</i> – 11 sites along permanent or semi-permanent creeks and rivers.

Key: V – Vulnerable, LC – Least Concern

Recording of invasive species

Prohibited or restricted invasive species as defined under the Queensland *Biosecurity Act 2014* as well as commonly observed environmental weeds were recorded where identified. Where relevant, the surveys recorded densities and extent of presence (recorded in Appendix C).

2.3.4 Description of GHD terrestrial fauna survey methods

Two terrestrial fauna surveys were undertaken by GHD in October 2021 (Spring) and March 2022 (Autumn) at representative locations throughout the Project area. The initial terrestrial fauna survey undertaken in 2021 involved a combination of habitat assessments, vigilant bird surveys, recording of hollow-bearing trees and targeted searches for koala faecal pellets. The additional fauna survey undertaken in 2022 involved targeted surveys for threatened fauna species that required additional survey effort. These species included the black-throated finch (southern), koala, northern quoll, bare-rumped sheath-tail bat and yakka skink.

Table 2-3 Summary of survey effort for conservation significant fauna species

Species	Status		Recommended surveys and conditions	Survey effort undertaken
	EPBC Act	NC Act		
Birds				
<i>Geophaps scripta scripta</i> (squatter pigeon (southern))	V	V	Area searches/diurnal bird surveys (15 hours over three days) Flushing surveys (10 hours over three days) (Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) 2010b)	Driving surveys (minimum 464 km based on two vehicles over 6 x 10 hr days) Vigilant bird surveys over 10 x 10 hr days
<i>Hirundapus caudacutus</i> (white-throated needletail)	V, Mig	V	Survey guidelines for the white-throated needletail are detailed in the SPRAT database (DAWE 2022a). Surveys must occur between October and April in northern and eastern Australia (DAWE 2022a)	Vigilant bird surveys over 10 x 10 hr days (October to April)
<i>Poephila cincta cincta</i> (black-throated finch)	E	E	Land-based area searches (5 x 10 hr days) Targeted searches of waterholes and woodswallow nests (2 x 6 hr days) (DEWHA 2010b).	Vigilant bird surveys over 10 x 10 hr days Daytime waterbody watch surveys – 28 sites (9.2 hrs over 11 days) Fauna and habitat assessments for black-throated finch (southern) – 35 sites Area searches around waterbodies in suitable nesting habitat for the black-throated finch (southern), searching for the species and their nests – 14 sites
Mammals				
<i>Phascolarctos cinereus</i> (koala)	V	E	SAT searches Strip transects Nocturnal spotlighting Call playback Remote sensor cameras (Commonwealth Department of the Environment (DoE) 2014)	SAT searches (60 sites) Remote cameras (seven sites)
<i>Saccolaimus saccolaimus nudicluniatus</i> (bare-rumped sheath-tail bat)	V	E	Acoustic detection (16 detector nights over four nights) Trapping via mistnets (16 mist-net nights over four nights) Roost searches (1-2 hours per survey day) (DEWHA 2010a).	Recording location of all hollow-bearing trees Deployment of two anabat detectors for bare-rumped sheath-tail bat – 5 sites Dusk roost watch surveys – 6 sites

Key: E – Endangered, V – Vulnerable, Mig – Migratory, SL – Special Least Concern, LC – Least Concern

Information on the methods applied is described below.

Habitat assessments

The length of the Project area was traversed on foot and the value of habitats was assessed based on the presence and quality of resources at canopy, shrub and ground layers. Targeted habitat assessments were undertaken for the black-throated finch (southern), koala, squatter pigeon (southern) and bare-rumped sheath-tail bat as detailed below.

- **Targeted habitat assessments for black-throated finch (southern):** Targeted habitat assessments were undertaken at 35 locations to document the value of habitat for the black-throated finch (southern). At each

site, the following was assessed: RE community, grazing intensity, buffel grass occurrence, habitat description, grass species richness, native grass cover, abundance of trees within 400 m of waterbodies, whether waterbody watch was undertaken, whether species was recorded present, species usage of site (where present), the presence of nests and description of nesting tree

- **Targeted habitat assessments for squatter pigeon (southern):** Throughout the surveys, the value of habitat for the squatter pigeon (southern) was assessed, considering the RE community and soil type, grazing intensity, proximity to water and presence of tussocky grasses. In particular, the presence of suitable breeding habitat was assessed against the Commonwealth definition (i.e. breeding habitat occurs on stony rises occurring on sandy or gravelly soils, within 1 km of a suitable, permanent waterbody (Squatter Pigeon Workshop 2011))
- **Targeted habitat assessment for koalas:** The value of koala habitat was assessed throughout the surveys, with targeted assessments undertaken at 30 locations. At each location the following criteria was assessed: the RE community, presence and diversity of koala food trees, evidence of koalas as detailed in SAT searches, potential barriers to koala movement and potential threats to koalas from dog attacks and vehicle strike
- **Targeted habitat assessment for bare-rumped sheathtail bat:** Resource availability for the bare-rumped sheathtail bat was assessed along the length of the Project area. This involved marking the location of all hollow-bearing trees within the Project area and noting those that are consistent with the dimensions of known roost trees as reported in the 'National Recovery Plan for the bare-rumped sheathtail bat' (Schulz and Thomson 2007) and 'Australian Bats' (Churchill 2008) (i.e. large hollows in *Eucalyptus platyphylla*). The species is known to roost in large *E. platyphylla* hollows ranging between 18 cm and 29 cm diameter (Schulz and Thomson 2007; Churchill 2008). Hollows were categorised by the following dimensions in the field, where large and moderate sized hollows in *E. platyphylla* represent potential roost trees and small hollows in *E. platyphylla* represent future potential roost trees:
 - Large hollows: >30 cm diameter
 - Moderate hollows 20 – 30 cm diameter
 - Small hollows < 20 cm diameter.

Area searches for the black-throated finch (southern) and nesting sites for this subspecies

Area searches around waterbodies in potential nesting habitat for the species were undertaken at 14 locations. This involved two ecologists traversing through an area within 600 m of a waterbody for 30 minutes, searching for the black-throated finch and recording potential nest sites.

Vigilant surveys for the black-throated finch (southern) and squatter pigeon (southern)

Vigilant bird surveys were undertaken whilst traversing the length of the Project area. These were undertaken over 10, 10-hour days. All birds seen or heard calling were recorded. Particular attention was paid to flocks of birds in which the black-throated finch (southern) is known to occur including flocks of finches and woodswallows.

Daytime waterbody watch surveys for the black-throated finch (southern) and squatter pigeon (southern)

Twenty-eight waterbody watches were undertaken in suitable habitat for the black-throated finch (southern) and squatter pigeon (southern). Waterbody watches were undertaken at dawn, midday or dusk, with 30 minutes spent watching each waterbody, recording all birds seen or heard.

Driving/flushing surveys for ground-dwelling birds

Driving/flushing surveys were undertaken to detect the squatter pigeon (southern) and the black-throated finch (southern). Flushing surveys were conducted whilst driving, with an estimated length of 464 km assessed within the Project area (based on two vehicles driving around the Project area over 6 days).

Spot assessment technique (SAT)

Targeted searches for koala faecal pellets were undertaken at 55 sites within the Project area using the SAT search method (Phillips and Callaghan 2011). SAT searches targeted areas with high potential value along watercourses and in other areas where koala food trees were locally abundant.

Dusk roost watches and bat call recordings for the bare-rumped sheath-tail bat

Dusk roost watches were undertaken at five potential roost trees during the 2022 fauna surveys. This involved dusk visits to potentially suitable roost trees, to detect bats as they leave or enter the roost, while recording bat calls with an Anabat detector.

Anabat detectors were also deployed at two locations and were left overnight for 4 consecutive nights within suitable flyways. The data from the Anabat detectors were analysed by Greg Ford. Greg is a terrestrial ecologist with more than 25 years' experience in ecological research and is an active member of the Australasian Bat Society.

Active searches for threatened reptile species

A 20 minute active search was undertaken at 24 locations to detect reptile and amphibian species by searching beneath rocks, logs, bark, leaf litter and other suitable microhabitats. Survey effort was aligned with the Commonwealth *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (DSEWPoC 2011). Sites were targeted around areas of accumulated groundcover (i.e. microhabitats) and fallen timber, and habitat assessments were concentrated during the early morning and late afternoon (i.e. during cooler parts of the day) where reptiles were likely to be sunning themselves and more easily detectable. Species targeted included the yakka skink (*Egernia rugosa*), ornamental snake (*Denisonia maculata*) and Mount Cooper striped skink (*Lerista vittata*).

Remote cameras

Remote cameras were baited and set at seven locations and were left overnight within the Project area. The remote cameras were used to detect fauna, with particular focus on habitat potentially suitable for the northern quoll (*Dasyurus hallucatus*), black-throated finch (southern) and squatter pigeon (southern).

Opportunistic surveys for wildlife and traces

All incidental records of fauna observed during surveys were recorded. All indirect traces of fauna including bones, feathers, skulls, sloughed skins, faecal pellets, tracks, burrows and scratchings were also recorded.

2.3.5 Animal ethics and legislative permits

GHD field surveys were conducted in accordance with the following permits and approvals:

- Department of Employment, Economic Development and Innovation Scientific Users Registration Certificate (Registration Number 132)
- DES Scientific Purposes Permit (permit number WA0021563)
- Animal Researcher Authority issued by the accredited GHD Animal Ethics Committee.

2.4 Likelihood of occurrence assessment

An assessment was conducted to attribute a 'likelihood of occurrence' to TECs and species that are MNES, which have been previously recorded or were predicted to occur within the desktop search extent. The likelihood of occurrence assessment was based on a review of species distributions and habitat requirements, historical records for the region, and the results of habitat assessments and field surveys conducted within the Project area. The likelihood of occurrence ranking was based on the following framework:

- **Confirmed present:** TEC/species recorded during the field survey
- **Likely to occur:** TEC/species has been recorded in the desktop search extent **and** suitable habitat is present in the Project area
- **May occur:** TEC's/species' distribution incorporates the Project area but only habitat of poor quality and/or very limited extent is present **or** the species has not been recorded in the desktop extent. This includes transient, vagrant or cryptic species that have a reduced likelihood of occurrence but cannot be entirely discounted. Species within this category were not subject to further impact assessment

- **Unlikely to occur:** Species has not been previously recorded in the desktop search extent **and/or** current known distribution does not encompass Project area **or** suitable habitat is lacking from the Project area. Species within this category were not subject to further impact assessment.

The likelihood of occurrence assessment for TECs and species that are MNES is provided in Appendix A.

2.5 Habitat for species that are MNES

This report includes habitat mapping and known records for four EPBC Act listed species confirmed present and one EPBC Act listed species considered likely to occur (with the exception of the vulnerable/migratory white-throated needletail) within the Project area. The likelihood of occurrence assessment was based on a review of species' distributions and habitat requirements, literature review of recent papers, historical records for the region, and the results of habitat assessments and field surveys conducted within the Project area.

The distribution of predicted habitat was mapped based on criteria detailed in Sections 5 and 6, differentiating areas of habitat into habitat critical to the survival of the species and potential breeding, foraging and drinking/dispersal habitat, where relevant.

The criteria used for each species are informed by the habitat requirements and definitions specified in the Commonwealth listing advice/conservation advice, Species Profile and Threats (SPRAT) database, recovery plans or referral guidelines, where available, as well as DES Wildlife Online (WO) historical records. For most species, predicted habitat mapping was underpinned by REs considered ecologically equivalent to the Commonwealth habitat descriptions relevant to conservation significant species, noting that REs represent a high-resolution spatial representation of ecosystem composition, structure and landscape position (e.g. landform, topography), that is conducive to aligning to species-specific habitat requirements. Where relevant, (field-verified) REs as the base unit for mapping were adapted to reflect variations in on-site conditions identified via field surveys (for example, inclusion of non-REs (e.g non-remnant) vegetation as a habitat criterion for koala). The relationship between Commonwealth habitat criteria and the criteria used to map habitat for each species has been detailed in the relevant species sections in Sections 5 and 6. Reasons for any minor deviations from the Commonwealth habitat descriptions are explained in the species descriptions below. For each species, habitat critical to the survival of the species was defined for the Project and its alignment with the Commonwealth definition is detailed in Sections 5 and 6.

Of the remaining 26 threatened species and communities identified in the desktop assessment, it was concluded that five EPBC Act threatened species 'may occur' in the Project area. Those species determined to 'may occur' includes species where the distribution incorporates the Project area but only marginally suitable habitat is present, or the species has not been recorded in the desktop search extent. This includes transient or vagrant species that have a reduced likelihood of occurrence but cannot be entirely discounted. Due to their reduced potential to occur, the impact to these species arising from the Project is considered minimal or negligible – as such, habitat has not been mapped for these species. Additionally, detailed assessments of impacts against the Commonwealth Significant impact guidelines is not considered necessary for these species, given impacts arising are unlikely to have any population/metapopulation-level implications, nor reduce access to resources. These may occur species include ghost bat, large-eared horseshoe bat, yakka skink, Mount Cooper striped lerista and *Tephrosia leveillei*.

The two threatened ecological communities (TECs) identified in the PMST as being of relevance to the Project are both considered 'unlikely to occur'. Mapping of occurrence/potential occurrence has not been undertaken for these communities.

2.6 Assessment of potential impacts

Potential impacts associated with the construction and operation of the Project were assessed in relation to the ecological values of the existing environment. During the construction phase the Project is expected to result in localised losses of habitat, predominantly due to clearing for infrastructure: access tracks, stockpiles, pump station, cabling, power supply works, firebreaks etc., and the disturbance of wildlife through construction light, noise, vibration and increased vehicle movements, as well as the potential for erosion and sedimentation.

Residual impacts to threatened species and their habitat were assessed using risk framework provided in Appendix E. Risk assessments provide residual risk rating after avoidance, minimisation and mitigation measures have been applied to potential impacts.

During the operational phase, the Project is unlikely to have any substantive impacts (above and beyond those arising from the construction phase) – indeed, much of the disturbance footprint will be actively or passively rehabilitated.

For each potential impact identified for threatened species that are MNES, mitigation measures have been detailed and an assessment of the significance of impact undertaken.

2.7 Significance of impacts assessment

A significant impact assessment was undertaken on the Project's potential impacts on those species that are MNES that have been **confirmed present** or are considered **likely to occur** within the Project area.

The assessment was made against the Commonwealth Significant impact guidelines (DoE 2013) (and where available, species-specific guidelines) for the following listed species:

- Threatened flora species
 - *Eucalyptus raveretiana*.
- Threatened fauna species
 - Koala
 - Bare-rumped sheathtail bat
 - Black-throated finch (southern)
 - Squatter pigeon (southern)
 - White-throated needletail.

'May occur' species were not considered for significant impact assessment due to their low potential to occur, and because impacts to these species arising from the Project are considered minimal or negligible – as such, habitat has not been mapped, or assessed for significant residual impact for these species (listed in Appendix A).

3. Summary of the existing environment

3.1 Habitat values

The Project area exists in a region which has undergone substantial disturbance and clearing of vegetation within the last 200 years for agricultural and cattle grazing purposes. Through these processes, the natural environment and undergone substantial alteration and fragmentation of habitat values, including through the sowing of pastoral grasses resulting in the spread of invasive weeds. Across substantial areas, the ground and shrub layers were dominated by invasive weeds in localised and widespread areas, including *Themeda quadrivalvis*, *Urochloa mutica* grasses, rubber vine (*Cryptostegia grandiflora*) and chinese apple (*Ziziphus mauritiana*) (Plate 3.1), extensive areas were also disturbed through trampling of the ground layer by cattle. Thirty-six invasive weed species were identified during the GHD field survey (Appendix D), as well as five invasive fauna species, these included wild dog (*Canis familiaris*), feral cat (*Felis catus*), pig (*Sus scrofa*), rabbit (*Oryctolagus cuniculus*) and cane toad (*Rhinella marina*).

Despite this, areas of the Project area contains remnants of very sparse to open woodland, dominated by native *Eucalyptus*, *Corymbia*, *Melaleuca* and *Casuarina* species, dominant canopy species included *Corymbia dallachiana*, *Eucalyptus tereticornis*, *Eucalyptus platyphylla*, *Corymbia erythrophloia*, *Corymbia clarksoniana*, *Corymbia tessellaris*, *Eucalyptus crebra*, *Grevillia striata*, *Melaleuca leucadendra* and *Melaleuca viridiflora*. Within these remnants, open woodlands were commonly described as poor quality understorey of grasses or with dense chinese apple coverage and occasional native canopy species. In the central section of the Project area, chinese apple management had been recently undertaken. While these remnants exist within a landscape with high levels of fragmentation occurring particularly to the east of the Project area, areas of remnant vegetation predominantly along riparian corridors provide localised habitat values for birds, mammals, reptiles and amphibians, including breeding habitat. Open woodlands and waterbodies throughout the Project area provide foraging habitat, breeding places, drinking sites, shelter habitat and dispersal corridors for species. Cleared non-remnants, predominantly in the southernmost and northernmost sections of the Project area provide foraging habitat for raptors, macropods and other species adapted to open environments. The Project area is connected to larger tracts of remnant habitat further north and west through a State terrestrial corridor, which provides connectivity for species within the wider landscape.



Plate 3.1 Dense Chinese apple (left) and rubber vine (right) within the Project area



The following five fauna habitat types were observed within the Project area, as described in Table 3-1:




- *Eucalyptus platyphylla* open woodland on alluvial plains
- Very sparse open woodland/grassland on alluvial plains
- *Melaleuca* and *Grevillea* woodland on alluvial plains
- Ephemeral or permanent watercourses with fringing riparian woodland

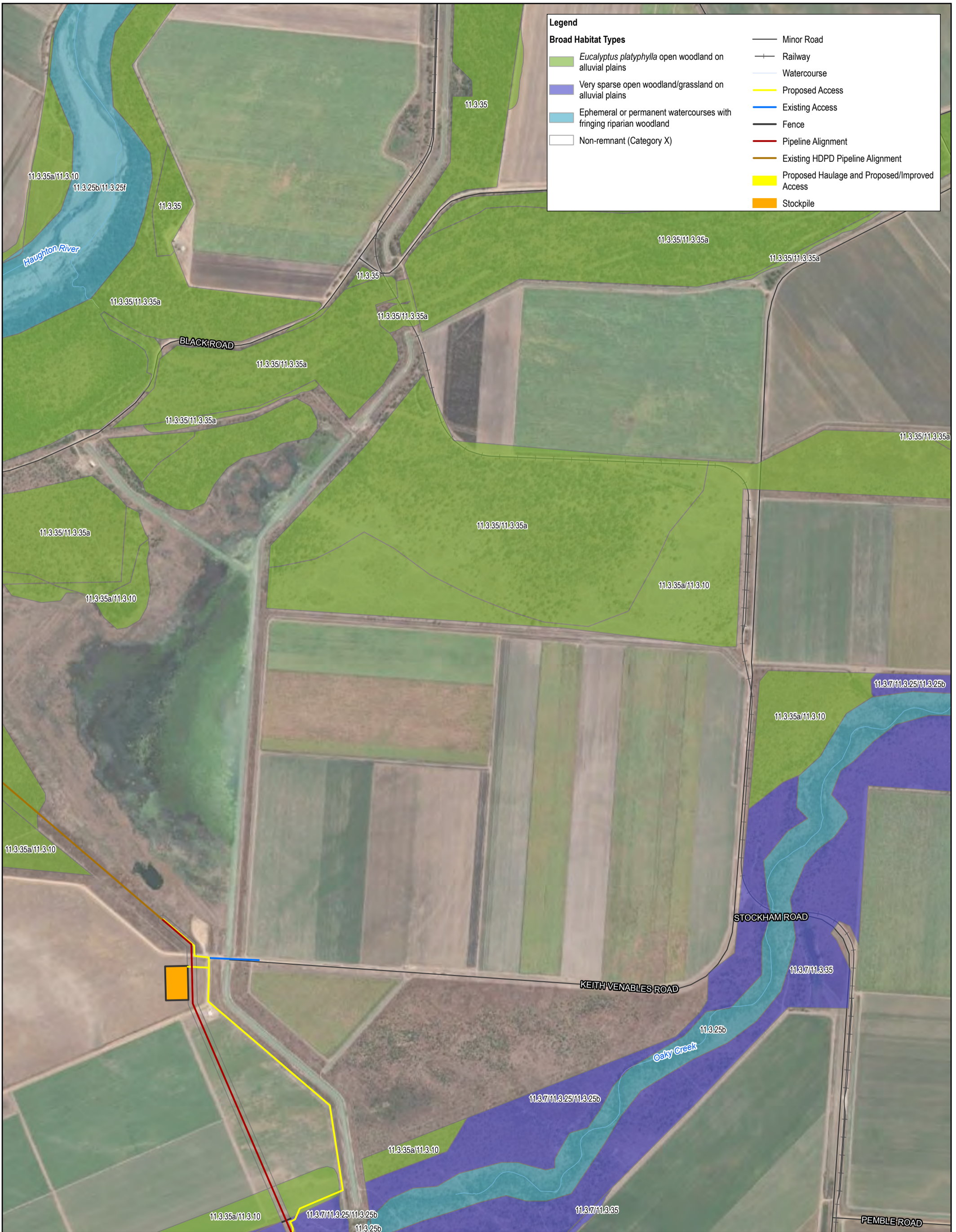
- Very sparse native canopy with mixture of invasive and native grasses and shrubs (non-remnant).

Terrestrial habitats are shown on Figure 3.1.

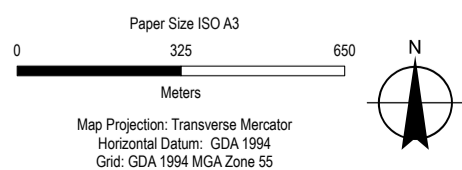
Table 3-1 Fauna habitat types within the Project area

Habitat type	Characteristics	Ecological values
<i>Eucalyptus platyphylla</i> open woodland on alluvial plains		
	<p>Mature canopy vegetation</p> <p>Moderate abundance of hollow-bearing trees</p> <p>Abundant patches of invasive shrubs and grasses</p> <p>Logs, woody debris and other complex ground-level microhabitats present in low densities</p> <p>Moderate grassy ground layer</p>	<p>Nesting and foraging habitat for canopy-dwelling woodland birds including honeyeaters, parrots, finches</p> <p>Foraging habitat for granivorous birds</p> <p>Denning habitat for possums and other arboreal mammals</p> <p>Foraging and nesting habitat for raptors</p> <p>Roosting habitat for microchiropteran bats</p> <p>Foraging habitat for snakes, dragons, geckos, monitors, macropods and other ground dwelling mammals</p> <p>Potential conservation significant species – koala, bare-rumped sheathtail bat, black-throated finch (southern), squatter pigeon (southern).</p>
Very sparse open woodland/grassland on alluvial plains		
	<p>Mature canopy woodland with diverse range of species</p> <p>Low abundance of hollow-bearing trees</p> <p>Shrub layer periodically dominated by invasive rubber vine and chinee apple</p> <p>Dense grassy ground layer dominated by mix of native and exotic grasses</p> <p>Some areas subject to seasonal inundation</p>	<p>Nesting and foraging habitat for woodland birds including honeyeaters, finches, flycatchers cuckoos and parrots</p> <p>Foraging habitat for granivorous birds</p> <p>Roosting sites and foraging habitat for microchiropteran bats</p> <p>Foraging habitat for reptiles, macropods and other ground dwelling mammals</p> <p>Potential conservation significant species – koala, black-throated finch and squatter pigeon (southern).</p>

Habitat type	Characteristics	Ecological values
Melaleuca and Grevillea woodland on alluvial plains		
	<p>Dense low <i>Melaleuca</i> patches</p> <p>Woodland with sparse <i>Grevillea striata</i></p> <p>Low abundance of mature eucalypt or <i>Corymbia</i> canopy species</p> <p>Low to no hollow bearing trees</p> <p>Ground layer mixture of invasive and native grasses</p> <p>Shrub layer occasionally dominated by invasive chinese apple and rubber vine</p>	<p>Nesting and foraging habitat for woodland birds including honeyeaters, finches, doves</p> <p>Foraging habitat for granivorous birds</p> <p>Foraging habitat for macropods and other ground dwelling mammals</p> <p>Foraging habitat for snakes and other reptiles</p> <p>Potential conservation significant species – koala, foraging for bare-rumped sheathtail bat, black-throated finch and squatter pigeon (southern).</p>
Ephemeral or permanent watercourses with fringing riparian vegetation		
	<p>Mature canopy with diverse range of species</p> <p>Low abundance of hollow-bearing trees</p> <p>Patches of dense shrubs including mixture of invasive and native</p> <p>Ephemeral and permanent water sources</p> <p>Sandy substrate suitable for burrowing</p>	<p>Drinking sites for birds and mammals</p> <p>Nesting and foraging habitat for canopy, shrub and ground-dwelling birds</p> <p>Refuges and breeding sites for amphibians</p> <p>Foraging habitat for snakes</p> <p>Foraging and roosting habitat for microbats</p> <p>Movement corridors for birds, reptiles and mammals</p> <p>Potential conservation significant species – koala, bare-rumped sheathtail bat and black-throated finch (southern)</p>
Very sparse native canopy with mixture of invasive and native grasses and shrubs (non-remnant)		
	<p>Mature to regrowth native eucalypt and <i>Corymbia</i> species</p> <p>Very low presence of hollow-bearing trees</p> <p>Patches of dense invasive grasses and shrubs</p> <p>Highly disturbed by cattle, weeds or historical vegetation clearing</p>	<p>Foraging habitat for raptors</p> <p>Foraging habitat for macropods and other ground dwelling mammals</p> <p>Movement and dispersal habitat to areas of higher quality and vegetation cover</p> <p>Potential conservation significant species – koala.</p>



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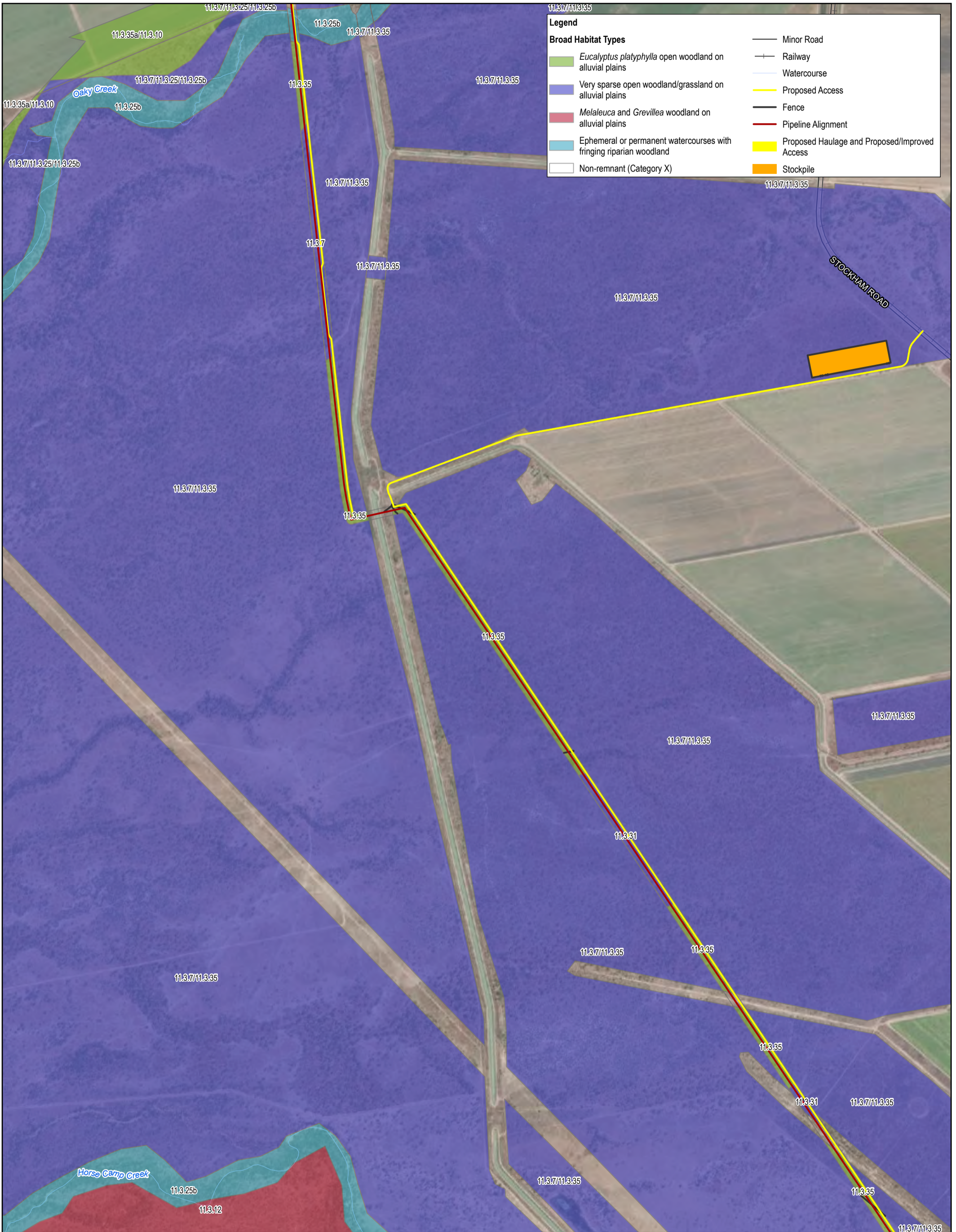


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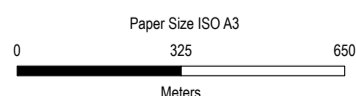
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Distribution of fauna habitat types
within survey area

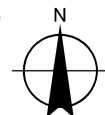
FIGURE 3-1



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

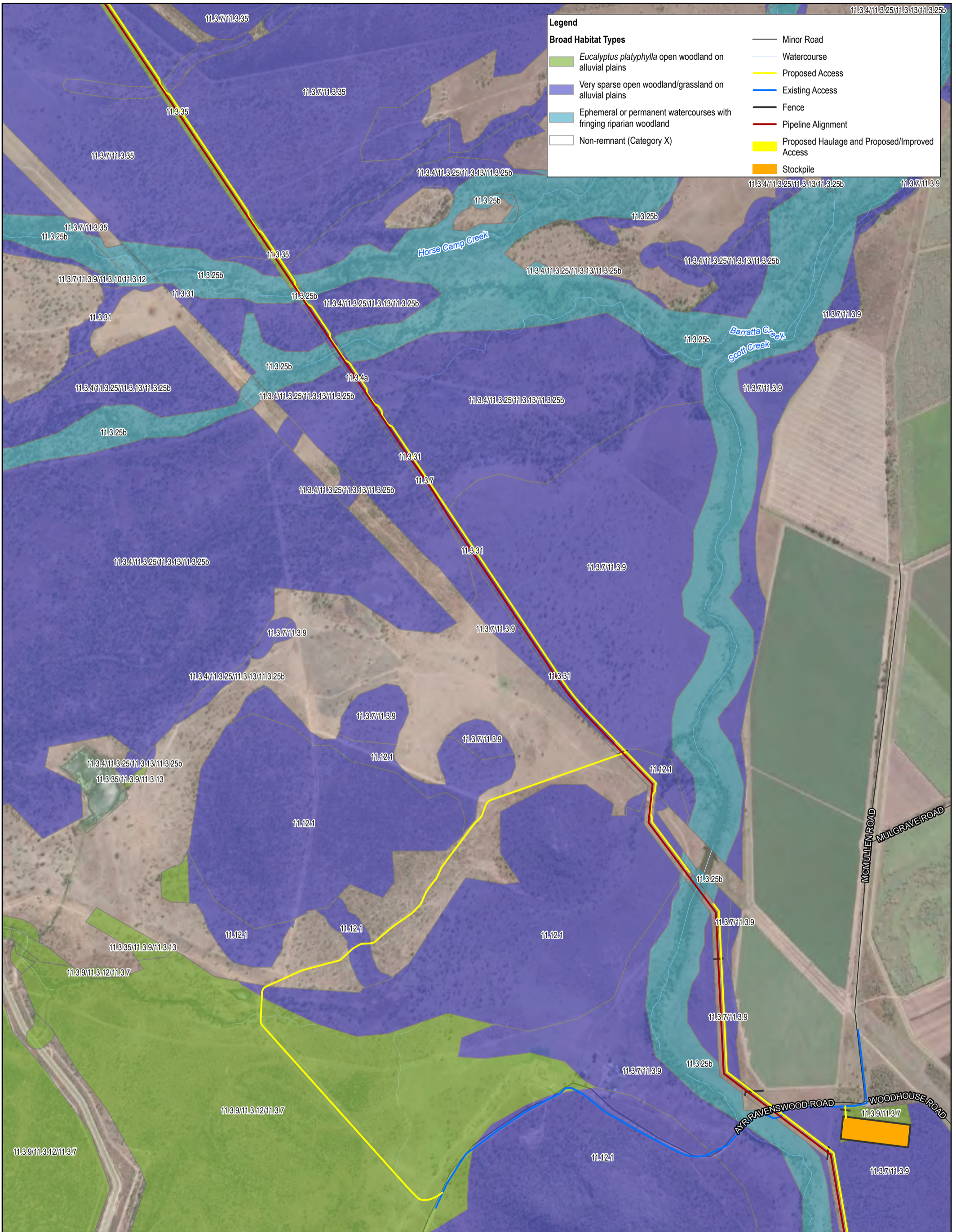


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Distribution of fauna habitat types
within survey area

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FIGURE 3-1



Legend

Broad Habitat Types	— Minor Road
 <i>Eucalyptus platyphylla</i> open woodland on alluvial plains	— Watercourse
 Very sparse open woodland/grassland on alluvial plains	— Proposed Access
 Ephemeral or permanent watercourses with fringing riparian woodland	— Existing Access
 Non-remnant (Category X)	— Fence
	— Pipeline Alignment
	 Proposed Haulage and Proposed/Improved Access
	 Stockpile

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Paper Size ISO A3

0 325 650

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



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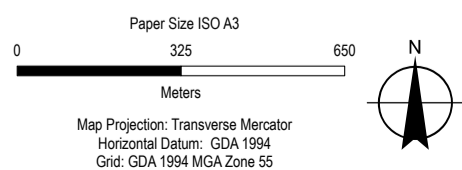
Distribution of fauna habitat types within survey area

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FIGURE 3-1



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Distribution of fauna habitat types
within survey area

FIGURE 3-1



Legend

Broad Habitat Types

- Eucalyptus platyphylla* open woodland on alluvial plains
- Very sparse open woodland/grassland on alluvial plains
- Non-remnant (Category X)

- Minor Road
- Railway
- Watercourse
- Proposed Access
- Fence
- Pipeline Alignment
- Proposed Haulage and Proposed/Improved Access
- Stockpile

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Paper Size ISO A3

0 325 650

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

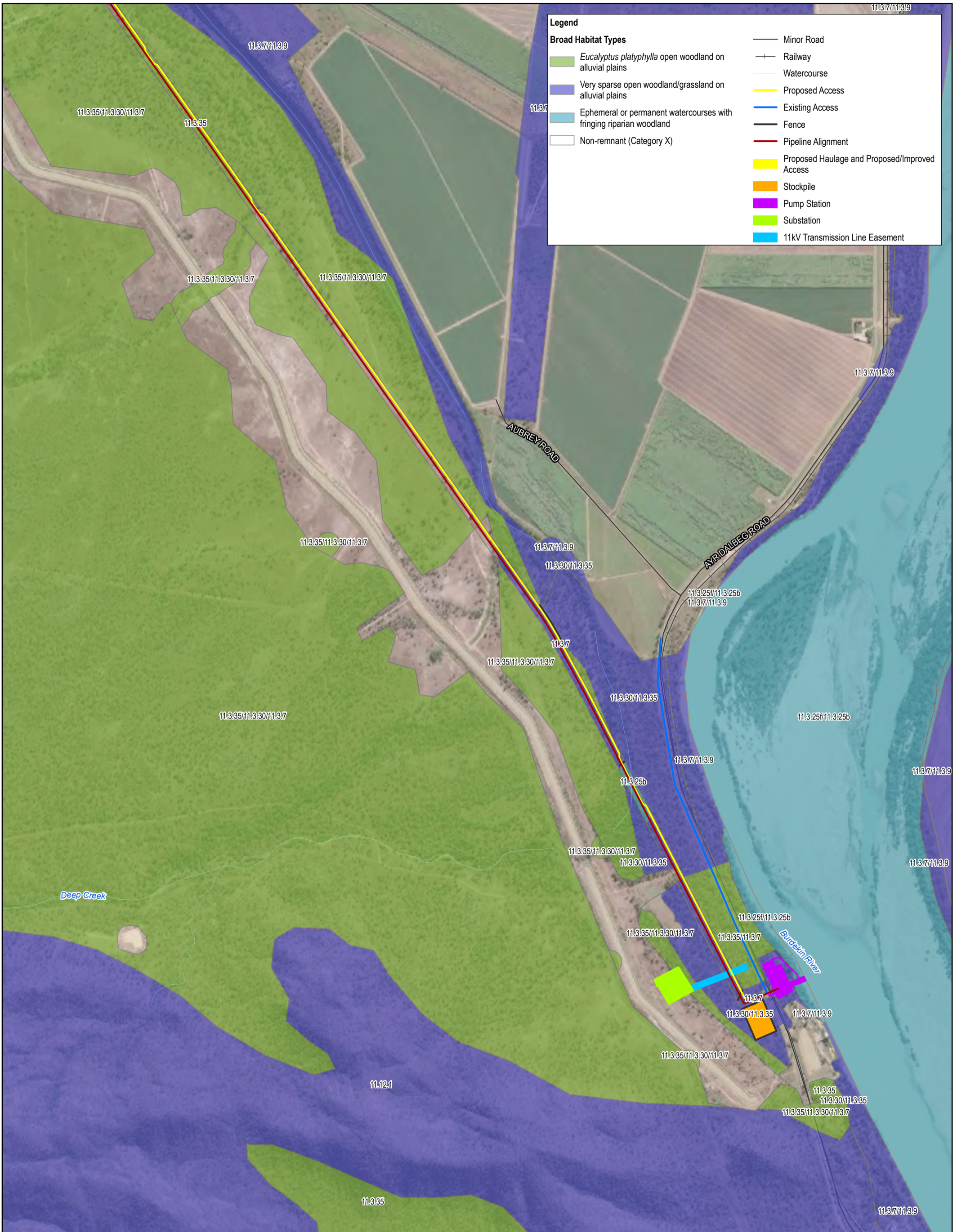


Townsville City Council
Houghton Pipeline Stage 2 - MNES Assessment

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Distribution of fauna habitat types within survey area

FIGURE 3-1



Legend

Broad Habitat Types

- Eucalyptus platyphylla* open woodland on alluvial plains
- Very sparse open woodland/grassland on alluvial plains
- Ephemeral or permanent watercourses with fringing riparian woodland
- Non-remnant (Category X)

- Minor Road
- Railway
- Watercourse
- Proposed Access
- Existing Access
- Fence
- Pipeline Alignment
- Proposed Haulage and Proposed/Improved Access
- Stockpile
- Pump Station
- Substation
- 11kV Transmission Line Easement

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Meters

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Haughton Pipeline Stage 2 - MNES Assessment

Distribution of fauna habitat types within survey area

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FIGURE 3-1

3.2 Regional Ecosystem mapping

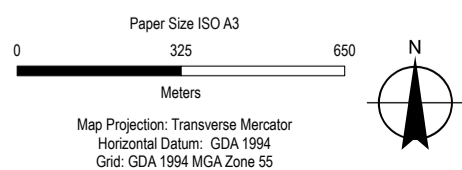
Quaternary surveys were completed along the length of the pipeline alignment. REs were verified within the nominated disturbance areas by GHD. NRA field-verified mapping was accepted beyond the nominated survey areas evaluated by GHD. Where BioCondition assessments resulted in further refinement of the REs within the Project area, the RE mapping was updated to reflect these changes. Based on the field verified data the 15 REs are present within the Project area as shown in Table 3-2 and presented in Figure 3.2.

Table 3-2 Regional Ecosystem mapping

Regional Ecosystem	VM Act Status	Description
11.3.4	Of Concern	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains
11.3.4a	Of Concern	<i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict.
11.3.7	Least Concern	<i>Corymbia</i> spp. open woodland on alluvial plains
11.3.9	Least Concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains
11.3.10	Least Concern	<i>Eucalyptus brownii</i> woodland on alluvial plains
11.3.12	Least Concern	<i>Melaleuca viridiflora</i> , <i>M. argentea</i> +/- <i>M. dealbata</i> woodland on alluvial plains
11.3.13	Of Concern	<i>Grevillea striata</i> open woodland on coastal alluvial plains
11.3.25	Least Concern	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines
11.3.25b	Least Concern	<i>Melaleuca leucadendra</i> and/or <i>M. fluviatilis</i> , <i>Nauclea orientalis</i> open forest
11.3.25f	Least Concern	Main river channels. Open water or exposed stream beds and bars. Usually devoid of emergent vegetation although scattered trees and shrubs such as <i>Melaleuca viminalis</i> or <i>Melaleuca</i> spp. May be present and aquatic species may be abundant particularly in water holes and lagoons. Occurs in river channels. Riverine
11.3.30	Least Concern	<i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains
11.3.31	Of Concern	<i>Ophiuros exaltatus</i> , <i>Dichanthium</i> spp. grassland on alluvial plains
11.3.35	Least Concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains
11.3.35a	Least Concern	<i>Corymbia tessellaris</i> , <i>C. clarksoniana</i> and <i>Eucalyptus platyphylla</i> woodland
11.12.1	Least Concern	<i>Eucalyptus crebra</i> woodland on igneous rocks



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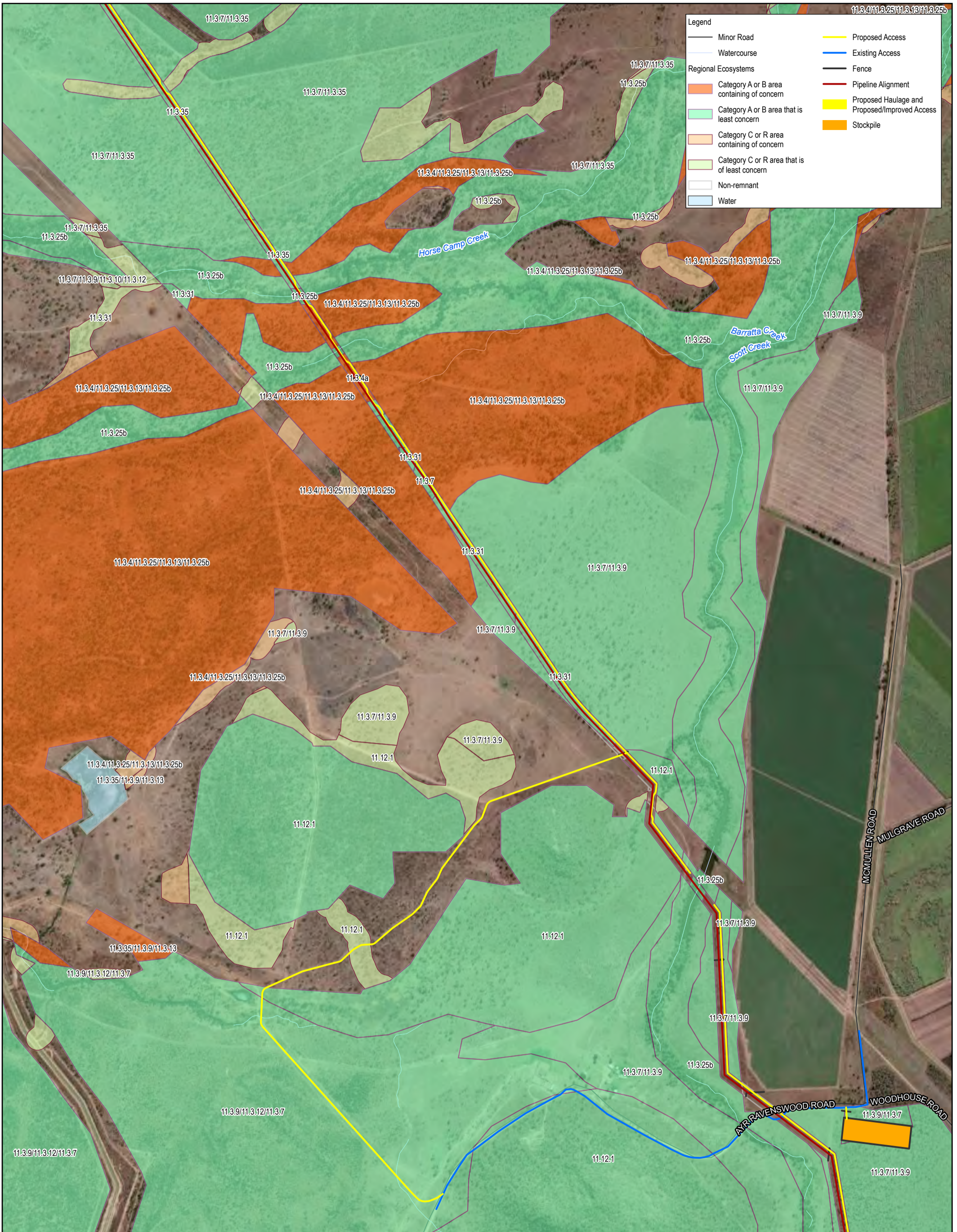


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**Vegetation communities
(regional ecosystems)**

FIGURE 3-2



Legend

- Minor Road
- Watercourse
- Regional Ecosystems
 - Category A or B area containing of concern
 - Category A or B area that is least concern
 - Category C or R area containing of concern
 - Category C or R area that is of least concern
 - Non-remnant
 - Water
- Proposed Access
- Existing Access
- Fence
- Pipeline Alignment
- Proposed Haulage and Proposed/Improved Access
- Stockpile

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Paper Size ISO A3

0 325 650

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

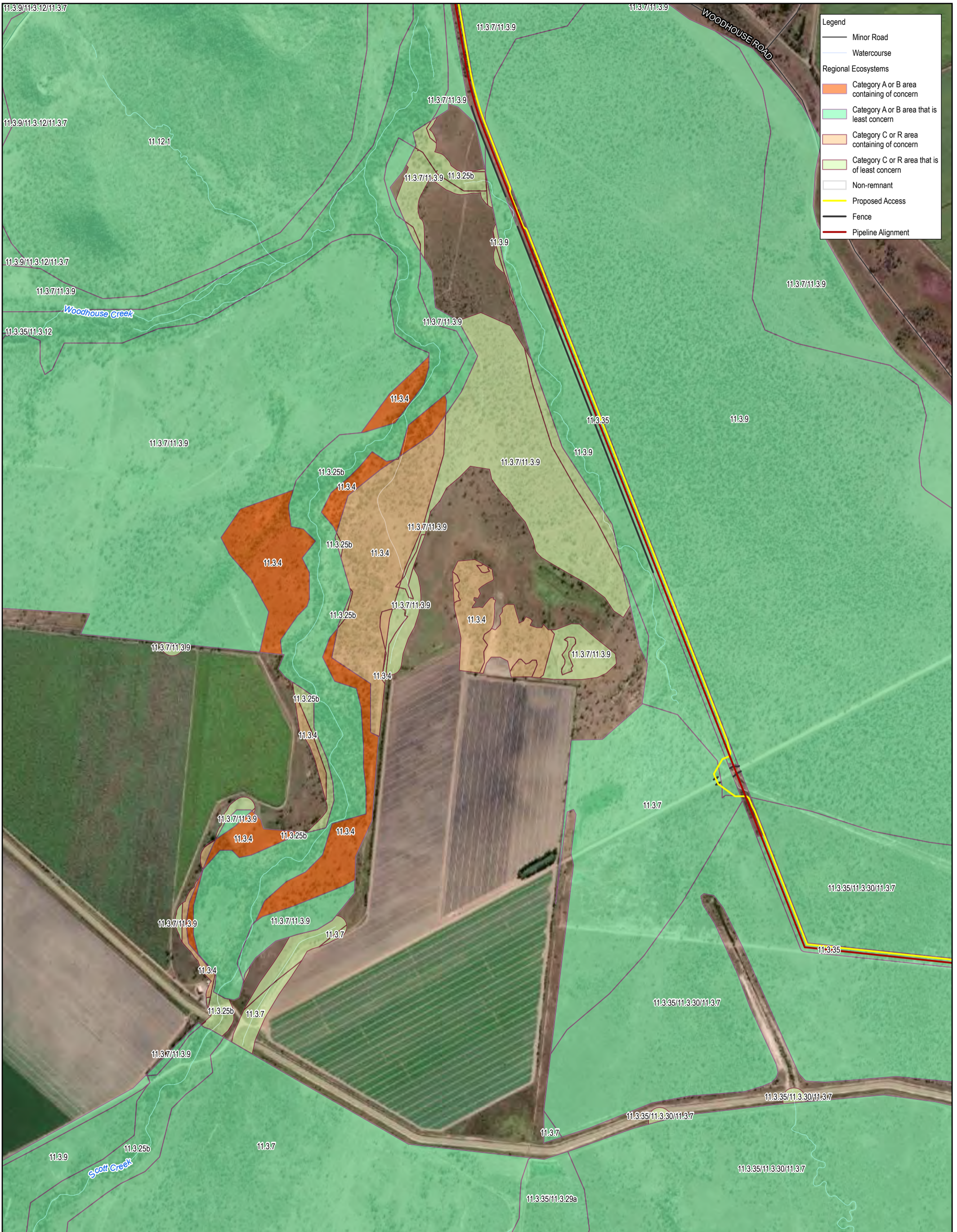


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**Vegetation communities
(regional ecosystems)**

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FIGURE 3-2



Legend

- Minor Road
- Watercourse
- Regional Ecosystems**
- Category A or B area containing of concern
- Category A or B area that is least concern
- Category C or R area containing of concern
- Category C or R area that is of least concern
- Non-remnant
- Proposed Access
- Fence
- Pipeline Alignment

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Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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Houghton Pipeline Stage 2 - MNES Assessment

**Vegetation communities
(regional ecosystems)**

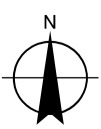
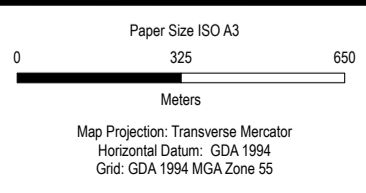
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FIGURE 3-2



- Legend**
- Minor Road
 - +— Railway
 - Watercourse
- Regional Ecosystems**
- Category A or B area that is least concern
 - Category C or R area that is of least concern
 - Non-remnant
 - Proposed Access
 - Fence
 - Pipeline Alignment
 - Proposed Haulage and Proposed/Improved Access
 - Stockpile

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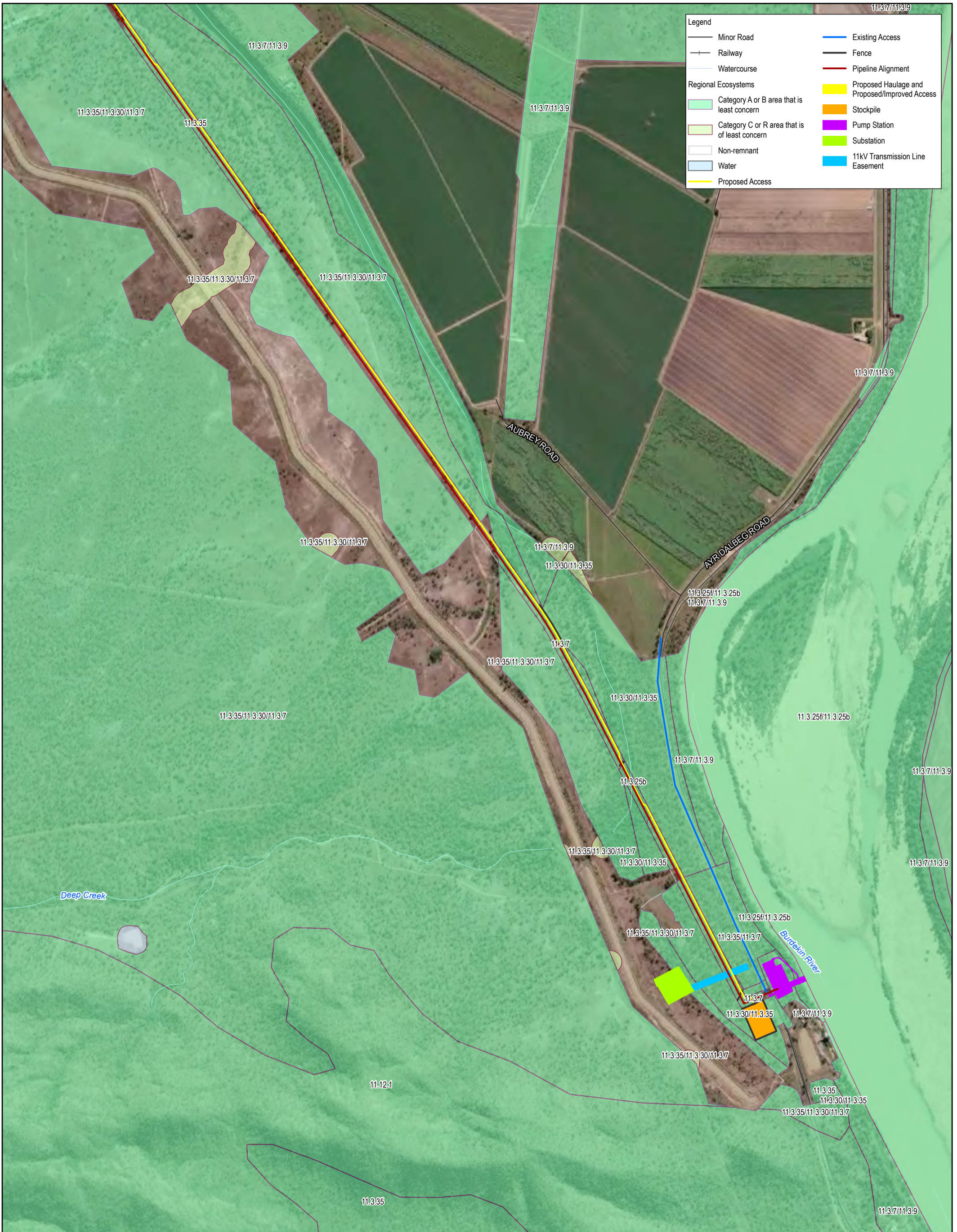


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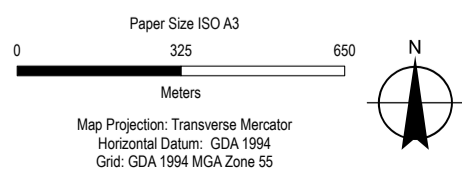
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**Vegetation communities
(regional ecosystems)**

FIGURE 3-2



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**Vegetation communities
(regional ecosystems)**

FIGURE 3-2

3.3 Threatened ecological communities

3.3.1 Desktop results

Two TECs were identified within the PMST output (Appendix B) for the Project area as ‘may occur’:

- Poplar Box Grassy Woodland on Alluvial Plains – Endangered
- Semi-evergreen vine thickets (SEVT) of the Brigalow Belt (North and South) and Nandewar Bioregions – Endangered.

Remnant patches of the SEVT TEC are mostly associated with coastal dunes and river deltas in the vicinity of Townsville and Ayr through the northern and central parts of the Brigalow Belt Bioregion (McDonald 2010). No such environs are within or immediately adjacent to the Project area.

The Poplar Box TEC occurs south of Charters Towers and east of Longreach, with the nearest mapped patch to the Project area occurring at least 150 km to the south (i.e. north west of Collinsville) (DEE 2019).

3.3.2 Field results

NRA and GHD undertook surveys for the purpose of RE and TEC verification during April and October 2021 across the length of the Project area. During October 2021, a senior botanist traversed the Project area and undertook vegetation surveys over five days. During this time, no TECs were observed.

Additionally, field survey results indicated that no vegetation or REs indicative of either Poplar Box or SEVT TECs were present within or adjacent to the Project area. While Poplar Box TEC occurs in fragmented patches, and potential SEVT TEC may occur 3 km south of the Project area in suitable mapped REs, the Project area does not contain REs or vegetation that is diagnostic of either TECs. No REs representative of the two TECs identified in the desktop assessment were recorded during field surveys of the Project area. Accordingly, these TECs are considered unlikely to occur within the Project area.

To assist in understanding the potential for the occurrence of Poplar Box TEC and Semi-evergreen vine thicket TEC within the landscape of the Project area, a desktop search for REs constituent for either of the TECs was undertaken within a 2 km buffer of the Project area, using DoR RE mapping version 12.

REs constituent with the TECs are provided in Table 3-3, as per Commonwealth *Conservation Advice (including listing advice) for the Poplar Box Grassy Woodland on Alluvial Plains* (DEE 2019) and Commonwealth *National recovery plan for the "Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions" ecological community* documentation.

Table 3-3 Poplar Box TEC and Semi-evergreen vine thicket constituent Regional Ecosystems

TEC	Constituent REs
Poplar box	RE 11.3.2, 11.3.17, 11.4.7, 11.4.12, 12.3.10 (DEE 2019)
Semi-evergreen vine thicket	RE 11.2.3, 11.3.11, 11.4.1, 11.5.15, 11.8.3, 11.8.6, 11.8.13, 11.9.4, 11.9.8, 11.11.18 (McDonald 2010)

Within a 2 km buffer of the Project area, no REs potentially corresponding to the Poplar Box TEC or Semi-evergreen vine thicket TEC were identified within the desktop assessment.

3.4 Terrestrial fauna

3.4.1 Desktop results

The EPBC Act PMST database identified 21 threatened species that are MNES within the desktop search extent. State based searches (i.e. WildNet, Species Profile Search and Biomaps) identified five threatened species that are MNES that have been historically recorded within the desktop search extent.

The PMST and WildNet desktop search results are provided in Appendix B and summarised in Table 3-4.

Table 3-4 Conservation significant fauna species identified within the desktop search extent

Scientific name	Common name	Status		Source
		EPBC Act	NC Act	
Birds				
<i>Calidris ferruginea</i>	Curlew sandpiper	CE, Mig	CE	PMST
<i>Erythrotriorchis radiatus</i>	Red goshawk	V	E	PMST
<i>Falco hypoleucos</i>	Grey falcon	V	V	PMST
<i>Geophaps scripta scripta</i>	Squatter pigeon (southern)	V	V	WO
<i>Hirundapus caudacutus</i>	White-throated needletail	V, Mig	V	PMST, WO
<i>Neochmia ruficauda ruficauda</i>	Star finch (easter, southern)	E	E	PMST
<i>Numenius madagascariensis</i>	Eastern curlew	CE, Mig	E	PMST
<i>Poephila cincta cincta</i>	Black-throated finch (southern)	E	E	PMST, WO
<i>Rostratula australis</i>	Australian painted snipe	E	E	PMST
<i>Turnix olivii</i>	Buff-breasted button-quail	E	E	PMST
<i>Tyto novaehollandiae kimberli</i>	Masked owl (northern)	V	V	PMST
Mammals				
<i>Dasyurus hallucatus</i>	Northern quoll	E	LC	PMST, WO
<i>Hipposideros semoni</i>	Semon's leaf-nosed bat	V	E	PMST
<i>Macroderma gigas</i>	Ghost bat	V	E	PMST
<i>Phascolarctos cinereus</i>	Koala	E	V	PMST, WO
<i>Rhinolophus robertsi</i>	Large-eared horseshoe bat	V	LC	PMST
<i>Saccolaimus saccolaimus nudicluniatus</i>	Bare-rumped sheath-tail bat	V	E	PMST
<i>Xeromys myoides</i>	Water mouse	V	V	PMST
Reptiles				
<i>Denisonia maculata</i>	Ornamental snake	V	V	PMST
<i>Egernia rugosa</i>	Yakka skink	V	V	PMST
<i>Lerista vittata</i>	Mount Cooper striped skink	V	V	PMST
Fish				
<i>Pristis pristis</i>	Freshwater sawfish	V, Mig	LC	PMST

Key: E – Endangered, V – Vulnerable, Mig – Migratory, LC – Least Concern
 PMST – Protected Matters Search Tool, WO – Wildlife Online

3.4.2 Field results

A total of 129 fauna species were recorded during the ecological surveys within and immediately adjacent to the Project area. This comprised of 109 species of birds, 10 species of mammals, seven species of reptiles and three species of amphibians. A description of each of the fauna groups is provided below. A list of fauna species encountered during ecological field surveys is provided in Appendix D.

3.4.2.1 Birds

Two conservation significant bird species were recorded within the Project area during the field surveys, including the black-throated finch (southern) (refer to Section 6.3) and squatter pigeon (southern) (refer to Section 6.4). One EPBC Act listed threatened bird species, namely the white-throated needletail (Vulnerable and Migratory under the

EPBC Act) (refer to Section 6.5) is likely to occur due to the presence of historical records and suitable habitat within the Project area.

A total of 109 bird species were recorded within the Project area. The diversity and relative abundance of birds was highest in woodland areas. These areas provided habitat for a range of birds including, forest kingfisher (*Todiramphus macleayii*), red-winged parrot (*Aprosmictus erythropterus*), spangled drongo (*Dicrurus bracteatus*) and white-throated gerygone (*Gerygone albogularis*). Open woodland and cleared areas supported a range of bird species adapted to open landscapes including brown falcon (*Falco berigora*), emu (*Dromaius novaehollandiae*) (Plate 3.2), golden-headed cisticola (*Cisticola exilis*) and Australian raven (*Corvus coronoides*). Watercourses provided foraging and breeding habitat for a range of waterbirds including, Australasian darter (*Anhinga novaehollandiae*) (Plate 3.2), brolga (*Grus rubicunda*), comb-crested jacana (*Irediparra gallinacea*) and little black cormorant (*Phalacrocorax sulcirostris*), as well as suitable drinking sites and movement corridors for a range of woodland bird species.

Birds observed within the Project area are listed in Appendix D and shown in Plate 3.2.



Plate 3.2 Bird species recorded within the Project area – emu (top left), young Australasian darters (top right), rufous whistler (bottom left) and black kite (bottom right).

3.4.2.2 Mammals

One conservation significant mammal was recorded within the Project area during GHD March 2022 field surveys, namely the bare-rumped sheath-tail bat was confirmed present through Anabat recordings analysed by Greg Ford (subconsultant). One conservation significant mammal species, namely the koala, has the potential to occur within the Project area due to suitable habitat (i.e. presence of koala food trees). More information on the koala is presented in Section 6.1, and bare-rumped sheath-tail bat in Section 6.2.

An additional ten mammal species were recorded within the Project area during the field surveys. Macropods, including the agile wallaby (*Macropus agilis*), eastern grey kangaroo (*Macropus giganteus*) (Plate 3.3), swamp wallaby (*Wallabia bicolor*) and rufous bettong (*Aepyprymnus rufescens*), were encountered throughout the Project area in grassy woodland and open grassland areas. During nocturnal spotlighting activities, the common brushtail possum (*Trichosurus vulpecula*) was recorded in woodland habitats retaining hollow-bearing trees. Pest mammals recorded included the wild dog (Plate 3.3), feral pig, feral cat and rabbit.



Plate 3.3 Mammal species recorded within the Project area – eastern grey kangaroo (left) and wild dog (right)

3.4.2.3 Reptiles

No conservation significant reptiles were recorded within the Project area, and none were assessed as likely to occur. A total of seven reptile species were recorded throughout the Project area during the field surveys. Snake species including the common tree snake (*Dendrelaphis punctulatus*), lesser black snake (*Demansia vestigiata*) and water python (*Liasis fuscus*) (Plate 3.4) were encountered along watercourses retaining small pools of water. The Adams' snake-eyed skink (*Cryptoblepharus adamsi*) was commonly recorded basking on ground logs and trees, and the eastern brown snake (*Pseudonaja textilis*) (Plate 3.4) and lace monitor (*Varanus varius*) were observed in grassy woodland areas.



Plate 3.4 Reptile species recorded within the Project area – water python (top left), common tree snake (top right), eastern brown snake (bottom left) and lesser black snake (bottom right)

3.4.2.4 Amphibians

No conservation significant amphibian species were recorded or have the potential to occur within the Project area. Three amphibian species were recorded during the field surveys, including the eastern snapping frog (*Cyclorana novaehollandiae*) (Plate 3.5), green tree frog (*Litoria caerulea*) and the introduced species, the cane toad (*Rhinella marina*). These species were recorded along semi-permanent and ephemeral watercourses and in the vicinity of artificial dams and waterbodies.



Plate 3.5 Amphibian species recorded within the Project area – eastern snapping frog

3.5 Likelihood of occurrence assessment results

Based on the results of the likelihood of occurrence assessment, four conservation significant species were **confirmed present** within the Project area, and a further two were considered **likely to occur** within the Project area (Table 3-5). Of the remaining 26 conservation significant species identified in desktop searches, five **may occur**. The remaining 27 threatened species and ecological communities are unlikely to occur due to the absence of suitable habitat and nearby historical records. The results of the likelihood of occurrence assessment are presented in Appendix A.

Table 3-5 Conservation significant species known or likely to occur

Scientific name	Common name	EPBC Act status	NC Act status
Confirmed present			
<i>Eucalyptus raveretiana</i>	Black ironbox	V	LC
<i>Saccolaimus saccolaimus nudicluniatus</i>	Bare-rumped sheath-tail bat	V	E
<i>Poephila cincta cincta</i>	Black-throated finch (southern)	E	E
<i>Geophaps scripta scripta</i>	Squatter pigeon (southern)	V	V
Likely to occur			
<i>Phascolarctos cinereus</i>	Koala	E	V
<i>Hirundapus caudacutus</i>	White-throated needletail	V, Mig	V

Key: E – Endangered, V – Vulnerable, Mig – Migratory, LC – Least Concern

Information on those species confirmed present or considered likely to occur is detailed in the following sections.

3.5.1 Justification of key species excluded from ‘likely to occur’ status

Five EPBC Act listed species were considered as ‘may occur’ within the Project area, including one flora species. For these five threatened species, further detail on the desktop and field studies undertaken to arrive at these conclusions are described further here.

The Department of Climate Change, Energy, the Environment and Water (DCCEEW) sent a Request for Further Information (RFI) (dated 10 March 2022, EPBC ref: 2021/9133) for an assessment under Part 9 of the EPBC Act for the Project. Noting their explicit mention in the RFI, the northern quoll, red goshawk and grey falcon, all of which were determined to be ‘unlikely to occur’ are also discussed below.

***Tephrosia levelleii* (concluded to be ‘may occur’)** – survey effort for threatened flora species comprised of targeted searches including random meander searches at 11 sites and quaternary vegetation assessments at 40 sites. Desktop and field data was used to determine the likelihood of occurrence of *Tephrosia levelleii* within the Project area and surrounds. The species was not recorded during field surveys. Noting:

1. The species has not been historically recorded within the desktop search extent,
2. There are no publicly accessible DES historical records within the broad landscape of the Project area. According to ALA the nearest record is approximately 315 km northwest near Undara Volcanic National Park. Of six known locations that the species has been recorded, the closest is near Ravenswood.

While suitable habitat for the species occurs in the form of eucalypt and *Corymbia* woodland and open forest, on the basis that the species has not been historically recorded in the desktop search extent, the species is considered to have potential to occur.

Northern quoll (*Dasyurus hallucatus*) (concluded to be ‘unlikely to occur’) – survey effort for the northern quoll comprised of baited remote camera traps at seven sites (seven trap nights) and habitat assessments at 35 sites. Desktop and field data was used to determine the likelihood of occurrence of the northern quoll within the Project area and surrounds. Noting: (1) field data and observations from habitat assessments and BioCondition surveys (especially regarding the lack of structural complexity of remnant habitats, and their open and weed-affected ground layer); (2) the fragmented landscape in which the Project occur; (3) the prevalence of cane toads; (4) the absence of suitable rocky areas and topographically diverse areas in or near the Project area; (5) the lack of records (or evidence of occurrence) from surveys conducted for the Project; and (6) the lack of historical records within the immediate surrounding landscape, it is considered unlikely that the species will utilise habitats within the Project area on anything more than a highly infrequent and enigmatic basis (if it is indeed it persists in upland areas in the lower Burdekin region). Desktop and field data indicates that habitat within the Project area does not contain the requisite characteristics that comprise shelter habitat for the species (i.e. provides breeding and refuge habitat generally defined as rocky areas or structurally diverse woodland or forest with surrounding vegetated habitats) (DoE 2016). Habitat within the Project area may comprise suitable foraging and/or dispersal habitat for the species, however this habitat is unlikely to support more than transient individuals within the landscape. Additionally, where shelter habitat may occur within the surrounding landscape, the Project area does not provide sufficient connectivity for the species (i.e. within 1 km of shelter habitat) (DoE 2016). Accordingly, the species was considered unlikely to occur.

Grey falcon (*Falco hypoleucos*) and red goshawk (*Erythrotriorchis radiatus*) (both concluded to be ‘unlikely to occur;’) – survey effort for the grey falcon and red goshawk comprised of 10 days x 10 hour vigilant bird surveys, habitat assessments at 35 sites and searches for nests. Desktop and field data informed the likelihood of occurrence for both species. While habitat of very marginal suitability (e.g. sparse woodland) was present for the grey falcon, the species’ Commonwealth approved conservation advice indicates that this bird is generally absent from areas east of the Great Dividing Range and where rainfall is greater than 500 mm, except when wet years are followed by drought (TSSC 2020). Bureau of Meteorology (BOM 2022a) long-term climate statistics for the ‘Burdekin Shire Council’ weather station (Station ID 033001) report the average annual rainfall for the region is 1056 mm. Additionally, the nearest historical record is located approximately 75 km southeast of the Project area from 1999, where the record is protected by a 10 km inaccuracy buffer. Accordingly, the grey falcon is considered unlikely to occur. Potentially suitable habitat is also present for the red goshawk within the Project area. While a historical record from 1998 is located 55 km north of the Project area, recent research by Garnett and Baker 2020 has determined the red goshawk has experienced a recent, rapid northward contraction, and is now rarely encountered south of southern Cape York in Queensland. On this basis, the red goshawk is unlikely to occur within the Project area.

Ghost bat (*Macroderma gigas*) and large-eared horseshoe bat (*Rhinolophus robertsi*) – survey effort for the ghost bat and large-eared horseshoe bat comprised of 35 habitat assessments, six dusk roost watch surveys and two Anabat detectors at 5 sites. Desktop and field data informed the likelihood of occurrence for both species. Potentially suitable habitat was present in the Project area for the ghost bat. Desktop review of Commonwealth documentation for historically known roosts revealed the nearest known roost is Cape Hillsborough (220 km southeast). According to the Commonwealth approved conservation advice for the ghost bat, the species is known to forage within 1.9 km, and typically less than 5 km from diurnal roosts (TSSC 2016a). Although the closest historical record (75 km northwest) and roost (220 km southeast) are significantly further than known foraging distances for the species, given the presence of suitable habitat for the ghost bat, the species was considered to

have *potential* to occur within the Project area (i.e. 'may occur'). Any such occurrence is likely to be enigmatic and infrequent, given the lack of proximal records. Potentially suitable habitat for the large-eared horseshoe bat is present in the form of foraging habitat in open woodland and roosting habitat in hollow-bearing trees. The species is poorly-known and generally uncommon, and within the species' core habitat it occurs in low densities (TSSC 2016b). The nearest historical record is 300 km north from 2019. Given suitable habitat is present within the Project area, the species is considered to have *potential* to occur (i.e. 'may occur'). Any such occurrence is likely to be enigmatic and infrequent, given the lack of proximal records.

Yakka skink (*Egernia rugosa*) – survey effort for the yakka skink comprised of habitat assessments and 24 active reptile search sites around areas of accumulated groundcover and fallen timber. Active searches were undertaken in >27°C temperatures (BOM 2022b) and were concentrated during the early morning and late afternoon where reptiles were likely to be sunning themselves and more easily detectable. Field survey effort met minimum survey effort required for diurnal searches as per the Commonwealth *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (DSEWPaC 2011). Desktop and field data informed the likelihood of occurrence for the species. The Project area is within the *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* 'may occur' modelled distribution for the yakka skink (DSEWPaC 2011). The nearest historical record for the yakka skink is located 75 km southwest (from 1980) - it should be noted that this historical record has a 10 km inaccuracy buffer.

Microhabitats required by the yakka skink comprise dense ground vegetation, large hollow logs, cavities in soil-bound root systems of fallen trees and beneath rocks. The species may persist in cleared habitat where shelter sites such as tunnel erosion, rabbit warrens and log piles exist (DoE 2014b). Important habitat for the yakka skink is defined in the *Draft Referral guidelines for the national listed Brigalow Belt reptiles* as (1) habitat where the species has been identified during a survey; (2) near the limit of the species' known range; (3) large patches of contiguous, suitable habitat and viable landscape corridors (necessary for the purposes of breeding, dispersal or maintaining the genetic diversity of the species over successive generations); or (4) a habitat type where the species is identified during a survey, but which was previously thought not to support the species (DSEWPaC 2011). Habitat of limited suitability was observed in the Project area for the yakka skink due to weed affected ground habitats, fragmentation and disturbance, and a lack of structural complexity across much of the Project area. Accordingly, important habitat, and especially microhabitats that are essential for shelter habitat for the yakka skink are largely absent within the Project area. Active searches did not confirm the presence of traces of the species (e.g. communal defecation sites). Although no historical records are located within the desktop search extent, the yakka skink is an extremely secretive reptile and seldom ventures far from shelter sites, where they retreat to at the first sign of disturbance. Accordingly, the yakka skink has a remote chance of occurring within the Project area ('may occur').

Mount Cooper striped lerista (*Lerista vittate*) – survey effort for the Mount Cooper striped skink comprised of habitat assessments and 24 active reptile search sites around areas of accumulated groundcover and fallen timber. Active searches were undertaken in >27°C temperatures (BOM 2022b) and were concentrated during the early morning and late afternoon where reptiles were likely to be sunning themselves and more easily detectable. Field survey effort met minimum survey effort required for diurnal searches as per the Commonwealth *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (DSEWPaC 2011). Desktop and field data informed the likelihood of occurrence for the reptile. The Project area is within the *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* 'may occur' modelled distribution for the Mount Cooper striped lerista (DSEWPaC 2011). The nearest historical record for the Mount Cooper striped lerista is 73 km southwest (from 1980) at Mount Cooper station which is the only confirmed location of a population, with a second population tentatively identified on the Chudleigh Plateau 200 km northwest of Hughenden (further research required to confirm whether the Chudleigh Plateau population comprises a conspecific population, or represents a separate taxa).

Microhabitats required by the Mount Cooper striped lerista include low closed forest and woodlands with vine thickets, on soft sandy soils where burrows are made into leaf litter and loose soil under logs, while the species can also be found in open patches of low vegetation that extends into adjacent woodland on heavier soils (DEWHA 2008b). Important habitat for the Mount Cooper striped lerista is defined in the *Draft Referral guidelines for the national listed Brigalow Belt reptiles* as (1) habitat where the species has been identified during a survey; (2) near the limit of the species' known range; (3) large patches of contiguous, suitable habitat and viable landscape corridors (necessary for the purposes of breeding, dispersal or maintaining the genetic diversity of the species over successive generations); or (4) a habitat type where the species is identified during a survey, but

which was previously thought not to support the species (DSEWPaC 2011). The species is currently only known (with confidence) to occur at one location – it is highly unlikely that it occurs at the Project area, given the survey effort undertaken and the composition, structure and condition of broad habitats and especially ground-layer microhabitats. Habitat of limited suitability was observed in the Project area for the Mount Cooper striped lerista due to weed affected ground habitats, fragmentation and disturbance, and lack of structural complexity across much of the Project area. Accordingly, important habitat for the Mount Cooper striped lerista is considered to be absent within the Project area. Additionally, active searches did not confirm the presence of traces of the species.

4. Overview of the Project

This section presents an overview of the Project, summarising the extent of clearing and the general avoidance and mitigation measures that will be undertaken to minimise impacts on MNES.

4.1 Nature of construction

4.1.1 Construction activities

The Project will result in the construction of a 28.5 km long 1800 mm pipeline, buried at a depth of 1.2 – 2.5 m using imported embedment materials. The pipeline will have capacity to transfer 364 ML of water per day. The pipeline route is generally located across open and flat to slightly undulating land, in which most of the construction work should be able to be undertaken via open trench excavation. Where the pipeline crosses rail and road crossings, a stiffer class of pipe and/or restrained joints may be required, and installation will likely be carried out within an envelope. Completion of the HPS2 is scheduled to take place over a period of approximately three years (including a twelve month defects monitoring period after construction completion), with mobilisation works to commence in April 2023 for construction of temporary access tracks and laydown areas. Construction of the pipeline and pump station is scheduled to take approximately 2.3 years, commencing May 2023 and be completed by the July 2025. Construction will generally be undertaken during daylight hours with the exception of some of the road crossings which may require night works for traffic management reasons.

4.1.2 Temporary and permanent impacts

The Project will result in 153.9 ha of (remnant, regrowth and non-remnant) vegetation clearing within the disturbance footprint, of which 15.64 ha will be lost permanently. The disturbance footprint will be associated with parts of the Project area that will be cleared for construction, much of which will be rehabilitated post-construction, as outlined in Section 4.2.1. Permanent impacts will be associated with parts of the Project area that will be cleared for permanent infrastructure. The temporary and permanent impact areas are defined below.

Temporary clearance impacts for MNES

The total temporary disturbance footprint is 138.26 ha

- Construction corridor for the 28.5 km long pipeline alignment – typically consisting of a 40 m wide corridor (for clearing activities, trenching works, pipe installation, fencing and stockpiling of excavated material and topsoil which are to be accommodated within the pipeline clearance extents), reducing to a 20 m wide corridor at riparian zones and mapped watercourse/waterway crossings
- Temporary access and haulage roads and five stockpile areas for storing materials and equipment.

Permanent clearance impacts for MNES

- The total permanent disturbance footprint is 15.64 ha, 4 m wide gravel access road along the length of the pipeline
- Pump station – as per the extent of the pump station site (1.63 ha)
- Intake structure – 11.52 ha for intake structure and access road
- Substation site – 1.7 ha to establish substation
- Power supply works – 0.8 ha for overhead power line from the substation to the pump station.

4.2 Operation phase

Operation of the Project will involve the ongoing maintenance of a 21.5 m wide public utility easement, 10 m wide zone influence above the pipeline, 4 m wide permanent gravel access road for the length of the pipeline and operation of the pump station and substation. This will include low levels of vehicle movements along the access corridor approximately once a week. No permanent fencing is proposed, other than surrounding the pump station

and substation. The temporary disturbance areas will have been subject to reinstatement and rehabilitation, as detailed in Section 4.2.1. The rehabilitation areas are shown in Figure 4.2.

4.2.1 Proposed rehabilitation measures

It is noted that rehabilitation of much of the disturbance footprint will be undertaken to help mitigate impacts to EPBC Act listed species arising from the clearing of vegetation. However, it is recognised that there will be a time lag between rehabilitation works and the reestablishment of vegetation (especially woody vegetation). The temporal program for rehabilitation is described in more detail below.

Rehabilitation shall be undertaken to all disturbance areas within the construction corridor, in which the rehabilitation treatments shall be based on the following components:

- Areas that currently support remnant vegetation and are located within 400 m from a watercourse depicted on the DoR Vegetation Management Watercourse and Drainage Feature Map will be revegetated with tubestock consistent with the relevant riparian or woodland REs and hydromulch comprising endemic grass species. These areas exclude a 10 m wide zone of influence above the pipeline and 4 m wide permanent access track
- Hydromulching all other areas of the pipeline construction corridor with endemic grass species. These areas include minor watercourses and drainage lines that are not mapped on the DoR Vegetation Management Watercourse and Drainage Feature Map, the pipeline 10 m wide zone of influence centred about the pipeline (i.e. 5 m either side of the pipeline centerline), temporary construction access roads and stockpile yards.

Disturbance area, indicative impact and rehabilitation extent and requirements are detailed in Table 4-1. A revegetation plan for the vegetation management watercourses is presented in Figure 4.1.

Table 4-1 Project construction components and rehabilitation requirements

Rehabilitation extent	Disturbance	Indicative impact	Rehabilitation requirements
Remnant vegetation within 400 m of a DoR Vegetation Management Watercourse	<p><i>Temporary</i></p> <ul style="list-style-type: none"> – Clearing of remnant vegetation within a 20 m corridor of a defined distance from a mapped DoR Vegetation Management Watercourse, and 40 m corridor in all other areas – Clearing of temporary construction access roads and stockpile yards within 400 m of a vegetation management watercourse <p><i>Permanent</i></p> <p>4 m gravel access track for access along the length of the pipeline</p>	<ul style="list-style-type: none"> – Clearing/felling/grubbing vegetation within construction corridor – Construction of pipeline trench within pipeline corridor – Gabion mattress scour protection to watercourse defining banks with 300mm topsoil overlaid <p>Construction of a 4 m wide access track</p>	<ul style="list-style-type: none"> – Plant tubestock of canopy, sub-canopy, shrub and ground strata (excluding grasses) outside the pipeline 10 m zone of influence and 4m access track; hydromulch with endemic grasses <p>Hydromulching with endemic grasses to full extent of disturbed corridor including pipeline 10 m zone of influence (i.e. pipeline's 10 m zone of influence is to remain free from tubestock planting)</p>
All other areas in the construction corridor including watercourses not mapped on the DoR Vegetation Management Watercourse and Drainage Feature Map, the pipeline 10 m wide zone of influence, temporary construction access roads and stockpile yards	<p><i>Temporary</i></p> <ul style="list-style-type: none"> – Clearing of a 40 m wide pipeline construction corridor – Clearing of temporary construction access roads, stockpile yards and site construction compounds <p><i>Permanent</i></p> <p>4 m wide gravel access track parallel to pipeline</p>	<ul style="list-style-type: none"> – Clearing/felling/grubbing vegetation within construction corridor – Construction of pipeline trench within pipeline corridor – Gabion mattress scour protection to watercourses with 300mm topsoil overlaid <p>Construction of a 4 m gravel access track</p>	Hydromulching with endemic grasses

Rehabilitation extent - Remnant vegetation within 400m of a DoR Vegetation Management Watercourse

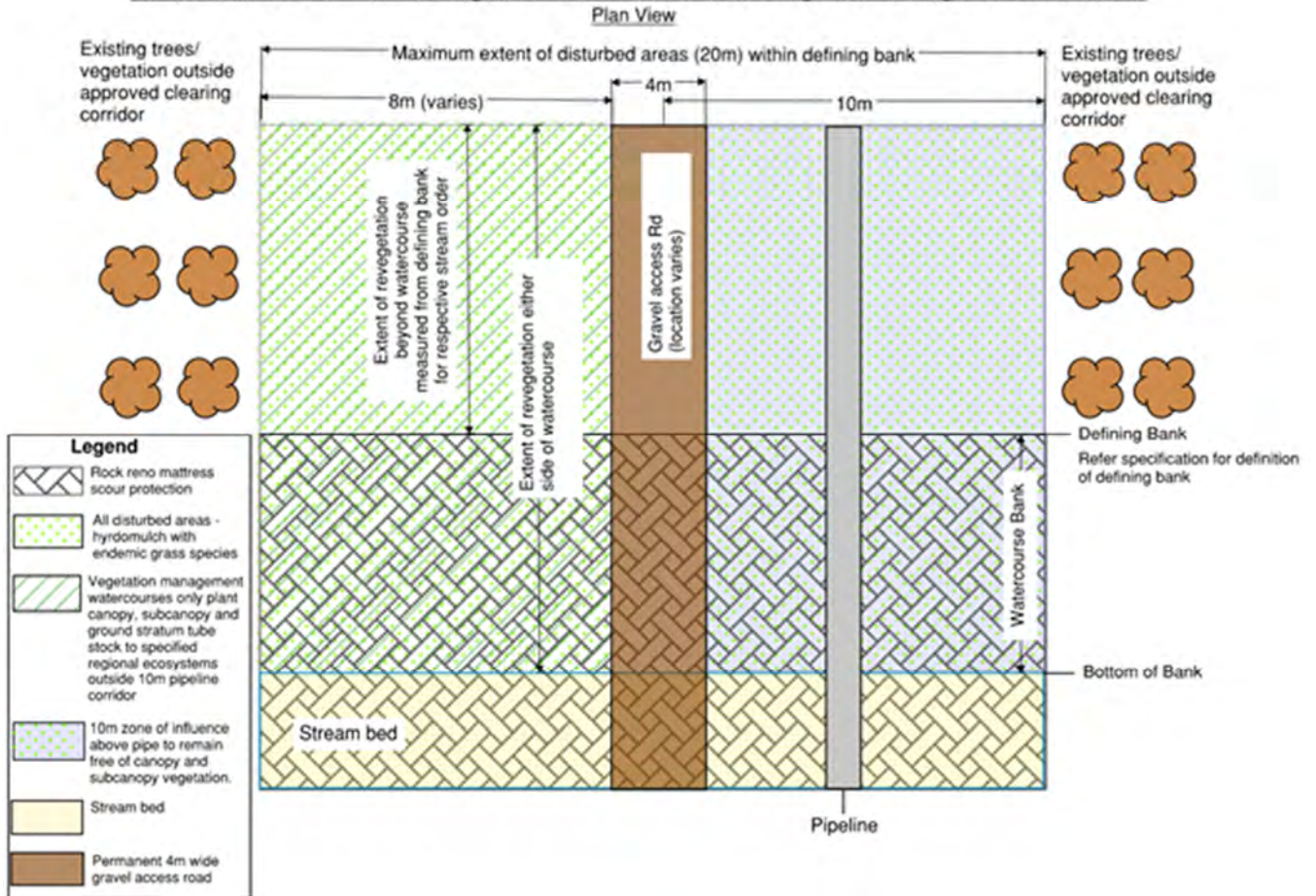


Figure 4.1 Revegetation plan

4.2.2 Rehabilitation measures proposed at vegetated watercourse crossings

Revegetation of remnant vegetation areas within 400 m from a DoR Vegetation Management Watercourse: Remnant areas within 400 m from a DoR Vegetation Management Watercourse will be revegetated (with the exception of the 4 m wide gravel access road and the 10 m wide zone of influence) to establish future areas of suitable habitat for the species. Specifically, these rehabilitation areas will be replanted with tubestock of species that characterise the endemic riparian open forest and woodland communities.

Sowing food grass species: Rehabilitation areas will be subject to sowing of native grasses that are documented to be food species for the southern black-throated finch.

Avoiding direct impact to potential roost trees: Potential large roost trees will be protected from direct and indirect impact by avoiding the removal of these potential roost trees where possible. Where avoidance is not possible in the remnant watercourse areas, these areas will be replanted with *E. platyphylla* tubestock to increase the availability of future roosting habitat.

Weed management: Given the extensive weed coverage that currently exists in the Project area, there are substantial opportunities to improve the habitat values for the southern black-throated finch through removal and ongoing management of weeds in all rehabilitation areas.

4.2.3 Species-specific rehabilitation measures proposed within 400 m of a water source

Based on the outcomes of a preliminary consideration of anticipated impacts on MNES, additional species-specific rehabilitation commitments were considered necessary and have been proposed by TCC to further avoid and mitigate the impact on habitats for the black-throated finch (southern) and bare-rumped sheath-tail bat. The proposed measures and the anticipated outcomes in terms of mitigating the residual impacts on habitat critical to the survival of the species are outlined in Section 7 and below.

In remnant vegetation within 400 m of a vegetation management watercourse hydromulch will be applied across the extent of the construction corridor for the pipeline alignment, with exception of the 4 m gravel access road. *E. platyphylla* tubestock will be planted within temporary stockpile areas and in the outer edges of the pipeline alignment (basically outside of the 21.5 m wide public utility easement).

4.2.3.1 Rehabilitation requirements

Specific hydromulch and tubestock requirements are detailed in Table 4-2 and suitable plant species are detailed in Table 4-3 (hydromulch) and Table 4-4 (tubestock). All grass species included in the hydromulch specification are endemic grasses that have been documented as food species for the black-throated finch (southern).

Table 4-2 Hydromulch and tubestock requirements

Hydromulch	Tubestock requirements		
	Tubestock planting rate at the following rates per stratum	Tubestock species diversity requirements	Plant spacing requirements
<ul style="list-style-type: none"> – Endemic grass species will be used with the goal of surface stabilisation through over-seeding the rehabilitation area with endemic grass species – Seeding rate will be sufficient for germination and sustainable cover of approximately 1000 plants per hectare, per riparian zone – A minimum of four different native grass species will be used. Several options are provided in Table 4-4 – Bonded fibre matrix to be provided at watercourse banks as a minimum. 6-month functional longevity, minimum application rate of 5000 kg/ha (500 g/m²) and minimum wet thickness of 5 mm – Apply hydromulching material to rehabilitation areas (100% cover on entire rehabilitation footprint) at the minimum application rate as per the nominated product requirements 	<ul style="list-style-type: none"> – 30 canopy trees per hectare – 50 sub-canopy trees per hectare – 60 shrubs per hectare – 3,000 sedges and forbs per hectare 	<p>RE11.3.25a</p> <ul style="list-style-type: none"> – A minimum of four different canopy species – A minimum of two different sub-canopy species – A minimum of two different shrub species – A minimum of four different forb or sedge species <p>RE11.3.25b</p> <ul style="list-style-type: none"> – A minimum of four different canopy species – A minimum of three different sub-canopy species – A minimum of five different shrub species – A minimum of four different forb or sedge species 	<p>Recommended plant spacing is as follows:</p> <p><i>Below the defining bank</i></p> <ul style="list-style-type: none"> – Forbs and sedges can be planted in clumps of four with a minimum spacing of 1m between clumps – Shrub species with a minimum spacing of 2m (stream order 3 or higher watercourses) or with a minimum spacing of 3m (stream order 1 and 2 watercourses) <p><i>Beyond the defining bank</i></p> <ul style="list-style-type: none"> – Plant sub-canopy, shrub, and ground strata species with a minimum spacing of 2m – Plant canopy species with a minimum spacing of 3m

Table 4-3 Endemic grass species for hydromulch mix

Scientific name	Common name	RE 11.3.35	RE 11.3.25b	All other areas
<i>Alloteropsis cimicina</i>	Carpet Grass	-	-	X
<i>Dichanthium sericeum</i>	Queensland Bluegrass	X	X	X
<i>Enteropogon acicularis</i>	Curly Windmill Grass	-	X	X
<i>Heteropogon contortus</i>	Black Speargrass	X	X	X
<i>Heteropogon triticeus</i>	Giant Speargrass	X	-	X
<i>Panicum decompositum</i>	Native Millet	-	-	X
<i>Panicum effusum</i>	Hairy Panic		X	X
<i>Setaria surgens</i>	Pigeon Grass	X	X	X
<i>Themeda triandra</i>	Kangaroo Grass	X	X	X

Table 4-4 Suitable tubestock plant species for rehabilitation of DoR Vegetation Management Watercourses

Stratum	Lifeform	Species	Common name	RE 11.3.35	RE 11.3.25b
Canopy	Tree	<i>Casuarina cunninghamiana</i>	River she-oak	-	X
	Tree	<i>Corymbia tessellaris</i>	Moreton Bay ash	X	X
	Tree	<i>Eucalyptus camaldulensis</i>	River red gum	X	
	Tree	<i>Eucalyptus platyphylla</i>	Poplar gum	X	X
	Tree	<i>Eucalyptus raveretiana</i>	Black ironbox	X	
	Tree	<i>Eucalyptus tereticornis</i>	Forest red gum	-	X
	Tree	<i>Euroschinus falcatus</i>	Cudgerie	-	X
	Tree	<i>Melaleuca fluviatilis</i>	River tea tree	-	X
	Tree	<i>Melaleuca leucadendra</i>	Weeping paperbark	-	X
	Tree	<i>Nauclea orientalis</i>	Leichhardt tree	-	X
	Tree	<i>Alphitonia excelsa</i>	Soap bush	-	X
Subcanopy	Tree	<i>Alphitonia excelsa</i>	Soap tree	-	X
	Tree	<i>Ficus racemose</i>	Cluster fig	-	X
	Tree	<i>Geijera salicifolia</i>	Wilga	-	X
	Tree	<i>Lysiphyllym hookeri</i>	White bauninia	-	X
	Tree	<i>Mallotus philippensis</i>	Kamala tree	-	X
	Tree	<i>Melaleuca nervosa</i>	Firebark	X	X
	Tree	<i>Melaleuca viridiflora</i>	Broad-leaved paperbark	X	X
Shrub	Shrub	<i>Acacia holosericea</i>	Silky wattle	X	X
	Shrub	<i>Alyxia ruscifolia</i>	Native holly	-	X
	Shrub	<i>Breynia oblongifolia</i>	Coffee bush	-	X
	Shrub	<i>Ficus opposita</i>	Sandpaper fig	-	X
	Shrub	<i>Lophostemon grandiflorus</i>	Northern swampbox	X	
	Shrub	<i>Macaranga tanarius</i>	Macaranga	-	X
	Shrub	<i>Planchonia careya</i>	Cocky apple	-	X

Stratum	Lifeform	Species	Common name	RE 11.3.35	RE 11.3.25b
Ground	Forb	<i>Commelina diffusa</i>	Scurvy weed	-	X
	Forb	<i>Commelina ensifolia</i>	Scurvy grass	-	X
	Forb	<i>Dianella caerulea</i>	Blue flax lily	-	X
	Forb	<i>Eustrephus latifolius</i>	Wombat berry	-	X
	Forb	<i>Lomandra longifolia</i>	Spiny-head mat-rush	X	X
	Sedge	<i>Cyperus distans</i>	Slender cyperus	-	X
	Sedge	<i>Cyperus javanicus</i>	Javanese flatsedge	-	X
	Sedge	<i>Cyperus trinervis</i>	-	-	X
	Sedge	<i>Fimbristylis dichotoma</i>	Common fringe sedge	-	X
	Sedge	<i>Fimbristylis littoralis</i>	Lesser fimbristylis	-	X

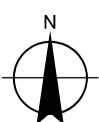
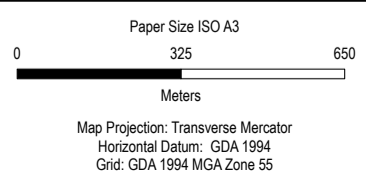
4.2.4 Avoidance of large and moderate sized *E. platyphylla* hollows within the pipeline alignment

Potential large roost trees will be protected from direct and indirect impact by avoiding the removal of these potential roost trees where possible. However, no *E. platyphylla* trees will be able to be retained within the 21.5 m wide permanent easement corridor as this will involve the excavation and trenching works, pipe installation, construction vehicle movements and will generally require the entire extent to be cleared of all woody vegetation. Where avoidance is not possible in the remnant watercourse areas, these areas will be replanted with *E. platyphylla* tubestock to increase the availability of future roosting habitat. The proposed avoidance areas are shown in Figure 4.4.

Revegetation of remnant vegetation areas within 400 m from a DoR Vegetation Management Watercourse: Remnant areas within 400 m from a DoR Vegetation Management Watercourse will be revegetated (with the exception of the 4 m wide gravel access road and the 10 m wide zone of influence) to establish future areas of suitable habitat for the species.



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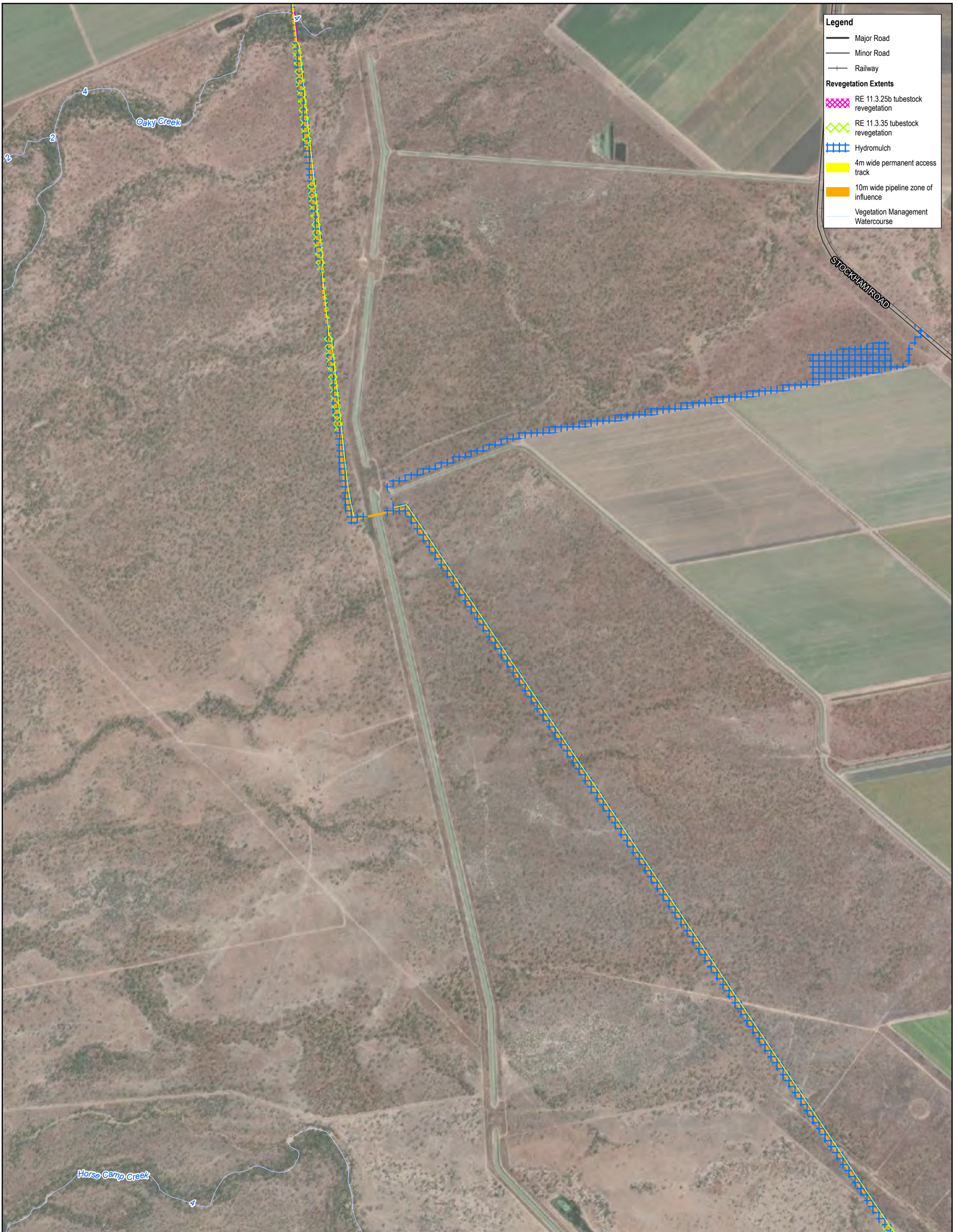


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Houghton Pipeline Stage 2 - Rehabilitation Plan

Project No. 12537606
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Date 7/28/2022

Revegetation extents

Sheet 1 of 6
FIGURE 4-2



Legend

- Major Road
- Minor Road
- Railway

Revegetation Extents

- RE 11.3.25b tubestock revegetation
- RE 11.3.35 tubestock revegetation
- Hydromulch
- 4m wide permanent access track
- 10m wide pipeline zone of influence
- Vegetation Management Watercourse

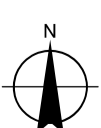
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Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

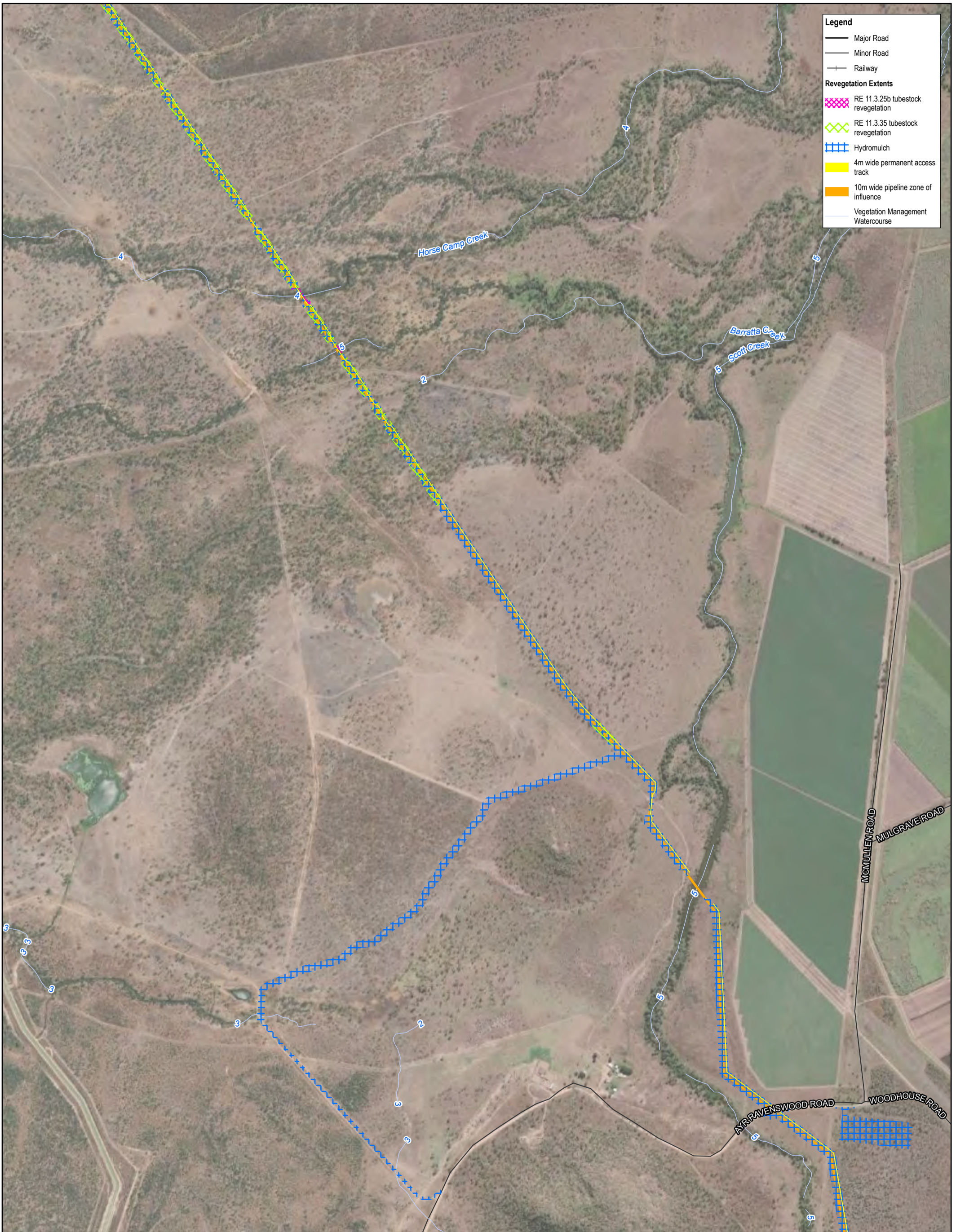


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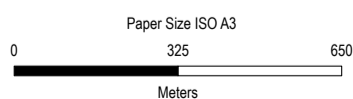
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Revegetation extents

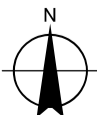
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FIGURE 4-2



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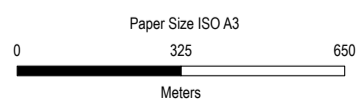
Revegetation extents

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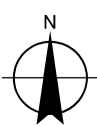
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 FIGURE 4-2



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Map Projection: Transverse Mercator
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Revegetation extents

Sheet 4 of 6
FIGURE 4-2



Legend

- Major Road
- Minor Road
- +— Railway

Revegetation Extents

- RE 11.3.25b tubestock revegetation
- RE 11.3.35 tubestock revegetation
- Hydromulch
- 4m wide permanent access track
- 10m wide pipeline zone of influence
- Vegetation Management Watercourse

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Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

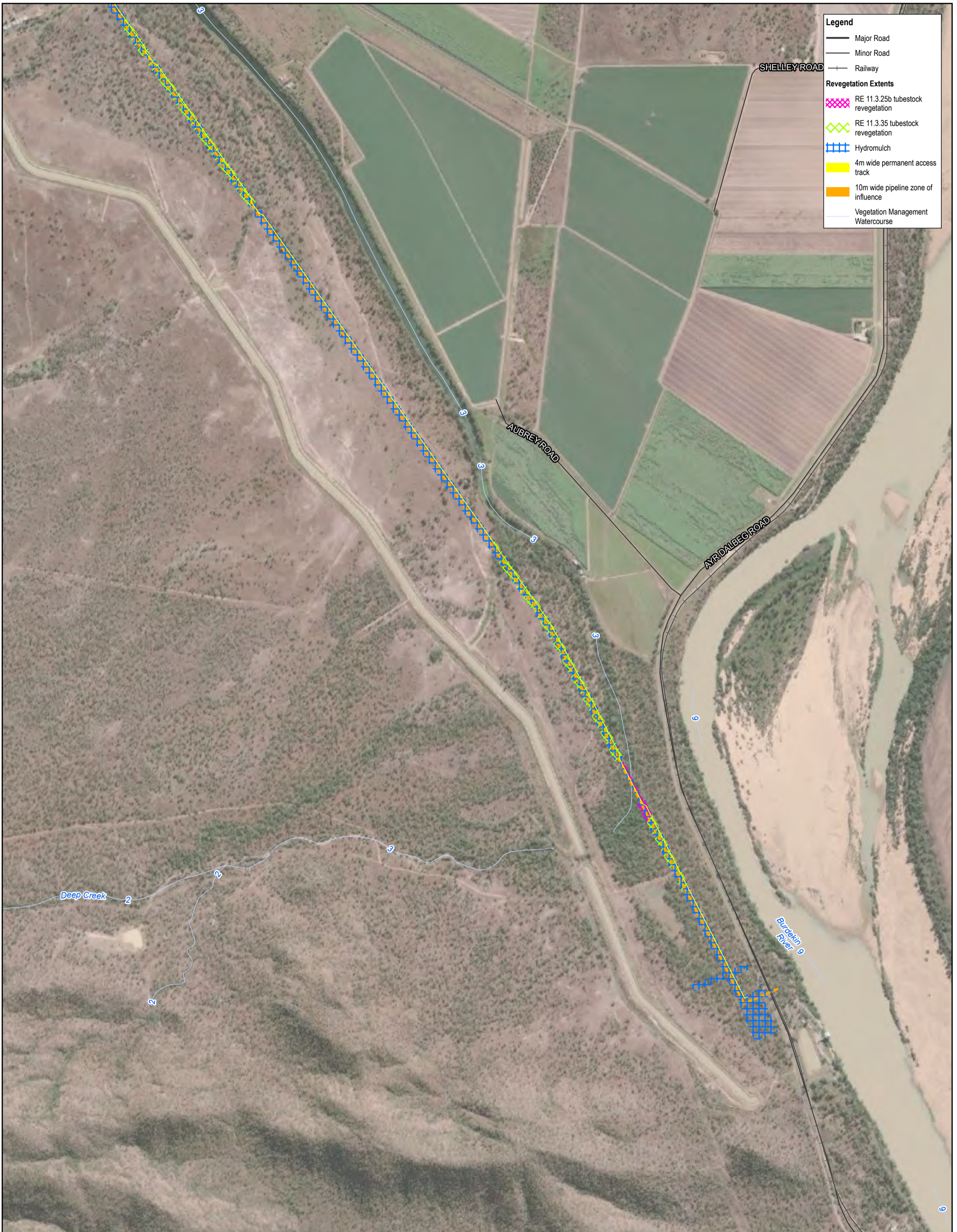


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Revegetation extents

Sheet 5 of 6
FIGURE 4-2



Legend

- Major Road
- Minor Road
- Railway

Revegetation Extents

- RE 11.3.25b tubestock revegetation
- RE 11.3.35 tubestock revegetation
- Hydromulch
- 4m wide permanent access track
- 10m wide pipeline zone of influence
- Vegetation Management Watercourse

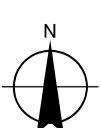
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Paper Size ISO A3

0 325 650

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



Townsville City Council
Houghton Pipeline Stage 2 - Rehabilitation Plan

Project No. 12537606
Revision No. C
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Revegetation extents

Sheet 6 of 6
FIGURE 4-2

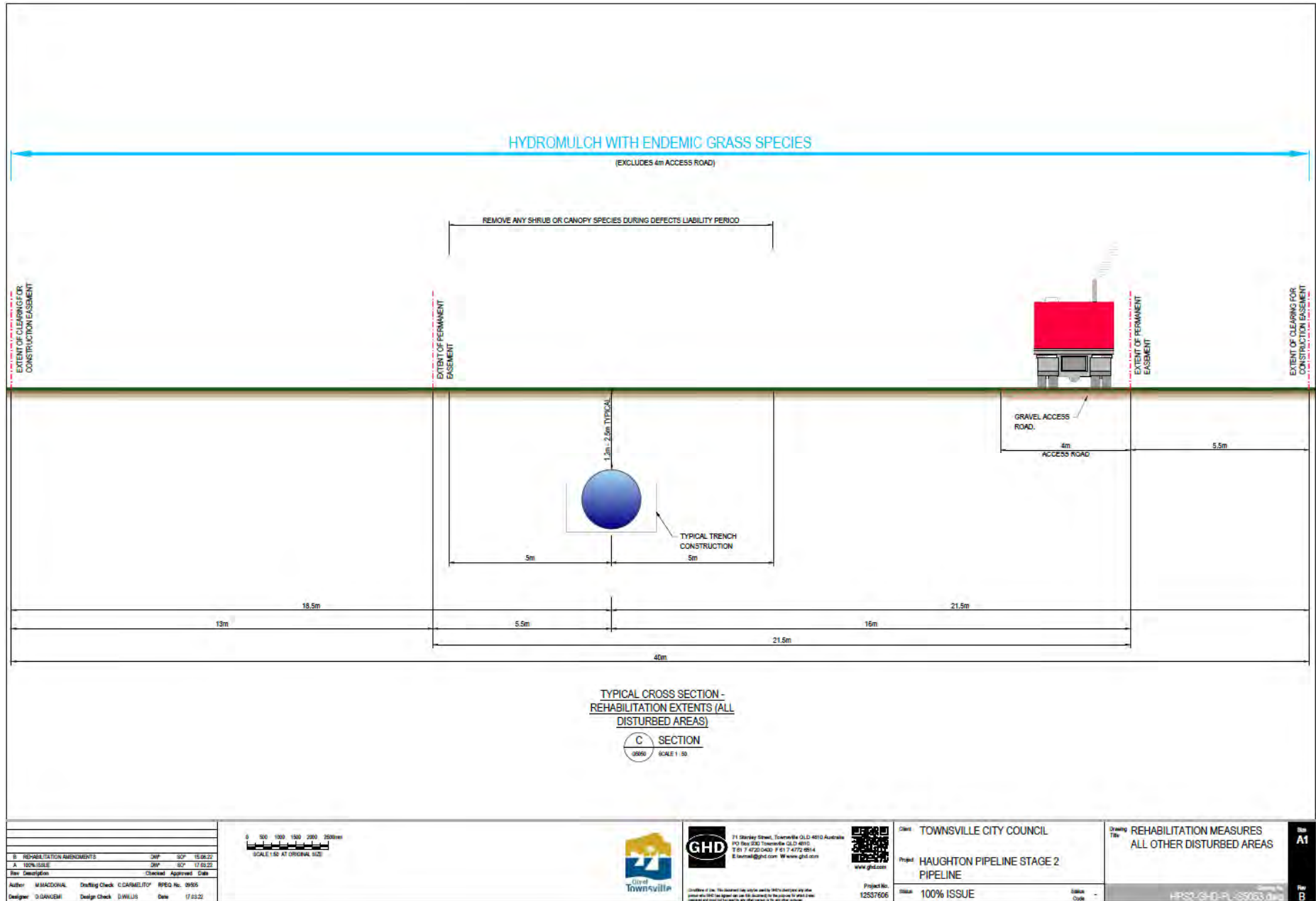
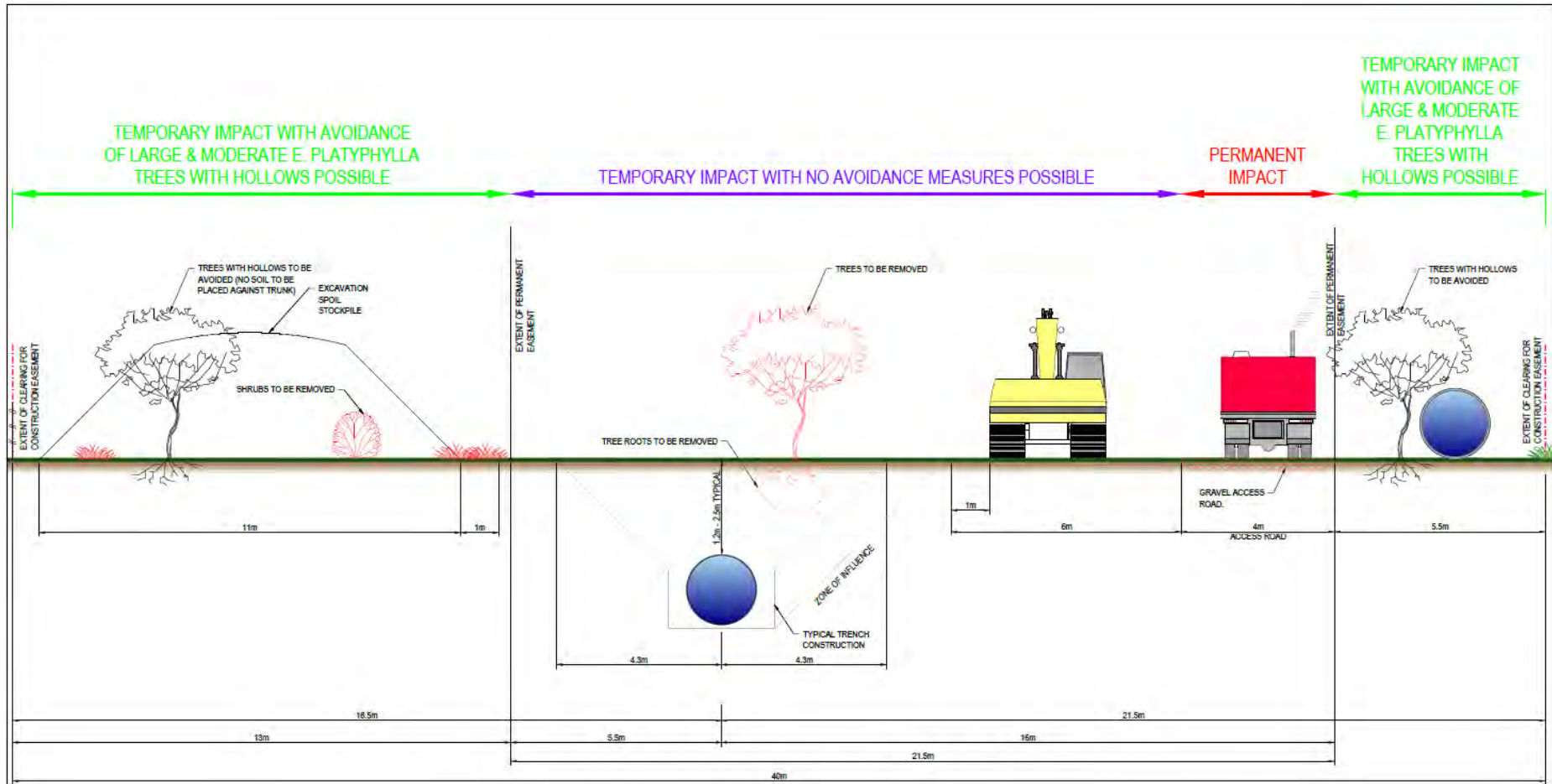


Figure 4.3 Rehabilitation of all other disturbed areas within the pipeline alignment



TYPICAL CROSS SECTION - AVOIDANCE AND IMPACT OF E.PLATYPHYLLA HOLLOWES
SCALE 1:50

<table border="1"> <tr> <td>Author</td> <td>M.MACDONALD</td> <td>Drafting Check</td> <td>C.CARRELLIOT</td> <td>RPEQ No.</td> <td>3956</td> </tr> <tr> <td>Designer</td> <td>D.DANDEMI</td> <td>Design Check</td> <td>D.WILLIS</td> <td>Date</td> <td>17.03.22</td> </tr> </table>		Author	M.MACDONALD	Drafting Check	C.CARRELLIOT	RPEQ No.	3956	Designer	D.DANDEMI	Design Check	D.WILLIS	Date	17.03.22			<p>71 Stanley Street, Townsville QLD 4810 Australia PO Box 952, Townsville QLD 4810 T 61 7 4722 0420 F 61 7 4722 8914 © ghd.com.au</p>	<p>Project No. 12537606</p>	<p>Client TOWNSVILLE CITY COUNCIL</p> <p>Project HAUGHTON PIPELINE STAGE 2 PIPELINE</p> <p>Status 100% ISSUE</p>	<p>Drawing Title REHABILITATION MEASURES AVOIDANCE AND IMPACT OF E.PLATYPHYLLA HOLLOWES</p> <p>Sheet No. A1</p> <p>File Name HPS2-GHD-PL-06064.dwg</p>
Author	M.MACDONALD	Drafting Check	C.CARRELLIOT	RPEQ No.	3956														
Designer	D.DANDEMI	Design Check	D.WILLIS	Date	17.03.22														

Figure 4.4 Avoidance of large and moderate E. platyphylla hollows within the pipeline alignment

4.3 Summary of permanent and temporary impacts

4.3.1 Construction Phase

The Project has the potential to result in a number of impacts during construction and operation phases. Potential impacting processes and relevant mitigation measures are summarised in Table 4-5, Table 4-6 and Table 4-7.

Table 4-5 Summary of impacts and mitigation measures (construction)

Impacting process	Mitigation and management measures
Loss of habitat	<ul style="list-style-type: none"> – Clearing restricted to minimum area required for Project area – Clearing areas to be clearly identified during construction – Existing disturbed areas to be utilised – Rehabilitation of the disturbance footprint areas – Implementation of a CEMP, CESC and ESCP – Environmental awareness training for construction personnel
Injury or mortality	<ul style="list-style-type: none"> – Pre-clearance surveys and clearing activities to be supervised by a qualified fauna spotter-catcher – Adverse incident response procedures implemented – CEMP to include protocols on fauna injury and mortality
Fragmentation of habitat and loss of connectivity	<ul style="list-style-type: none"> – Activities to be undertaken in existing disturbed areas
Disturbance to habitat from noise, light, and vibration	<ul style="list-style-type: none"> – Lighting to be kept to a minimum (unless required for safety reasons) – Construction activities to typically occur in daylight hours (unless night works are required for road crossings) – Implementation of a Traffic Management Plan – Maintenance schedule for construction vehicles
Habitat degradation and increased erosion	<ul style="list-style-type: none"> – CESC and ESCPs to include appropriate erosion and sediment controls – Vehicle movements to remain on dedicated tracks
Spread of invasive species	<ul style="list-style-type: none"> – Waste management plan, as part of the CEMP – Weed management plan and weed hygiene protocols, as part of the CEMP – Vehicle movements to remain on dedicated tracks

The construction and operation of the Project will result in disturbance to 153.9 ha, comprised of the following impacts:

- **Temporary impacts** – 138.26 ha
- **Permanent impacts** – 15.64 ha.

4.3.2 Operation phase

Table 4-6 Summary of impacts and mitigation measures (operation)

Impacting process	Mitigation and management measures
Injury or mortality	Low level vehicle movement approximately once per week along corridor
Disturbance to habitat from noise, light, and vibration	Lighting to be kept to a minimum (unless required for safety reasons) Operational works will typically be performed in daylight hours
Habitat degradation and increased erosion	ESCPs to include appropriate erosion and sediment controls Vehicle movements to remain on dedicated tracks
Spread of invasive species	Waste management plan, as part of the EMP Weed management plan and weed hygiene protocols, as part of the EMP Vehicle movements to remain on dedicated tracks

4.3.3 Maintenance

Table 4-7 Summary of impacts and mitigation measures (maintenance)

Impacting process	Mitigation and management measures
Injury or mortality	Adverse incident response procedures implemented EMP to include protocols on fauna injury and mortality
Disturbance to habitat from noise, light, and vibration	Lighting to be kept to a minimum (unless required for safety reasons) Maintenance activities to typically occur in daylight hours (unless night works are required for road crossings)
Habitat degradation and increased erosion	ESCPs to include appropriate erosion and sediment controls Vehicle movements to remain on dedicated tracks
Spread of invasive species	Waste management plan, as part of the EMP Weed management plan and weed hygiene protocols, as part of the EMP Vehicle movements to remain on dedicated tracks

5. Threatened flora species

5.1 *Eucalyptus raveretiana* (black ironbox)

5.1.1 Conservation status and documentation

Eucalyptus raveretiana is listed as Vulnerable under the EPBC Act.

This species is a tree growing to 25 m tall and is distinguished from other eucalypts by having the smallest fruit of the genus (less than 2 mm wide). It is generally restricted to the riparian zone of watercourses (i.e. below the high bank), growing in loams and clay soils between altitudes of 0 – 300 m. It is found in the region between Ayr in the north to Rockhampton in the south, and inland to Nebo (DAWE 2021; TSSC 2012). Within this range it is locally common on certain permanent streams but absent from many others. *Eucalyptus raveretiana* is usually co-dominant or sub-dominant with species such as *Melaleuca leucadendra*, *Melaleuca fluviatilis*, *Eucalyptus tereticornis* and *Corymbia tessellaris* (DEWHA 2008a).

5.1.2 Criteria used to map *Eucalyptus raveretiana* habitat

The Commonwealth conservation advice identified that *E. raveretiana* occurs on banks of rivers, creeks and other watercourses on clayey or loamy soil, codominant with the abovementioned species (Queensland Herbarium 2009; cited TSSC 2012). Potentially suitable sites for *E. raveretiana* intersecting the Project area were surveyed by three ecologists. Flora survey effort is shown in Figure 2.1. Confirmed records from the field survey and historical records within the desktop search extent were mapped for *E. raveretiana*.

5.1.3 Desktop results

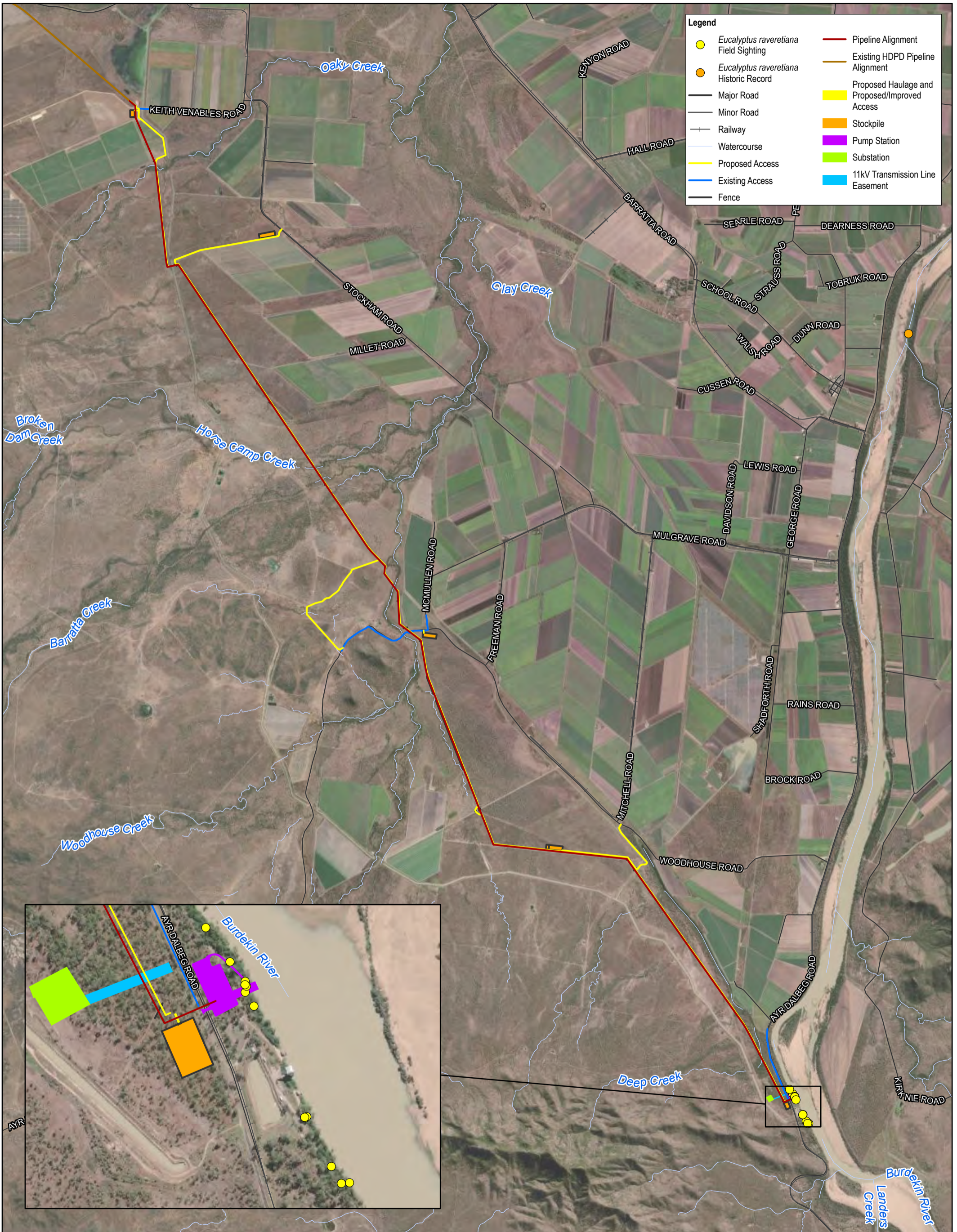
Eucalyptus raveretiana was identified within the PMST (Appendix B) as having potential to occur within a 30 km radius from a central point within the Project area. A search of WildNet (Appendix B) reported one historical record within 30 km of the search coordinates. Biomaps was used to determine the historical location – this search revealed that the species was recorded in 1949 downstream of the Project area along the bank of the Burdekin River in (what is today) Category B vegetation, approximately 11 km east from the pipeline alignment in RE11.3.25f/11.3.25b. The historical record is located adjacent to freehold land used for agricultural purposes.

5.1.4 Survey results

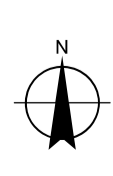
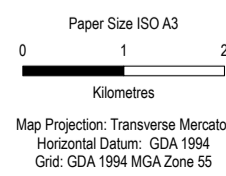
Thirteen adult *E. raveretiana* individuals were recorded during the field surveys. All individuals were recorded along the lower terrace and lower bank of the Burdekin River. Individuals were recorded in loose pale-yellow sands dominated by *E. tereticornis* with associated *Nauclea orientalis* over a lower mid-dense lower tree layer of *Ficus racemosa*, *F. opposita* and *Melaleuca leucadendra*. The species is known from 23 locations from Townsville to Nebo, Queensland, and historical records 11 km from the Project area indicates the species is present in areas outside of the Project area. Land use in the Project area and surrounding vicinity is primarily used for cattle grazing and agriculture. In potentially suitable habitat for *E. raveretiana* within the Project area, land clearing has impacted vegetation surrounding rivers, creeks and other watercourses. Depending on the construction methodology of the intake structure, the Project may result in the direct impact and removal of up to a maximum of four *E. raveretiana* individuals.



Plate 5.1 *Eucalyptus raveretiana* recorded during the field survey



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Townsville City Council
Houghton Pipeline Stage 2 - MNES Assessment

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Extent of Eucalyptus raveretiana within and surrounding the Project area

FIGURE 5-1

5.1.5 Significance of Project area

This section assesses the significance of *E. raveretiana* habitats within the Project area, whether they constitute habitat critical to the survival of the species, their importance in the context of the local population and whether the local population is important at a national level.

5.1.5.1 Status as an important population

An 'important population' for *E. raveretiana* has not been formally defined in the Commonwealth listing advice for the species. In the absence of a formal definition, the definition outlined in the Commonwealth Significant impact guidelines applies. 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.

The Project area is within the northern limits of the species distribution and known range. The local population is therefore considered an important population under the definition outlined in the EPBC Act.

5.1.5.2 Status as habitat critical to the survival of *Eucalyptus raveretiana*

Habitat critical to the survival of the species has not been formally defined in the Commonwealth listing advice for the species. In the absence of a formal definition, the definition outlined in the Commonwealth Significant impact guidelines applies. 'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary: for activities such as foraging, breeding, roosting, or dispersal; for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators); to maintain genetic diversity and long term evolutionary development, or; for the reintroduction of populations or recovery of the species or ecological community.

The Project area is not considered to be habitat critical to the survival of the species. The distribution of current and historical records along the Burdekin River suggests the species persists in areas outside of the Project area. In particular, Pollock (2012) found the species occurs within over 46 major river or creek systems within the Burdekin and Fitzroy River catchments. Therefore, the suitable habitat within the Project area itself is not considered to be critical to the long-term maintenance of the species as habitat in the surrounding region supports a relatively high abundance of populations and individuals that facilitate reproductive processes and maintain genetic diversity.

5.1.6 Threatening processes

Threats to *Eucalyptus raveretiana* (DAWE 2021; TSSC 2012) include:

- Invasive weeds including rubber vine
- Water resource development
- Loss and damage through timber harvesting.

5.1.7 Potential impacts

Thirteen *Eucalyptus raveretiana* individuals are located within the Project area. Depending on the construction methodology of the intake structure, the Project may result in the maximum removal of four *E. raveretiana* individuals.

Potential impacts include:

- Loss of habitat and individuals
- Habitat degradation by increased dust, runoff and sedimentation
- Introduction and spread of weed species.

5.1.7.1 Loss of habitat and individuals

The Preliminary design of the Project area has been sited to avoid the majority of the *E. raveretiana* individuals. However, dependent on the construction methodology of the intake structure, construction may result in removal of four *E. raveretiana* individuals.

5.1.7.2 Habitat degradation by increased dust, runoff and sedimentation

Construction activities have the potential to generate localised dust, erosion, run-off and sedimentation through increased vehicle movements, clearance of vegetation and earthworks. This can reduce the abundance and diversity of adjacent terrestrial and aquatic habitats by physically smothering vegetation, changing nutrient levels, impeding the growth and germination of plant species, encouraging weed incursions and altering the movement and behaviour of fauna species.

The receiving environment has already been subject to high levels of erosion and sedimentation as a result of existing land-clearing and grazing activities. Nevertheless, sensitive ecological receptors (e.g. larger open woodland remnants and aquatic habitats) are particularly susceptible to adverse impacts associated with dust, run-off, erosion and sedimentation. These areas require protection through the implementation of sediment and erosion control measures during construction.

Adverse weather conditions during construction can exacerbate the potential impact of erosion and sedimentation. High rainfall has the potential to remove exposed topsoil, destabilise creek beds and distribute sediment through creek lines. Strong winds have the potential to spread exposed topsoil, decreasing the likelihood of recolonisation by vegetation and potentially distributing dust into nearby sensitive environments.

5.1.7.3 Introduction and spread of weed species

The Project has the potential to adversely impact *E. raveretiana* by introducing or spreading exotic weed species. Invasive weeds including rubber vine are listed as a key threat to the species. As such, the introduction and spread of weeds can substantially reduce the ability for recruitment, longevity and growth *E. raveretiana*. The Project area is already highly degraded by weeds, including rubber vine. The Project has the potential to exacerbate the loss through introduction and spread of weeds. Clearing native vegetation creates areas of disturbance that are naturally susceptible to colonisation by invasive weed species. These can form a local source of future weed infestations within the surrounding landscape.

5.1.8 Measures to avoid, reduce or mitigate impacts

5.1.8.1 Loss of habitat and individuals

Planning phase measures that have been employed to avoid and reduce the direct loss of habitat and individuals including:

- Preliminary design has sought to minimise disturbance and removal of observed *E. raveretiana* individuals at the intake site
- Locating the Project area in open areas that have been subject to historical land clearing and cattle grazing
- Minimising impacts to watercourses
- Utilising existing tracks and locating proposed tracks within previously disturbed areas.

During the construction phase of the Project, the following mitigation measures will be employed:

- Land clearing will be restricted to the minimal amount necessary for the construction of the Project and will not extend outside of the Project area
- The extent of vegetation clearing (and any no-go areas) will be clearly identified on construction plans and in the field using high visibility fencing or flagging in the vicinity of high conservation significant areas. Clearing extents will be communicated to construction supervisors
- Where infrastructure crosses waterways, the Project area has been minimised to a 20 m wide construction corridor. Infrastructure is sited within 57.57 ha of non-remnant vegetation (part of substation and access roads), the Project area is sited within 96.34 ha of remnant and regrowth vegetation

- A CEMP will be prepared to inform actions with regards to managing weed hygiene, erosion, fuels and hazardous substances, fire, etc. and includes erosion and sediment control measures
- All construction personnel will attend environmental training as part of the site induction process prior to entering the work site. As part of this training, all personnel will be instructed on their obligations in regard to vegetation clearing protocols. Areas identified for vegetation clearance are to be clearly defined and detailed in site inductions.

5.1.8.2 Habitat degradation by increased dust, runoff and sedimentation

The following mitigation measures will be used to minimise the impacts of dust, run off and sedimentation during construction of the Project:

- Erosion and sediment controls have been developed as part of the CEMCP and will be expanded on by the construction Contractor as part of their ESCPs
- Routine dust suppression and monitoring will be undertaken throughout construction and operation
- Duration of in-stream works will be minimised wherever practicable to reduce the potential for sedimentation
- Erosion and sediment control measures will be installed where in-stream disturbance must be undertaken during flow conditions
- Areas subject to clearing will be stabilised as soon as practicable
- All vehicle movement will be restricted to designated tracks located within the Project area
- Weather conditions will be monitored during the construction stage and temporary controls will be established during extreme weather events
- Construction activities during adverse weather conditions will be managed in accordance with the CEMP.

5.1.8.3 Introduction and spread of weed species

The following measures will be implemented to minimise the introduction and spread of weeds:

- Weed management actions are included in the CEMP and include:
 - Hygiene protocols restricting the movement of vegetation and soil between impacted areas and areas of significantly lower weed infestation
 - Protocols for monitoring and management of weeds to identify and appropriately respond to significant changes in weed distribution and density
- All vehicles / equipment travelling from a declared restricted place or quarantine area will be required to wash down and possess a current weed hygiene inspection certificate before moving to a weed free area or commencing construction works onsite. The weed hygiene inspection certificate is to be obtained from an inspector who is deemed competent and is certified in line with Department of Agriculture and Fisheries (DAF) requirements
- Vehicle access will be restricted to within the Project area and existing roads and tracks.

5.1.9 Summary of residual impacts on *Eucalyptus raveretiana*

A summary of the Project's potential impacts on *E. raveretiana*, and measures to avoid and minimise impacts, is presented in Table 5-1. The risk rating criteria are outlined in Appendix E.

Table 5-1 Residual impact assessment for the *Eucalyptus raveretiana*

Impact	Initial impact rating	Mitigation measures	Residual impact	Effectiveness
Loss four individuals	High	Preliminary design has sought to minimise disturbance and removal of observed <i>E. raveretiana</i> individuals at the intake site Revegetate temporarily cleared areas (e.g. laydown areas) with native species.	Moderate	Low effectiveness
Habitat degradation through increased dust, run-off and sedimentation.	Low	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions or employ and water truck to reduce dust rates.	Negligible	High effectiveness
Introduction and spread of invasive weed species	Moderate	Implement measures for introduced flora (to be outlined in the CEMP). Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works. Educate staff on the impacts of weeds and their general environmental obligation. Identify areas of dense outcrops of introduced flora to eliminate construction vehicles from entering the area.	Low	Moderate effectiveness

5.1.10 Significance of impact assessment

An assessment against the Commonwealth Significant impact guidelines (DoE 2013) for *E. raveretiana* was undertaken and is provided in Table 5-2.

Table 5-2 Significance of impacts on *Eucalyptus raveretiana*

Impact criteria	Potential to occur
Lead to a long-term decrease in the size of an important population of the species.	Unlikely The local individuals are classified as an important population under the definition outlined in the EPBC Act. Depending on the construction methodology of the intake structure, the Project will result in the maximum direct loss of four individuals of the 13 recorded along the bank. With 23 known populations of the species located between Townsville and Nebo (additionally, Pollock (2012) found the species occurs within over 46 major river or creek systems within the Burdekin and Fitzroy River catchments), the loss of four individuals is not expected to lead to a long-term decrease in the size of an important population of the species. Suitable habitat is present along the Burdekin River, and the Project is unlikely to have any substantial operational impacts on this species. As such, the Project is therefore unlikely to 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.	Unlikely Depending on the construction methodology of the intake structure, the Project may result in the direct loss of four individuals of the 13 recorded along the bank. Although the recorded population is considered an important population, an individual has historically been recorded 11 km from the Project area along the Burdekin River. With 23 known populations of the species located between Townsville and Nebo, the loss of four individuals is not expected to reduce the area of occupancy of the species. Given the Project is unlikely to have any substantial impact on the species in the operational phase, and the continued presence of

Impact criteria	Potential to occur
	suitable habitat within the local area, the Project is therefore unlikely to reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations.	<p>Unlikely</p> <p>Depending on the construction methodology of the intake structure, the Project may result in the direct loss of four individuals of the 13 recorded along the bank. The Project will not directly impact the majority of individuals recorded during the field survey. Taking into consideration the extent of clearing and the reproductive processes of the species, no fragmentation into two or more populations will occur. Furthermore, given the Project is also unlikely to have any substantial impact on the species in the operational phase, the Project is therefore unlikely to fragment an existing important population into two or more populations.</p>
Adversely affect habitat critical to the survival of a species.	<p>Unlikely</p> <p>Habitat within the Project area is not considered to constitute habitat critical to the survival of the species. In his 2012 assessment of the conservation status of <i>E. raveretiana</i>, Pollock found the species occurs within over 46 major river or creek systems within the Burdekin and Fitzroy River catchments and estimated an overall population size of between approximately 68, 000 and 140, 000 individuals. Since Pollock’s paper was produced in 2012 a large new population has been recorded in the vicinity of the Burdekin Dam (P. Moonie, <i>pers comm.</i>). Therefore, this estimate is likely to be conservative.</p> <p>With an estimated 3,000 individuals along the Burdekin River, the loss of these individuals is likely to represent 0.13% of the Burdekin River population, and 0.06% of the greater Burdekin (Charters Towers-Haughton River) regional population based on an estimated regional population of 7,210 individuals (Pollock 2012). Pollock (2012) estimated that 120 km of suitable habitat was present along the Burdekin River, with the Project likely to impact approximately 0.05 km of suitable habitat for the species. Locally abundant populations and individuals facilitate reproductive processes and maintain genetic diversity, such that the Project area itself does not constitute habitat critical to survival of the species, such that the Project is unlikely to adversely affect habitat critical to the survival of the species.</p>
Disrupt the breeding cycle of an important population.	<p>Unlikely</p> <p><i>Eucalyptus raveretiana</i> seed production and release occurs in late summer to mid-autumn, which coincides with the late wet season to early dry season (Pollock 2012). Pollock postulated that the successful establishment of seedlings may be dependent on the availability of sand and cobble beds that are moist, shaded and have been scoured of competing ground and shrub layer vegetation by flood events. Deep sands exposed to the sun appeared to be unsuitable for successful seedling establishment. Pollock (2012) noted that where it was observed, regeneration was dense, and that “the presence of an adjacent parent “seed-tree” appeared essential, and suggested that seed is not soil-stored, in common with virtually all <i>Eucalyptus</i> species.</p> <p>The Project may result in the direct loss of four individuals of the 13 recorded along the bank. Suitable habitat is present within the local context, and the species has potential to recruit <i>E. raveretiana</i> seedlings. The Project will only impact a small proportion of riparian habitat which is suitable for the species to occur.</p> <p>Insects are presumed the primary pollinators for the species (DAWE 2021); no impacts on insect presence or movement in the local landscape are anticipated to occur as a result of the Project. The Project will not directly impact the majority of riparian habitat or the individuals recorded during the field survey. Therefore the Project is considered unlikely to disrupt the breeding cycle of an important population.</p>
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	<p>Unlikely</p> <p>The Project has the potential to result in the removal of four <i>E. raveretiana</i> individuals. Pollock (2012) estimated the Burdekin River provides 120 km of suitable stream length for the species. With an estimated 3,000 individuals along the Burdekin River, the loss of these individuals is likely to represent 0.13% of the Burdekin River population, and 0.06% of the greater Burdekin (Charters Towers-Haughton River) regional population based on an estimated regional population of 7,210 individuals (Pollock 2012). Without the implementation of mitigation measures, the construction phase has the potential to indirectly impact habitat through increased runoff, dust and sedimentation, introduction and spread of invasive weed species. The implementation of erosion and sediment controls, weed management actions and other mitigation measures are likely to avoid impacting the quality of habitat for the species. Given the Project is unlikely to have any substantial impact on the population of species in the construction phase, and negligible impact are anticipated in the operational phase, the Project is therefore unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.</p>

Impact criteria	Potential to occur
Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species habitat.	<p>Unlikely</p> <p>The Commonwealth listing advice lists smothering by rubber vine as a key threat to <i>E. raveretiana</i>. Rubber vine was recorded extensively throughout the Project area. Without the implementation of mitigation measures, the construction and operation of the Project has the potential to result in the further spread of rubber vine. The implementation of weed management actions is likely to reduce the extent of rubber vine and other invasive weed species impact across the Project area. As such, the Project is unlikely to result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species habitat</p>
Introduce disease that may cause the species to decline.	<p>Unlikely</p> <p>The Commonwealth listing advice does not list disease as a key threat to the species (TSSC 2012). Nevertheless, hygiene management measures will be utilised during the construction phase to avoid introduction of any diseases. The construction and operation phase of the Project is unlikely to introduce disease that may cause the species to decline.</p>
Interfere substantially with the recovery of the species	<p>Unlikely</p> <p>The Project may result in the direct loss of four <i>E. raveretiana</i> individuals of the 13 recorded along the bank. Suitable habitat is present within the local context, the individuals have potential to recruit <i>E. raveretiana</i> seedlings. The Project will not directly impact the majority of individuals recorded during the field survey. Therefore the Project is considered unlikely to interfere substantially with the recovery of the species.</p>

5.1.11 Conclusion

The Project is **unlikely** to have a significant impact on *E. raveretiana*.

6. Threatened fauna species

Field data collected subsequent to the Referral decision has resulted in a refinement in vegetation and habitat mapping. As such, this has had a bearing on the habitat area calculations for MNES (species that were 'confirmed present' or 'likely to occur').

For key threatened species considered 'may occur' (ghost bat, large-eared horseshoe bat, , yakka skink and Mt Cooper striped lerista) or 'unlikely to occur' (northern quoll, red goshawk and grey falcon) within the likelihood of occurrence, the Project is considered to result in minimal to negligible impacts to the aforementioned species. As such, no habitat mapped was undertaken for these species. Additionally, detailed assessments of impacts against the Commonwealth Significant impact guidelines is not considered necessary.

6.1 Koala

6.1.1 Conservation status and documentation

The koala is listed as Endangered under the EPBC Act.

The koala occurs in coastal and inland habitats from the Herberton area in Queensland, westward into hotter and dryer semi-arid climates through central Queensland, and south into coastal and inland New South Wales and the Australian Capital Territory. The species' distribution is not continuous across this range (DAWE 2022b).

The koala has a specialist diet, feeding on the leaves of select species of *Eucalyptus*, *Lophostemon*, *Corymbia*, *Angophora* and occasionally *Melaleuca* and *Leptospermum* (Martin and Handasyde 1999; Moore and Foley 2000). Consequently, koalas are reliant on access to stands of forest and woodland that support those key food-tree species. Shelter (non-food) tree species are also used to rest and assist in thermoregulation (Crowther et al. 2013; Briscoe et al. 2015).

Koala habitat is generally defined as coastal and inland areas characterised by *Eucalyptus* forests and woodlands (DAWE 2022b). Koala habitat includes places that contain resource necessary for foraging, survival, growth, reproduction and movement. This may include places such as forests or woodlands, road-side and rail vegetation and paddock trees, safe intervening ground matrix for travelling between trees and patches to forage and shelter and reproduce, and access to vegetated corridors or paddock trees to facilitate movement between patches (DAWE 2022b).

The way in which koalas move through the landscape also influences their use of habitat. In general, koalas are relatively sedentary, typically changing trees only a few times each day (DAWE 2021). Koala movement increases in spring when young dispersing males move distances of up to 10 km in urban south-east Queensland (Dique et al. 2003) and 16 km in rural south-east Queensland (White 1999). For the rest of the year koalas move relatively little within home ranges that vary between 8 ha and 135 ha (Ellis et al. 2002; Goldingay and Dobner 2014). Home range size generally increases with distance from the coast, as inland koalas need to move more widely to derive sufficient sources of food and water (Davies et al 2013).

Key factors that influence the quality of habitat for koalas are the presence and density of preferred food tree species, food trees' nutritional foliar chemistry, and shelter trees and vegetation structure. Koalas move between trees and patches, and the safety or hostility of these areas also contributes to the quality of koala habitat (DAWE 2022c). Broadly, these are determined by a number of factors including climate variables, disturbance (i.e. fire, vegetation clearance), and landforms of the natural and built environment. At a landscape scale, the total amount of available habitat and its' quality are the primary factors that influence koala presence (DAWE 2022c). In the assessment of habitat quantity and quality, the National Recovery Plan for the koala (DAWE 2022c) highlights the importance of considering landscape patch size, form and spatial configuration within the context of the wider landscape, which can vary among landscapes and varies regionally (DAWE 2022c). In fragmented landscapes, the use of isolated paddock trees is commonly recorded, along with the use of roadside vegetation. In more arid areas, riparian habitats and surface water bodies are essential for the survival of koalas, particularly in the western margins of the species' distribution. Additionally, riparian vegetation facilitates local movement and provides important dispersal pathways for long-distance movement (DAWE 2022c).

6.1.2 Survey effort

Surveys for the koala were undertaken using methods recommended in Section 5 of the Referral guidelines for the vulnerable koala (DoE 2014a) – noting that these guidelines are now superseded, but were applicable at the time when the survey was designed. A summary of ecological survey effort is provided in Table 2-1 and shown in Figure 2.2.

Targeted surveys for the koala were based on:

- Targeted searches for faecal pellets using the SAT technique (Phillips and Callaghan 2011). This was undertaken by two ecologists at 55 locations across the Project area over a six-day survey in Spring 2021 fauna survey and 4-day survey in Autumn 2022
- Assessments of koala habitat value undertaken at eight RE confirmation sites within the Project area.

6.1.3 Criteria used to map koala habitat

6.1.3.1 Commonwealth habitat definition

Conservation advice for *Phascolarctos cinereus* (DAWE 2022b)

The definition of koala habitat presented in the Commonwealth conservation advice includes:

'Forests or woodlands, road-side and rail vegetation and paddock trees, safe intervening ground matrix for travelling between trees and patches to forage and shelter and reproduce and access to vegetated corridors or paddock trees to facilitate movement between patches. These resources fall within individual koala's home ranges and allow for interaction with adjacent individuals.'

'Crucial habitat elements include patches and corridors for gene flow. Over longer-time frames habitat critical includes climate refugia such as drainage lines, riparian zones and patches that are resilient to drying conditions due to favourable hydrological systems.'

Referral guidelines for the vulnerable koala (DoE 2014a)

Habitat for the koala has been mapped for the Project area using criteria outlined within the (now redundant, although applicable at the time of survey design and data collection) Referral guidelines for the vulnerable koala (DoE 2014a). As the Project area is located in a contiguous landscape (i.e. < 500 ha but > 300 ha) within the coastal context (i.e. > 800 mm annual rainfall), the definition of coastal koala habitat has been used.


The coastal koala habitat definition in the Referral guidelines for the vulnerable koala (DoE 2014a) includes *'Any forest or woodland containing species that are known koala food trees, or shrubland with emergent food trees. In the coastal context, this can include small, isolated patches of native vegetation in rural, urban or peri-urban areas, narrow areas of native vegetation along riparian areas or linear infrastructure and isolated food and/or shelter trees.'* (DoE 2014a). This relies on the Specht (1970) definitions of forest, woodland, shrubland and sparsely distributed woodland.


6.1.3.2 Criteria used to map koala habitat within the Project area

Consistent with the koala habitat definition outlined in the conservation advice for the koala (DAWE 2022b), habitat was mapped according to the following habitat types, as detailed in Table 6-1:

- Forests or woodlands. These resources fall within individual koala's home ranges and allow for interaction with adjacent individuals
- Road-side and rail vegetation and paddock trees, safe intervening ground matrix for travelling between trees and patches to forage and shelter and reproduce and access to vegetated corridors or paddock trees to facilitate movement between patches. These resources fall within individual koala's home ranges and allow for interaction with adjacent individuals. These areas were manually selected using ArcGIS. While the majority of non-remnant vegetation within the Project area was included as potential koala habitat, a number of refinements were made. These included removing areas that are currently, or have historically, been cleared for cropping/agriculture, as well as access tracks adjacent to these cleared agriculture areas.

Table 6-1 Criteria used to map koala habitat

Habitat type	Definition and mapping criteria	Representative vegetation
<p>Koala habitat includes forests or woodlands. These resources fall within individual koala's home ranges and allow for interaction with adjacent individuals.</p>	<p>Mapping was based on field verified RE mapping (RE verified at 40 locations and BioCondition at 18 sites), mapping all remnant and high-value regrowth for the following RE communities which contain the koala food trees listed by DoR as essential habitat factors within 10 km of the Project area include:</p> <ul style="list-style-type: none"> – 9.12.1 <i>Eucalyptus crebra</i> and/or <i>E. xanthoclada</i> and/or <i>E. drepanophylla</i> low open woodland on igneous rocks – 9.12.4 <i>Eucalyptus shirleyi</i> and/or <i>E. melanophloia</i> and/or <i>Corymbia peltata</i> and/or <i>Callitris intratropica</i> low open woodland on igneous rocks – 9.12.19 <i>Eucalyptus crebra</i> or <i>E. granitica</i> +/- <i>Corymbia citriodora</i> subsp. <i>citriodora</i> +/- <i>E. portuensis</i> mixed woodland on igneous hills – 9.12.22 <i>Eucalyptus drepanophylla</i>, <i>Corymbia clarksoniana</i> or <i>C. intermedia</i> and <i>C. dallachiana</i> woodland on steep rugged igneous ranges – 9.12.24 <i>Eucalyptus drepanophylla</i> or <i>E. crebra</i> and/or <i>E. xanthoclada</i> and <i>Corymbia peltata</i> woodland on igneous rocks – 11.3.4 <i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains – 11.3.4a <i>Corymbia tessellaris</i> woodland – 11.3.7 <i>Corymbia</i> spp. open woodland on alluvial plains – 11.3.9 <i>Eucalyptus platyphylla</i>, <i>Corymbia</i> spp. woodland on alluvial plains – 11.3.10 <i>Eucalyptus brownii</i> woodland on alluvial plains – 11.3.12 <i>Melaleuca viridiflora</i>, <i>M. argentea</i> +/- <i>M. dealbata</i> woodland on alluvial plains – 11.3.13 <i>Grevillea striata</i> open woodland on coastal alluvial plains – 11.3.25 <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines – 11.3.25b <i>Melaleuca leucadendra</i> and/or <i>M. fluviatilis</i>, <i>Nauclea orientalis</i> open forest – 11.3.30 <i>Eucalyptus crebra</i>, <i>Corymbia dallachiana</i> woodland on alluvial plains – 11.3.33 <i>Eremophila mitchellii</i> open woodland on alluvial plains – 11.3.35 <i>Eucalyptus platyphylla</i>, <i>Corymbia clarksoniana</i> woodland on alluvial plains – 11.3.35a <i>Corymbia tessellaris</i>, <i>C. clarksoniana</i> and <i>Eucalyptus platyphylla</i> woodland – 11.11.1 <i>Eucalyptus crebra</i> +/- <i>Acacia rhodoxylon</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding 	

Habitat type	Definition and mapping criteria	Representative vegetation
	<ul style="list-style-type: none"> - 11.11.15 <i>Eucalyptus crebra</i> woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics - 11.12.1 <i>Eucalyptus crebra</i> woodland on igneous rocks - 11.12.9 <i>Eucalyptus platyphylla</i> woodland on igneous rocks 	
<p>Koala habitat includes road-side and rail vegetation and paddock trees, safe intervening ground matrix for travelling between trees and patches to forage and shelter and reproduce and access to vegetated corridors or paddock trees to facilitate movement between patches. These resources fall within individual koala's home ranges and allow for interaction with adjacent individuals.</p>	<p>Any patches of non-remnant vegetation that is not mapped. These were mapped using high resolution aerial imagery based on ground-truthed information from field observations.</p>	

6.1.4 Desktop results

The koala was identified within the PMST (Appendix B) as known to occur within a 30 km radius from a central point within the Project area. One historical koala record occurs within a 30 km radius, located approximately 2 km west of the southern extent of the Project alignment. This record is not recent, recorded in 1987 on remnant RE 11.3.35/11.3.30/11.3.7. Aerial imagery and desktop searches infer the historical record is located in what is currently mapped as mixed *Eucalyptus* and *Corymbia* woodland/open woodland on alluvial plains. Land use in the region has been disturbed from decades of cattle grazing. The distribution of historical koala records and DoR mapped essential habitat for the koala on and adjacent to the Project area is mapped in Figure 6.1. One polygon of essential habitat for the koala is mapped southwest of the Project area. Essential habitat is buffered around the historical koala record. There are very few records of the koala on the Townsville/Ayr floodplain. Population estimates undertaken for the koala estimated 15,179 koalas in the Brigalow Belt North bioregion (DAWE 2022b).

6.1.5 Survey results

No koalas or koala faecal pellets were observed during field surveys in the Project area. However, koalas were considered likely to occur, with transient individuals likely to occur at very low densities within the Project area. At watercourses, known to be important for koala movement in the region, koala food trees (i.e. *Eucalyptus platyphylla*, *E. dallachiana* and *Corymbia clarksoniana*) occurred in low densities and were interspersed with high local densities of non-food trees such as *Melaleuca leucadendra*. Dense rubber vine (*Cryptostegia grandiflora*) and chinese apple (*Ziziphus mauritiana*) would also tend to restrict koala mobility along the watercourses. One record of the species has been historically recorded approximately 2 km south-west of the Project area's southern extent in 1987. Very few records of the koala have been historically recorded on the Townsville/Ayr floodplain. The value of koala habitat as habitat critical to the survival of the species has been assessed in detail in Section 6.1.6.2 and was considered likely to support habitat critical to the survival of the species.

Suitable koala habitat is broadly mapped across the Project area. Areas of forest or woodland, road-side and paddock trees, safe intervening ground matrix for travelling between trees and patches to forage and shelter and reproduce and access to vegetated corridors or paddock trees to facilitate movement between patches occur across the Project area. Generally, the Project area is part of a contiguous landscape which provides north-south habitat connectivity through forest, woodland or shrubland with mature to emergent growth. Patches of non-remnant historically cleared grazing pastures are present in sparse patches across the Project area, predominantly in the southern and northernmost sections of the Project area. The Project area is connected to remnant habitat further west and north providing connectivity to larger areas for dispersal and movement. Non-remnant agricultural land restricts connectivity to the east, with the Burdekin River to the south-east of the Project area another barrier to movement. Irrigation channels that run north-south along much of the Project area would restrict local koala movement in places, limiting connectivity.

Although parts of the Project area have been historically cleared for grazing pastures, substantial connectivity is present in woodland and open woodland, especially in the southern portion of the Project area. The central and northern portion of the Project area contain areas existing as regrowth woodland to open woodland with grassy understorey, in these areas riparian fringes would also likely be important for facilitating koala movement for transient individuals.



Plate 6.1 *Remnant koala open woodland and woodland habitat*



Plate 6.2 *Very sparse open woodland habitat*



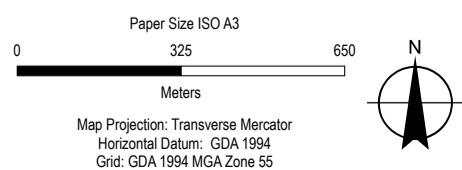
Plate 6.3 *Riparian habitat*



Plate 6.4 *Chinee apple and dense rubber vine areas*



Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

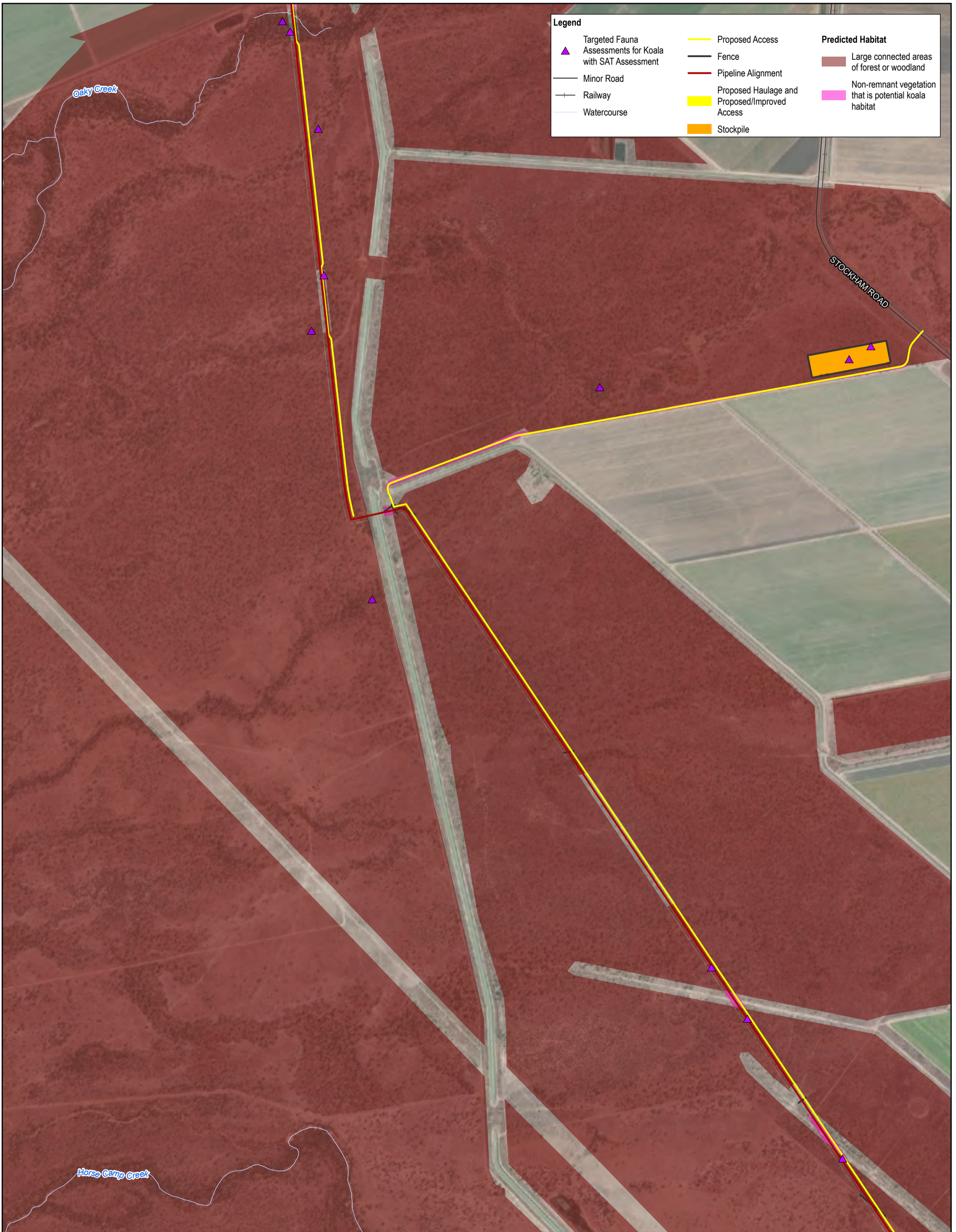


Townsville City Council
Haughton Pipeline Stage 2 - MNES Assessment

Project No. 12537606
Revision No. 3
Date 9/29/2022

Distribution of predicted koala habitat
within and surrounding the Project area

FIGURE 6-1



Legend

▲ Targeted Fauna Assessments for Koala with SAT Assessment	— Proposed Access	Predicted Habitat
— Minor Road	— Fence	■ Large connected areas of forest or woodland
— Railway	— Pipeline Alignment	■ Non-remnant vegetation that is potential koala habitat
— Watercourse	■ Proposed Haulage and Proposed/Improved Access	
	■ Stockpile	

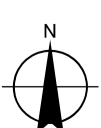
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Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

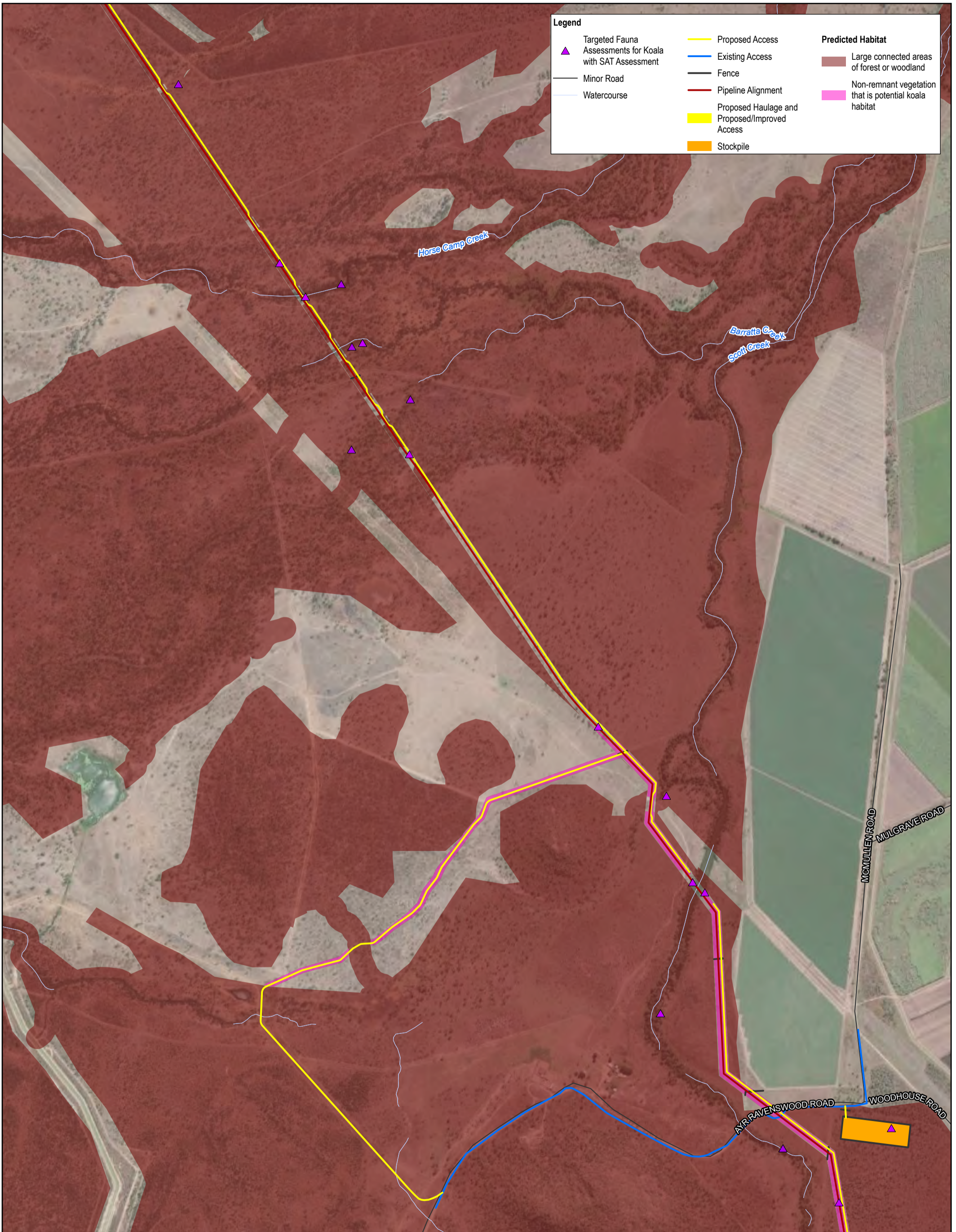


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Distribution of predicted koala habitat within and surrounding the Project area

FIGURE 6-1



Legend

▲ Targeted Fauna Assessments for Koala with SAT Assessment	— Proposed Access	Predicted Habitat
— Minor Road	— Existing Access	■ Large connected areas of forest or woodland
— Watercourse	— Fence	■ Non-remnant vegetation that is potential koala habitat
	— Pipeline Alignment	
	■ Proposed Haulage and Proposed/Improved Access	
	■ Stockpile	

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Project No. 12537606
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Date 9/29/2022

Distribution of predicted koala habitat within and surrounding the Project area

FIGURE 6-1



Legend

▲ Targeted Fauna Assessments for Koala with SAT Assessment	— Proposed Access	Predicted Habitat
— Minor Road	— Fence	■ Large connected areas of forest or woodland
— Watercourse	— Pipeline Alignment	■ Non-remnant vegetation that is potential koala habitat

Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

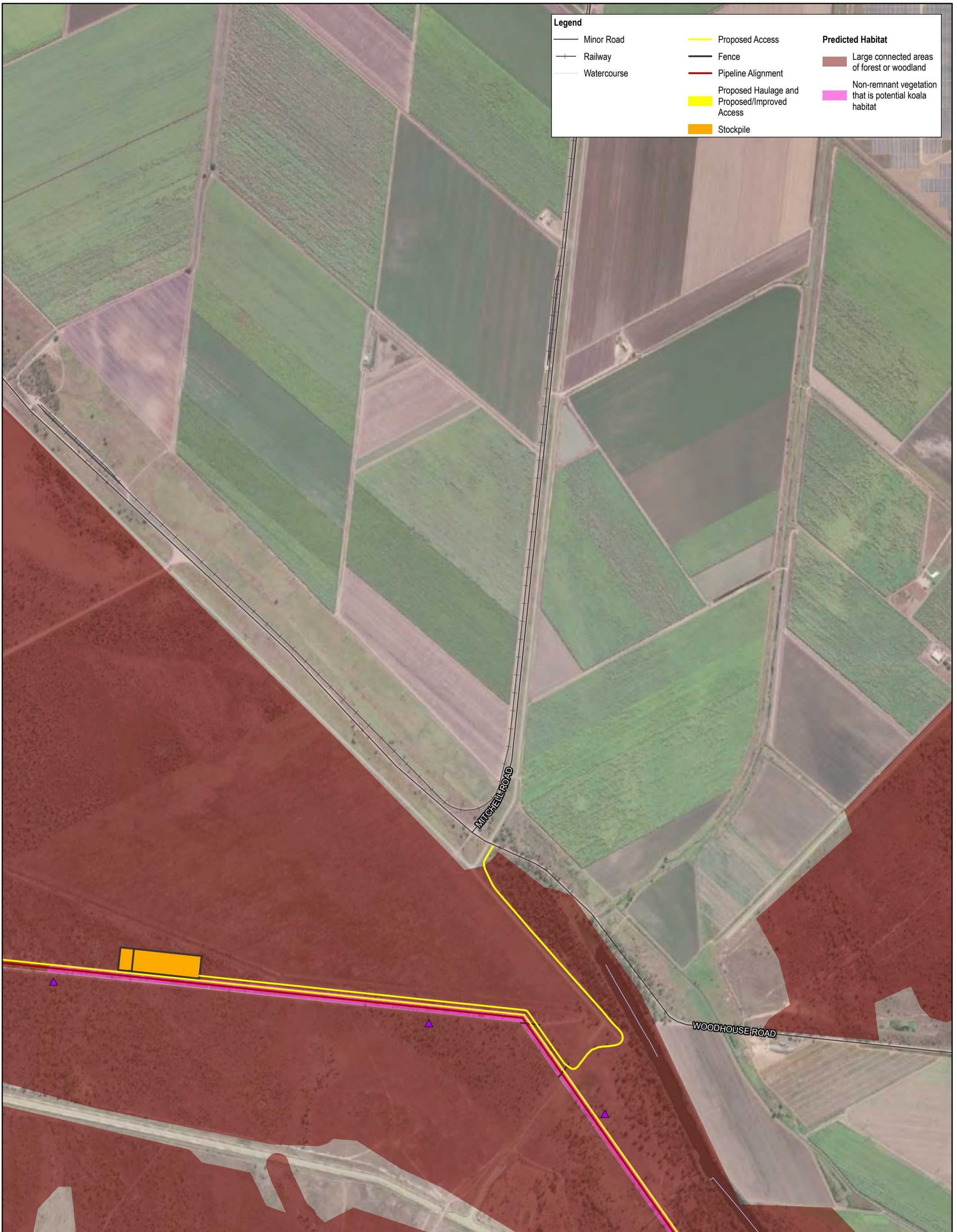


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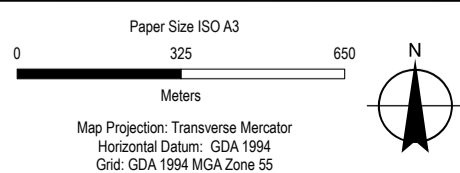
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Distribution of predicted koala habitat within and surrounding the Project area

FIGURE 6-1



Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

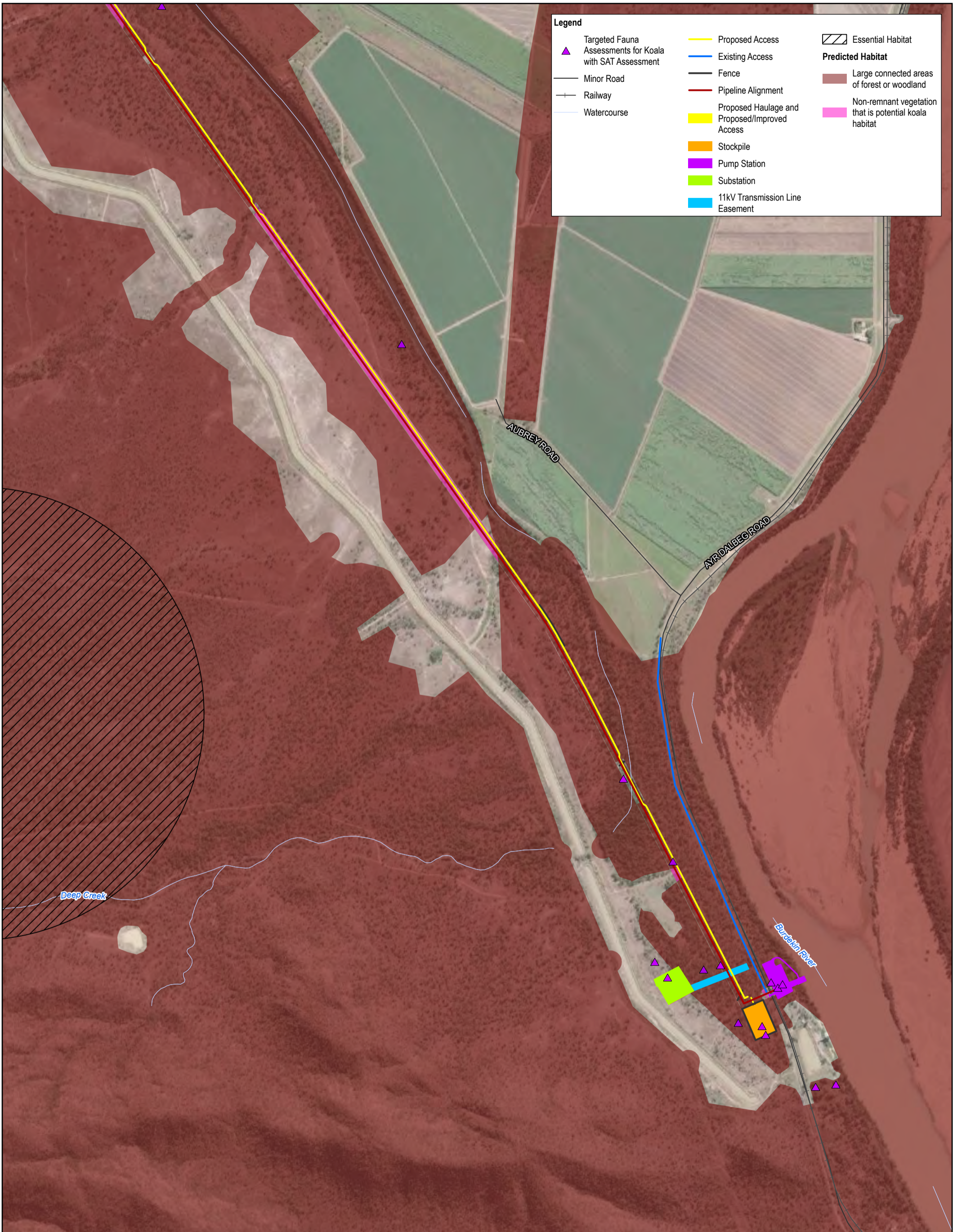


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Distribution of predicted koala habitat
within and surrounding the Project area

FIGURE 6-1



Legend

▲ Targeted Fauna Assessments for Koala with SAT Assessment	— Proposed Access	▨ Essential Habitat
— Minor Road	— Existing Access	Predicted Habitat
— Railway	— Fence	■ Large connected areas of forest or woodland
— Watercourse	— Pipeline Alignment	■ Non-remnant vegetation that is potential koala habitat
	■ Proposed Haulage and Proposed/Improved Access	
	■ Stockpile	
	■ Pump Station	
	■ Substation	
	— 11kV Transmission Line Easement	

Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

Paper Size ISO A3

0 325 650

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



Townsville City Council
Haughton Pipeline Stage 2 - MNES Assessment

Project No. 12537606
Revision No. 3
Date 9/29/2022

Distribution of predicted koala habitat within and surrounding the Project area

FIGURE 6-1

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Print date: 29 Sep 2022 - 15:07c
Data source: DoR: Roads, Railway, Watercourses, Essential Habitat v10 (2021); GHD: Site Layout, Field Survey, Potential Habitat (2022); DES: Wildnet Records (2021); World Imagery: Maxar. Created by: shaz2

6.1.6 Significance of Project

This section assesses the significance of koala habitats within the Project area, whether they constitute habitat critical to the survival of the species, their importance in the context of the local population and whether the local population is important at a national level.

6.1.6.1 Status as an important population

The concept of ‘important populations’ has been applied to the koala as per the definitions in DAWE 2022b (noting that for Endangered species, the ‘important population’ concept is not applicable for significant impact assessments):

- For conservation of the listed koala, among other reasons, it will be imperative to maintain populations that:
 - Have the potential to act as source populations to adjacent areas of suitable, or potentially suitable, habitat
 - Exist in areas of climatically suitable refugia during periods of environmental stress including droughts, heatwaves, and long-term climate change
 - Are genetically diverse
 - Are disease free and/or exhibit low rates of infection with important pathogens
 - Contain genes which may confer adaptation to current and future environmental stressors
 - Are geographical or environmental outliers within the species’ range.
- Populations that are also valued for social, cultural or economic reasons, and may or may not overlap with populations listed above:
 - Cultural and spiritual importance to Indigenous people
 - The social value and enjoyment of having koalas close to residential areas
 - The economic value brought to local business and tourism
 - The iconic species value at the national and international political and community level.

The low density of historical records within the Project area and geographical location would suggest the local population is not likely to be classified as an important population. However, at the national level, the Queensland subpopulation occurring north of the Clarence Valley in New South Wales is considered a genetically important population (DAWE 2022b).

6.1.6.2 Status as habitat critical to the survival of the species

The definition of habitat critical to the survival of the koala is formally defined in the conservation advice for *Phascolarctos cinereus* (DAWE 2022b) as ‘the areas that the species relies on to avoid or halt decline and promote the recovery of the species.’

Prior to conducting the significant impact assessment, an assessment to identify whether the Project area represented ‘habitat critical to the survival of the species’ was conducted using the criteria outlined in the species approved conservation advice (DAWE 2022b). The outcomes of the assessment deemed the Project area is likely to support habitat critical to the survival of the species. This assessment is present in Table 6-2.

Table 6-2 Assessment for habitat critical to the survival of the species - koala

Consideration	Assessment
Under the EPBC Act, the following factors and any other relevant factors may be considered when identifying habitat that is critical to the survival of a species:	
Whether the habitat is used during periods of stress (examples flood, drought or fire)	Half of the Project area is located within the basin 1% AEP flood level. The Project area is situated within a relatively flat landscape and is adjacent to the Burdekin River. As such, the Project area is likely to represent flood refugia habitat. The Project area is unlikely to represent suitable fire refugia habitat. The majority of the Project area supports non-remnant grazing areas or <i>Eucalyptus</i> mature and regrowth woodland to open woodland with a dense grassy understory. This vegetation is likely to facilitate fast fire spread due to the abundance of flammable biomass. In the surrounding landscape, suitable refugia habitat occurs along the Burdekin River and Scott Creek. These areas are intersected by the Project area; however, construction methodologies

Consideration	Assessment
	have been considered to reduce impact to these refugia (i.e. underboring) and are therefore unlikely to be impacted by the proposed works.
Whether the habitat is used to meet essential life cycle requirements (examples foraging, breeding, nesting, roosting, social behaviour patterns or dispersal processes)	The koala is likely to temporarily utilise the Project area for foraging and dispersal. No evidence of koala is present in the Project area and only one record is reported within 2 km of the Project (record from 1987). The Project exists within a landscape that has been heavily degraded and disturbed by decades of cattle grazing and sugar cane agriculture within and adjacent to the Project area, accordingly, threats to koala are likely to be prevalent within the landscape. The pipeline alignment intersects open woodland to very sparse open woodland. Although koalas are anticipated to utilise the Project area on an infrequent basis, the Project area would act as habitat used to meet essential life cycle requirements, particularly foraging and dispersal processes. Accordingly, the habitat represents habitat critical to the survival of the species.
The extent to which the habitat is used by important populations	The Project area is relatively isolated in the landscape, surrounded by extensive agriculture to the east and non-remnant vegetation is scattered across the Project area (predominantly in the southern and northern portions). The Project area is connected to remnant habitat further north and west, and thus the Project area intersects connectivity and dispersal pathways for the species within the region. The Project area is unlikely to support a large koala population, - the Project area occurs in a landscape in which there are very few recent records of the species - with koala food trees generally occurring in low densities, providing limited availability of foraging resources and presence of multiple threats (i.e. wild dogs, vehicles). Rather, the species is likely to occur in a temporary nature or as a dispersal pathway to alternative areas of habitat. There was no evidence of koala utilisation at the site during surveys and there is a lack of documented historical records in the area. As such, the Project area is unlikely to be utilised by an important population.
Whether the habitat is necessary to maintain genetic diversity and long-term evolutionary development	The Project is unlikely to be necessary to maintain genetic diversity and long-term evolutionary development. Whilst the Project is likely to be utilised for dispersal, the Project area is located on the easternmost boundary of a State terrestrial corridor connecting the Project area to higher value habitat further north and west (i.e. Mingela State Forest). The State terrestrial corridor is bound by the Burdekin River, as such the Project area does not connect the terrestrial corridor further east. Due to the low densities at which koalas occur within the region, the local population is unlikely to be of substantial value in maintaining genetic diversity at a species level.
Whether the habitat is necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements	The southern section of the Project area is mapped within a State terrestrial corridor, it is located in the south-western boundary of the corridor (bound by Burdekin River to the east and agricultural/grazing disturbed land to the north). As such, koalas have potential to use the Project area as a local dispersal corridor to other connected areas. However as the Project area is situated within an historically disturbed landscape, the species is likely to use the Project area in low densities where it provides foraging resources and dispersal pathways for the koala, connecting the species to higher-value habitat further west. These areas are likely to facilitate essential life cycle requirements for the koala. The Project area is considered likely to support habitat critical to the survival of the koala.
Whether the habitat is necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation	The Project is unlikely to represent habitat necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation. This is owing to a long history of disturbance within the Project area, sub-optimal condition of vegetation and presence of multiple threats within the surrounding landscape.
Any other way in which habitat may be critical to the survival of a listed threatened species or a listed threatened ecological community	No additional ways identified.

6.1.7 Threatening processes

Koala populations within eastern Australia have declined due to a number of threats, these include (DAWE 2022b):

- Loss of climatically suitable habitat
- Increased intensity/frequency of drought
- Increased intensity/frequency of heatwaves
- Increased intensity/frequency of bushfire
- Declining nutritional value of foliage
- Clearing and degradation of koala habitat
- Encounter mortality with vehicles and dogs
- Koala retrovirus (KoRV) and Chlamydia (*Chlamydia pecorum*).

6.1.8 Potential impacts

Potential impacts on koala populations and habitat within the Project area include:

- Loss of habitat
- Barrier effects and restriction of koala movement
- Injury and mortality
- Habitat degradation by increased dust run-off and sedimentation
- Introduction and spread of pest fauna species.

These are discussed below. Mitigation and management control measures are provided in Section 6.1.9.

6.1.8.1 Loss of habitat

The Project is anticipated to result in the loss of 134.19 ha of koala habitat critical to the survival of the species, and comprises:

- 85.94 ha of forest or woodland habitat critical to the survival of the species
- 48.25 ha of road-side and rail vegetation and paddock trees, safe intervening ground matrix for travelling between trees and patches to forage and shelter and reproduce and access to vegetated corridors or paddock trees to facilitate movement between patches is anticipated to be lost.

6.1.8.2 Barrier effects and restriction of koala movement

Habitat loss within the Project area is not expected to impact connectivity with surrounding koala habitat as the habitat losses will be localised and from a dispersed area and will not create new large gaps that present new barriers to koala movement. The pipeline vegetation clearance will be 40 m wide footprint, and is situated perpendicular to existing areas of unimpacted vegetation. The Project area is located within a contiguous landscape which despite having high levels of existing land-clearing for agriculture and grazing pastures and extensive irrigation channels that would present barriers to koala movement, maintains structural connectivity along woodland, open woodland, vegetated watercourses and fence lines. The Project alignment runs perpendicular to watercourses and other key areas likely to be important for local koala movement. The clearing of a 40 m wide corridor for the Project is therefore unlikely to restrict koala movement along watercourses. The Project area connects to areas of habitat to the west and south providing connectivity for koala dispersal and movement for the local population. These large areas of habitat will not be impacted by the Project. Impacts from increased levels of dust, runoff or sedimentation are likely to be localised at the Project area and will be managed through routine mitigation measures. Access tracks have as far as possible been located within existing cleared areas or in alignment with existing tracks. New and augmented access will be functionally similar in nature to farm tracks that traverse the landscape and do not impede koala movement.

6.1.8.3 Injury and mortality

Vegetation clearance during construction of the Project has the potential to cause injury and mortality to koalas. The koala has a heightened risk of injury or mortality as a result of the species' relatively slow movement. Entrapment within excavations poses an additional threat to the koala. These risks can be effectively mitigated by implementing strict controls during construction.

Construction related activities have the potential to attract dogs (and other pests) (Section 6.1.8.5). Construction of new access tracks may provide pathways for movement for dogs in particular within and across the Project area. However, the presence of farm tracks and cleared areas are already extensive within the Project area. Loss of habitat could increase exposure to mortality by increasing gaps (albeit narrow) between patches of koala habitat. In the Project area, the local population of koalas would face a low threat of dog attack when moving through cleared grazing land areas due to the distance to refugial habitat. Proposed predator controls have the potential to reduce the incidence of dog attacks on koalas.

Increased traffic movements during construction have the potential to impact on koala through injury and mortality. Appropriate practices and controls are proposed. The Project is unlikely to cause any substantial injury or mortality of koalas during the operation phase or restrict koala movement between habitat patches in and adjacent to the Project area given the minimal vehicle movements required during the operational phase of the Project (i.e. estimated average of one to two vehicle movements on any given access track once per week). For areas in the contiguous landscape, impacts attributed to permanent and temporary infrastructure have been assessed together due to similarity in the responses.

6.1.8.4 Habitat degradation by increased dust run-off and sedimentation

Construction activities have the potential to generate localised dust, erosion, run-off and sedimentation through increased vehicle movements, clearance of vegetation and earthworks. This can reduce the abundance and diversity of adjacent terrestrial and aquatic habitats by physically smothering vegetation, changing nutrient levels, impeding the growth and germination of plant species, encouraging weed incursions and altering the movement and behaviour of fauna species. Impacts from increased levels of dust, runoff, or sedimentation are likely to be localised at the Project area and can be managed through the proposed mitigation and management measures.

The Project will have no substantial impact on hydrology that could degrade the quality of koala habitat. The Project area intersects a number of ephemeral watercourses and drainage lines, and will require minor loss of riparian vegetation. Watercourse crossings for access tracks will utilise existing tracks wherever possible to minimise impact to watercourses. With exception to Scott Creek, all watercourses are ephemeral and only experience flow following rain events. All works within the vicinity of watercourses or in areas with potential for run-off will be subject to routine erosion and sediment control measures.

6.1.8.5 Introduction and spread of pest fauna species

Injury and mortality from wild dog attacks is a key threat to the koala (DoE 2014a). While construction activities can facilitate an increase in wild dog numbers through inappropriate waste disposal and the construction of new tracks which can facilitate increased dog movements, the risks can be mitigated through routine control measures. As part of CEMP, the Project will implement ongoing feral pest control measures.

6.1.9 Measures to avoid, reduce or mitigate impacts

6.1.9.1 Loss of habitat

During the planning stage, a number of measures were employed to avoid and reduce the direct loss of habitat. The following measures will be implemented during construction to reduce the loss of vegetation and koala habitat:

- Utilising existing tracks and locating proposed new access tracks within previously disturbed areas to avoid or minimise disturbance to vegetation and habitat
- Land clearing will be restricted to the minimal amount necessary for the construction of the Project and will not extend outside of the Project area

- The extent of vegetation clearing (and any no-go areas) will be clearly identified on construction plans and in the field using high visibility fencing or flagging in the vicinity of high conservation significant areas. Clearing extents will be communicated to construction supervisors
- Construction stockpiles and laydown/storage areas have been located within existing cleared or disturbed areas where possible
- Where infrastructure crosses waterways, the Project area has been minimised to a 20 m wide construction corridor. Infrastructure is sited within 57.57 ha of non-remnant vegetation (part of substation and access roads), the Project area is sited within 96.34 ha of remnant and regrowth vegetation
- A CEMP will be prepared to inform actions with regards to managing weed hygiene, erosion, fuels and hazardous substances, fire, etc. and the CESCP and ESCPs will include additional erosion and sediment control measures
- All construction personnel shall attend environmental training as part of the site induction process prior to entering the work site. As part of this training, all personnel will be instructed on their obligations in regard to vegetation clearing protocols. Areas identified for vegetation clearance are to be clearly defined and detailed in site inductions.

6.1.9.2 Barrier effects and restriction of koala movement

The following measures will be implemented to minimise barrier effects and restriction of koala movement during construction of the Project:

- Weed management actions will be included in the CEMP and will include:
 - Hygiene protocols restricting the movement of vegetation and soil between impacted areas and areas of significantly lower weed infestation.
 - Protocols for monitoring and management of weeds to identify and appropriately respond to significant changes in weed distribution and density
- All construction vehicles / equipment travelling from a declared restricted place or quarantine area will be required to wash down and possess a current weed hygiene inspection certificate before moving to a weed free area or commencing construction works onsite. The weed hygiene inspection certificate is to be obtained from an inspector who is deemed competent and is certified in line with DAF requirements.
- Land clearing will be restricted to the minimal amount necessary for the construction of the Project and will not extend outside of the Project area
- Removal of all temporary fencing after the completion of construction works and / or the establishment phase for any revegetation works (which ever finishes last)
- Location of temporary infrastructure located outside areas of linear connectivity where koalas are likely to move to avoid any barrier effects.

Impacts on koala during operations are negligible. Access tracks and other linear infrastructure will not preclude movement. Operational activities are expected to be limited to one to two utility movements once per week; consistent with current farming activities undertaken within the Project area.

Management of pest fauna is discussed in Section 6.1.8.5 below.

6.1.9.3 Injury and mortality

The following measures will be implemented to minimise injury and mortality during construction:

- All clearing will be supervised by suitably qualified and experienced fauna spotter-catchers. This will involve searching trees prior to clearing and relocating any resident koalas to the nearest suitable, safe habitat outside the clearing footprint
- Where deemed necessary by the fauna spotter-catcher, temporary exclusion fencing may be required in specific areas of high ecological sensitivity to prevent wildlife from returning to work areas
- Employment of sequential clearing practices and use of suitably qualified koala spotters in accordance with the Queensland *Nature Conservation (Koala) Conservation Plan 2017* for reducing impact on koalas, including:

- Clearing of koala habitat trees is carried out in a way that ensures koalas in the area being cleared have enough time to move out of the clearing site without human intervention, including, in particular, for clearing sites with an area of more than 3 ha, by carrying out the clearing in stages; and ensuring not more than the following is cleared in any one stage:
 - For a clearing site with an area of 6 ha or less – 50 percent of the site’s area
 - For a clearing site with an area of more than 6 ha – 3 ha or three percent of the site’s area, whichever is the greater
 - Ensuring that between each stage and the next there is at least one period of 12 hours starting at 6 p.m. on a day and ending at 6 a.m. on the following day during which no trees are cleared on the site
 - Clearing of the koala habitat trees is carried out in a way that ensures, while the clearing is carried out, 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 overlapping a tree in which a koala is present, is cleared.
- Restricting clearing to daylight hours only during the koala breeding season (September – November)
 - Establishing no-go areas
 - Restricting vehicle movements to designated areas within the Project area
 - Establishing and enforcing speed limits. Vehicles to be restricted to 40 km/hr along access tracks.
 - Signage in koala habitat areas
 - Adverse incident response procedures will be developed to detail actions to be taken in the event of wildlife injury or mortality during clearing
 - A Traffic Management Plan will be developed for the Project with designated access routes, speed limits and identified sensitive ecological areas
 - The CEMP will include protocols to limit injury and mortality to the koala, including management of risks associated with open excavations, trenching, waterbodies and responses and reporting for roadkill and adverse incident protocols.

6.1.9.4 Habitat degradation by dust, run-off and sedimentation

The following mitigation measures will be used to minimise the impacts of dust, run off and sedimentation for the Project:

- Erosion and sediment controls will be developed as part of the CESC and ESCP
- Routine dust suppression and monitoring will be undertaken throughout construction and operation
- Erosion and sediment control measures will be installed where in-stream disturbance must be undertaken during flow conditions
- Areas subject to clearing will be stabilised as soon as practicable
- All vehicle movement will be restricted to designated tracks located within the Project area
- Weather conditions will be monitored during the construction stage and temporary controls will be established during extreme weather events
- Construction activities during adverse weather conditions will be managed in accordance with construction measures to be outlined in the CEMP
- Duration of in-stream works will be minimised wherever practicable to reduce the potential for sedimentation.

6.1.9.5 Introduction and spread of pest fauna species

The following mitigation measures will be used to minimise the introduction and spread of pest fauna species for the Project:

- Responsible waste management practices (e.g. not leaving out food waste and not feeding wildlife) will be implemented and followed by all construction personnel. All waste will be stored in secure temporary holding containers and transported off site.

- Waste management actions will be included in the CEMP and will include:
 - Requirements for details on the location and specifications for disposal and removal of waste from the construction site
 - All putrescible waste to be stored in secure temporary holding containers and transported off site.
- Sightings or evidence of pest animals will be recorded during construction within a pest register. If increased densities of pest animals are observed, or new pest animals are identified, humane pest controls will be implemented to manage numbers
- As part of CEMP, the Project will implement feral pest control measures
- Construction staff will not bring domestic animals into the Project area
- All construction personnel shall attend environmental training as part of site inductions. As part of this training, all personnel will be instructed on their responsibilities related to avoiding and minimising the introduction/attraction to the construction site of feral animals.

6.1.10 Residual impacts on koalas and koala habitat

This section presents a summary of the residual impacts on the koala and koala habitats once avoidance and mitigation measures are implemented. A summary of the Project’s residual impacts on the koala is detailed in Table 6-3. Most Project impacts will be effectively mitigated to low or negligible levels for all habitat types. The risk ratings are presented in Appendix D. A residual impact remains for the clearance of 134.19 ha of suitable habitat critical to the survival of the species, within the following habitat types:

- 85.94 ha of forests or woodlands habitat is anticipated to be lost
- 48.25 ha of road-side and rail vegetation and paddock trees, safe intervening ground matrix for travelling between trees and patches to forage and shelter and reproduce and access to vegetated corridors or paddock trees to facilitate movement between patches is anticipated to be lost.

Despite the magnitude of loss, the nature of the Project and the dispersed distribution of habitat loss means that substantial consequences for the koala population on and adjacent to the Project area are largely avoided.

Direct impacts on woodland, open woodland and riparian and fringe habitat areas within the contiguous landscape will not adversely impact the ecological function of those areas for koalas, as they will not present a physical barrier to koala movement or increase risks to koalas during operation of the Project. Based on the low levels of noise and light and other potential sources of disturbance, the proposed infrastructure is unlikely to present an indirect deterrent to koala movement through the contiguous landscape. Temporary infrastructure will be located in open areas as far as practicable. Localised infrastructure will be predominantly located outside of linear habitat areas to avoid any barrier effects.

Table 6-3 Residual impact assessment for the koala

Potential impacts	Risk rating	Mitigation measure	Residual risk rating	Effectiveness
Loss of 134.19 ha of potential habitat comprising: Forest and woodland 85.94 ha Non-remnant suitable habitat 48.25 ha	High	Utilise existing tracks where possible Land clearing restricted to minimal amount necessary and will not extend outside of the Project area Establishing no-go areas Where infrastructure crosses waterways existing disturbed areas to be selected where possible Preparation of a CEMP, CESP and ESCPs	Moderate	Moderate effectiveness

Potential impacts	Risk rating	Mitigation measure	Residual risk rating	Effectiveness
<p>Injury/mortality during construction:</p> <ul style="list-style-type: none"> – Construction vehicle movements – Vegetation clearing – Entrapment/entanglement – Increase in dog attacks 	High	<p>Clearing supervised by spotter-catchers – at-risk koalas relocated before clearing</p> <p>Sequential clearing</p> <p>Restricting clearing to daylight hours only during the koala breeding season (September – November)</p> <p>Establishing no-go areas</p> <p>Restricting vehicle movements to designated areas</p> <p>Establishing and enforcing speed limits</p> <p>Signage in koala habitat areas</p> <p>Construct access/haulage roads in existing tracks wherever possible</p> <p>Pest control measures as part of the CEMP</p> <p>Waste management plan</p>	Low	Moderate effectiveness
<p>Injury/mortality during operation:</p> <ul style="list-style-type: none"> – Vehicle movements (on average 1-2 per week) – Entrapment in infrastructure – Increase in dog attacks 	Moderate	<p>Establishing no-go areas and temporary exclusion fencing (where required)</p> <p>Establishing and enforcing speed limits</p> <p>Pest control measures as part of the CEMP</p> <p>Waste management plan</p>	Low	Moderate effectiveness
Habitat degradation by increased dust run-off and sedimentation	Low	<p>Reduce duration of works in watercourses and drainage lines.</p> <p>Monitor weather events when working within watercourses.</p> <p>Reduce speed limits during dry conditions or employ and water truck to reduce dust rates.</p>	Negligible	High effectiveness
Barrier effects – localised restriction of koala movement	Low	<p>Fencing installed during construction to remain temporarily during the construction phase</p> <p>Limiting permanent fencing to small areas of operation and maintenance infrastructure</p> <p>Revegetate temporarily cleared areas (e.g. laydown areas) with native species</p>	Negligible	High effectiveness
<p>Introduction and spread of disease:</p> <p>The Project is unlikely to cause an increase in the incidence or transmission of Phytophthora that can degrade koala habitat in some regions.</p>	Low	Vehicle hygiene protocols implemented during construction	Negligible	High effectiveness

Potential impacts	Risk rating	Mitigation measure	Residual risk rating	Effectiveness
The Project is unlikely to result in any increase in Chlamydia among koalas				
Introduction and spread of invasive fauna and weed species	Moderate	<p>Implement measures for introduced flora and fauna (to be outlined in the CEMP).</p> <p>Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works.</p> <p>Educate staff on the impacts of weeds and their general environmental obligation.</p> <p>Identify areas of dense outcrops of introduced flora to eliminate construction vehicles from entering the area.</p>	Low	Moderate effectiveness

6.1.11 Significance of impact assessment

The significance of the Project's impacts on koala has been assessed with consideration to the DAWE Recovery Plan (DAWE 2022c) and the species Conservation Advice (DAWE 2022b), specifically:

- An assessment of the potential to impact 'habitat critical to the survival' of the koala
- An assessment of the potential to interfere with the recovery of the species
- An assessment against the significant impact criteria for an endangered species in the Commonwealth Significant impact guidelines.

The significance of impacts have been summarised using the framework detailed for Endangered species in the Commonwealth Significant impact guidelines (DoE 2013). Justification for the significance of impact assessment is provided in Table 6-4.

Table 6-4 Significance of impact on koalas

Impact criteria	Potential to occur
Lead to a long-term decrease in the size of a population	<p>Unlikely</p> <p>The Project area exists in a region which has undergone substantial disturbance and clearing of vegetation within the last 200 years for agricultural and cattle grazing purposes.</p> <p>No koalas (or evidence thereof) were recorded during field studies for this Project. The Project will result in loss of 134.19 ha of potential koala habitat. The habitat losses will be localised (a narrow linear strip) and across a dispersed area. The local habitat loss is small in the context of the availability of similar habitat in the surrounding landscape. The loss of habitat alone is therefore unlikely to lead to a long-term decrease in the size of a population, especially noting that highly localised loss of availability of some foraging resources (the species was not confirmed present in field surveys, and is thus considered likely to be sporadic, and restricted to a small number of individual koalas), can likely be 'absorbed' by surrounding areas of habitat which are not likely to be at carrying capacity (noting infrequency of koala records, the ubiquity of threats like dogs across the region).</p> <p>Vegetation clearing for the Project carries the risks of koala injury and mortality. However, these risks will be mitigated through the use of sequential clearing under the supervision of suitably trained and qualified fauna spotter/catchers. Risks of mortality and injury due to collision with construction vehicles will be mitigated through the implementation of a Traffic Management Plan. The Project is otherwise unlikely to have any substantial impact in terms of its expected impact on koalas, with no anticipated increase in dog attacks or vehicle collision risks. Based on the low risks and the mitigation measures proposed, the Project is unlikely to lead to a long-term decrease in the size of the local koala population.</p>
Reduce the area of occupancy of the species.	<p>Unlikely</p> <p>Habitat losses within the Project area are not expected to result in the displacement or disappearance of koalas from any individual area at a spatial scale that relates directly to the scale at which area of occupancy is measured (i.e. 2 km x 2 km) (IUCN 2013). While the Project will result in a loss of 134.19 ha of potential koala habitat, this will occur in small (and narrow) areas (i.e. 40 m wide alignment across a relatively broad geographic extent (along over 28.5 km) and will not result in the complete loss of habitat (e.g. patches) within any given area. Given that the ongoing risks to koalas post-construction are minor, and will not lead to ongoing habitat loss, the Project is not expected to reduce the area of occupancy of the species.</p>
Fragment an existing population into two or more populations.	<p>Unlikely</p> <p>The majority of proposed infrastructure is located within woodland and open woodland, in a landscape where fragmentation impacts already exist from irrigated agriculture and livestock grazing. The pipeline alignment will result in 134.19 ha of habitat loss, a proportion of which will be reinstated and rehabilitated in-situ post-construction with native flora species. Habitat loss will be small in the context of the local and regional landscape and will not create large gaps that present barriers to koala movement in this open landscape. The Project is connected via a State terrestrial corridor to large areas of habitat further west and south of the Project area. The State terrestrial corridor provides for koala dispersal and movement to areas outside of the Project area. As such, the Project will not fragment an existing population into two or more populations.</p>
Adversely affect habitat critical to the survival of a species.	<p>Likely</p> <p>Dispersing koalas may occasionally utilise trees in the Project area for foraging and shelter, with any permanent utilisation in the surrounding landscape likely to be restricted to a very small number of individuals. No evidence of koala was present in the Project area and only one record is reported within 2 km of the Project (record from 1987). Foraging resources (trees) occur at low densities within the Project area, within a modified matrix characterised by multiple threats (i.e. roads, domestic/wild dogs, existing fragmentation). However, as per the species' conservation advice, the Project area provides essential life cycle requirements for the koala – namely foraging and shelter trees. Accordingly, the Project area is considered likely to support habitat critical to the survival of the species.</p>

Impact criteria	Potential to occur
Disrupt the breeding cycle of a population.	<p>Unlikely</p> <p>The koala mating season is generally between September and March, with females giving birth to a single young between October and May. Based on the low density at which koalas occur in the Lower Burdekin region, the Project is at worst, likely to impact the breeding movements of a very small number of individual koalas. Measures will be implemented to further reduce the potential impacts to breeding individuals by managing the risks of vehicle strike, limiting the duration of works at watercourses, maintaining opportunities for longitudinal movement of koalas, and other fauna along watercourses, minimising works during the breeding season, implementing on-site speed limits, signage in higher-value koala habitat areas, and standard best practice sequential clearing using koala spotters.</p> <p>Clearing within koala habitat areas will be limited to daylight hours only during the peak breeding season (September – November). Once operational, the Project will cause negligible disruption to koala movement. Based on the low densities at which koalas are thought to occur, and the mitigation measures proposed, the Project is unlikely to disrupt the breeding cycle of the local koala population.</p>
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	<p>Unlikely</p> <p>The Project will result in a loss of 134.19 ha of potential koala habitat. This accounts for only a small proportion of suitable habitat in the broader landscape. Although clearing will cause minor temporary fragmentation of habitat (i.e. during construction) and reduce the area of available habitat, a proportion of the impacted (cleared) area will be reinstated and rehabilitated with native flora species, reconnecting temporarily fragmented areas for dispersal by the koala. The extent of temporary habitat disturbance is not likely to decrease the availability or quality of habitat available to the local population to the extent that the species will decline.</p>
Result in invasive species that are harmful to an endangered species becoming established in the endangered species habitat.	<p>Unlikely</p> <p>Wild dogs represent a key threat to koalas. Creation of new tracks can facilitate dog movements into new areas. However, as the existing environment already has an extensive network of farm tracks, the Project is unlikely to exacerbate the threat of wild dog attacks on koalas.</p> <p>Unmitigated, the Project has the potential to introduce or spread weeds, some of which (e.g. Chinese apple and rubber vine) could inhibit local koala movement. This potential will be mitigated by the implementation of a Weed Management Plan governing construction and operation of the Project. The Project therefore poses low risks to the local koala population via introduction and spread of invasive species.</p>
Introduce disease that may cause the species to decline.	<p>Unlikely</p> <p>The Project is not anticipated to introduce new diseases that may cause the species to decline. Stress may lead to an increase in the expression of chlamydia in koalas, however the implementation of mitigation measures such as sequential clearing will reduce disturbance-related stress and risk of disease.</p>
Interfere with the recovery of the species.	<p>Unlikely</p> <p>The National Recovery Plan for the Koala (DAWE 2022c) identifies six recovery actions required for effective management and conservation (DAWE 2022c). Two of these actions are field-based actions and of relevance to the Project. These being:</p> <ul style="list-style-type: none"> – Strategy 5: Strategic habitat restoration – Strategy 6: Active metapopulation management <p>The Project is unlikely to interfere with either of these recovery actions. The Project area exists in a landscape that has pre-existing disturbance and fragmentation. Vegetation clearance will not result in permanent areas of fragmentation. Of the 134.19 ha of potential habitat to be cleared, a proportion of the Project area will be reinstated and rehabilitated with native flora species post-construction, reconnecting temporarily fragmented areas for dispersal by the koala. The surrounding landscape is highly fragmented by irrigated agriculture (sugar cane) and cattle grazing land use. Noting this, and the lack of historic records and field survey observations, koala, if present, are likely to occur at very low densities. The Project will result in a loss of 134.19 ha of suitable koala habitat critical to the survival of the species, in a landscape in which the species occurs at low densities. Therefore, the Project is unlikely to impact the Ayr/Townville metapopulation. The extent of temporary habitat disturbance is not likely to interfere substantially with the recovery of the species.</p>

6.1.12 Conclusion

The Project is **likely** to have a significant impact on the koala, as the Project results in the clearance of 134.19 ha of habitat critical to the survival of the species.

6.2 Bare-rumped sheathtail bat

6.2.1 Conservation status and documentation

The bare-rumped sheathtail bat is listed as Vulnerable under the EPBC Act.

In Queensland, the species is known to occur from Ayr to the Iron Ranges (TSSC 2016c). Most historical records have been from near-coastal locations. In Queensland, the species is known to be associated with coastal lowland rainforests, as well as open forests dominated by *Eucalyptus* or *Corymbia* species intermingled with coastal lowland rainforest (TSSC 2016c). The species is thought to forage over habitat edges such as the edge of rainforest and in forest clearings. There is no information available on foraging habitat shifts between the dry and wet seasons (DAWE 2021). The species has been recorded using large, deep hollows for roosting and breeding in species *E. platyphylla*, *E. miniata*, *E. tetradonta* and *Melaleuca leucadendra* syn. *leucodendron* (TSSC 2016c). Information on the dimensions of known roosting hollows is presented in the National Recovery Plan for the bare-rumped sheathtail bat (Schulz and Thomson 2007) and Australian bats (Churchill 2008), with all hollows ranging in size between 18 cm and 29 cm diameter. DAWE SPRAT profile for the species notes that there are only two records in the last two decades, both from north-eastern Queensland (DAWE 2021), however, Milne et al. 2009 identified six new geographical records for the bare-rumped sheathtail bat, comprising approximately 100 individuals, predominantly from museum records that were historically misidentified as yellow-bellied sheathtail bat (*Saccolaimus flaviventris*). The bare-rumped sheathtail bat has also been recorded during ecological surveys for infrastructure Projects across north Queensland, including the Herberton Range (RPS 2014) and Mackay region (Jacobs 2016).

6.2.2 Criteria used to map bare-rumped sheathtail bat habitat

Commonwealth habitat definition: The bare-rumped sheathtail bat occurs mostly in lowland areas, typically in a range of woodland, forest and open environments (Schulz and Thomson 2007; Reardon et al. 2010; Dennis 2012).

Table 6-5 Criteria used to map bare-rumped sheathtail bat habitat

Habitat	Commonwealth definition	Criteria used to map habitat
Roosting	In Australia, all confirmed roosting records are from deep tree hollows in the Poplar Gum, Darwin Woollybutt (<i>Eucalyptus miniata</i>) and Darwin Stringybark (Churchill 1998; Compton and Johnson 1983; McKean et al. 1981; Murphy 2002). Hollows in these tree species have also been used as maternity roosts. All recorded roosts are in large hollows ranging between 18 cm and 29 cm diameter (Schulz and Thomson 2007; Churchill 2008).	Moderate and large hollows in <i>E. platyphylla</i> were mapped as potential roost trees and small hollow-bearing <i>E. platyphylla</i> were mapped as future potential roost trees. All areas within 200 m of moderate and large roost trees (<i>E. platyphylla</i> only) were also mapped as potential roosting habitat.
Foraging	Only anecdotal information is available, based on habitat around roosts or from shot specimens. No information is available on foraging habitat shifts between the dry and wet seasons (Schulz and Thomson 2007). The bare-rumped sheathtail bat has been suggested to forage over habitat edges such as the edges of rainforest and forest clearings (Churchill 1998).	All remnant and regrowth REs that are listed as essential habitat factors for the species by DoR that occur within 10 km of the Project area were mapped as potential foraging habitat: <ul style="list-style-type: none"> – 11.3.4 <i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains – 11.3.4a <i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict. – 11.3.7 <i>Corymbia</i> spp. open woodland on alluvial plains – 11.3.9 <i>Eucalyptus platyphylla</i>, <i>Corymbia</i> spp. woodland on alluvial plains – 11.3.10 <i>Eucalyptus brownii</i> woodland on alluvial plains – 11.3.12 <i>Melaleuca viridiflora</i>, <i>M. argentea</i> +/- <i>M. dealbata</i> woodland on alluvial plains – 11.3.13 <i>Grevillea striata</i> open woodland on coastal alluvial plains

Habitat	Commonwealth definition	Criteria used to map habitat
		<ul style="list-style-type: none"> – 11.3.25 <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines – 11.3.27 Freshwater wetlands – 11.3.30 <i>Eucalyptus crebra</i>, <i>Corymbia dallachiana</i> woodland on alluvial plains – 11.3.33 <i>Eremophila mitchellii</i> open woodland on alluvial plains – 11.3.35 <i>Eucalyptus platyphylla</i>, <i>Corymbia clarksoniana</i> woodland on alluvial plains – 11.3.35a <i>Eucalyptus platyphylla</i>, <i>Corymbia clarksoniana</i> woodland on alluvial plains – 11.11.1 <i>Eucalyptus crebra</i> +/- <i>Acacia rhodoxylon</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding – 11.11.15 <i>Eucalyptus crebra</i> woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics – 11.12.1 <i>Eucalyptus crebra</i> woodland on igneous rocks – 11.12.9 <i>Eucalyptus platyphylla</i> woodland on igneous rocks

6.2.3 Desktop results

The bare-rumped sheath-tail bat was identified within the PMST (Appendix B) as having potential to occur within a 30 km radius from a central point within the Project area. Historical records approximately 30 km north from 1978 and 1981 and associated with the Jerona fauna sanctuary in poplar gum communities on alluvial plains (Compton 1983). Additionally, two records located approximately 50 km northwest of the Project area were recorded in association with Bowling Green Bay National Park (from 2003) (DES 2022b) and over Alligator Creek, 16km SE of Townsville (from 1965) (Biomaps 2022). Essential habitat for the species is mapped north-west of the Project area (Figure 6.2).

6.2.4 Survey results

The bare-rumped sheath-tail bat was confirmed during the field survey undertaken by Balance! Environmental. An Anabat Swift detector was deployed from 28th to 31st March. Of the 4,184 files, 168 files were reliably attributed to the *S. saccolaimus* and a further 37 were attributed to either *S. saccolaimus* (possibly roost emergence call) or *Taphozous troughtoni* (not listed under the EPBC Act).

The species is known to roost in large *E. platyphylla* hollows ranging between 18 cm and 29 cm diameter (Schulz and Thomson 2007; Churchill 2008). During the GHD 2021 survey, hollows were categorised by the following dimensions in the field, where large and moderate sized hollows in *E. platyphylla* represent potential roost trees and small hollows in *E. platyphylla* represent future potential roost trees:

- Large hollows: >30 cm diameter
- Moderate hollows 20 – 30 cm diameter
- Small hollows < 20 cm diameter.

The GHD 2021 field survey recorded 10 large and 27 moderate hollow-bearing *Eucalyptus platyphylla* trees in the Project area that would represent potential roosting sites for the species. The survey also recorded 325 small hollow-bearing trees, representing potential future roosting sites. Suitable foraging habitat is broadly mapped across the Project area. Suitable foraging habitat in the Project area connects to suitable foraging habitat further north, west and south. Large areas of historically cleared land persists to the east of the Project area for agriculture, where no suitable foraging habitat is present. Roosting habitat was only mapped within the Project area, where the presence and size of hollow-bearing trees were recorded. Potential roosting habitat is scattered across the Project area; however, a cluster of potential roosting habitat is present in the southern section of the Project area. Potential foraging and roosting habitat and locations of large, moderate and small hollow-bearing trees for the bare-rumped sheath-tail bat are shown in Figure 6.2.

The GHD 2022 field survey conducted dusk roost watches at five potential roost trees. This involved dusk visits to potentially suitable roost trees, to detect bats as they leave or enter the roost, while recording with an Anabat detector. Anabat detectors were also deployed at two locations and were left overnight for 4 nights within suitable flyways.

6.2.5 Significance of Project area

This section assesses the significance of bare-rumped sheath-tail bat habitats within the Project area, their importance in the context of the local population and whether the local population is important at a national level.

6.2.5.1 Status as an important population

An 'important population' for the bare-rumped sheath-tail bat has not been formally defined in the Commonwealth listing advice for the species. In the absence of a formal definition, the definition outlined in the Commonwealth Significant impact guidelines applies. 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.

The population size of the species is poorly known, anecdotal information suggests the species occurs in low densities (DAWE 2021). The Project area is near the limit of the species range which extends coastally down to Ayr in north-east Queensland. The species is considered an important population under the Commonwealth Significant impact guidelines definition for important populations.

6.2.5.2 Status as habitat critical to the survival of the bare-rumped sheath-tail bat

Habitat critical to the survival of the bare-rumped sheath-tail bat has not been formally defined in the Commonwealth listing advice for the species. In the absence of a formal definition, the definition outlined in the Commonwealth Significant impact guidelines applies:

'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

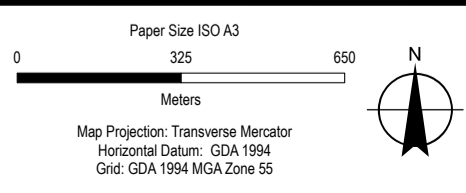
- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long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

The bare-rumped sheath-tail bat has specific roosting habitat requirements, only roosting in large hollows of select tree species (McKean et al. 1981; Compton and Johnson 1983; Churchill 1998; Murphy 2002), but demonstrates an ability to forage a relatively broad range of habitats. In this context, roosting habitat and roosting resources (as defined in Section 6.2.2) were considered habitat critical to the survival of the species.



Legend					
	Minor Road		Proposed Access		Essential Habitat
	Railway		Existing Access		Large hollow >30cm diameter
	Watercourse		Fence		Moderate hollow 20cm-30cm diameter
			Pipeline Alignment		Small hollow <10cm-20cm diameter
			Existing HDPD Pipeline Alignment		Stockpile
			Proposed Haulage and Proposed/Improved Access		Foraging Habitat
			Stockpile		Roosting Habitat

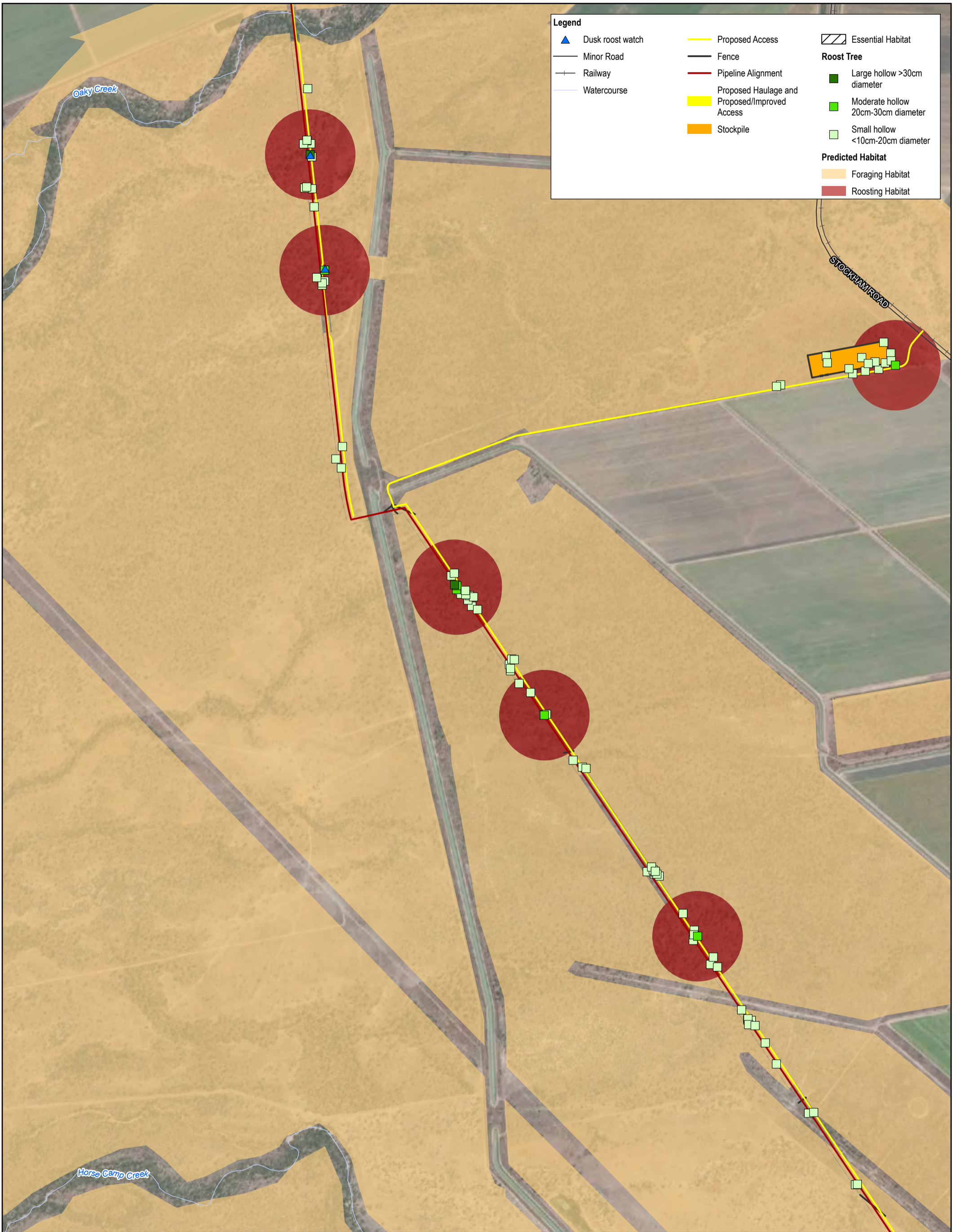
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Distribution of predicted bare-rumped sheath-tail bat habitat within and surrounding the Project area

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FIGURE 6-2



Legend

Dusk roost watch	Proposed Access	Essential Habitat
Minor Road	Fence	Roost Tree
Railway	Pipeline Alignment	Large hollow >30cm diameter
Watercourse	Proposed Haulage and Proposed/Improved Access	Moderate hollow 20cm-30cm diameter
	Stockpile	Small hollow <10cm-20cm diameter
		Predicted Habitat
		Foraging Habitat
		Roosting Habitat

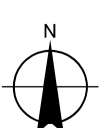
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Paper Size ISO A3

0 325 650

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



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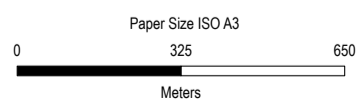
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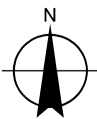
FIGURE 6-2



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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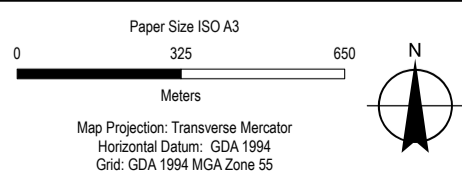
Distribution of predicted bare-rumped sheath-tail bat habitat within and surrounding the Project area

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FIGURE 6-2



Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



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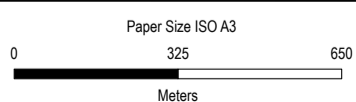
Distribution of predicted bare-rumped sheath-tail bat habitat within and surrounding the Project area

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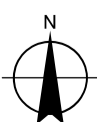
FIGURE 6-2



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

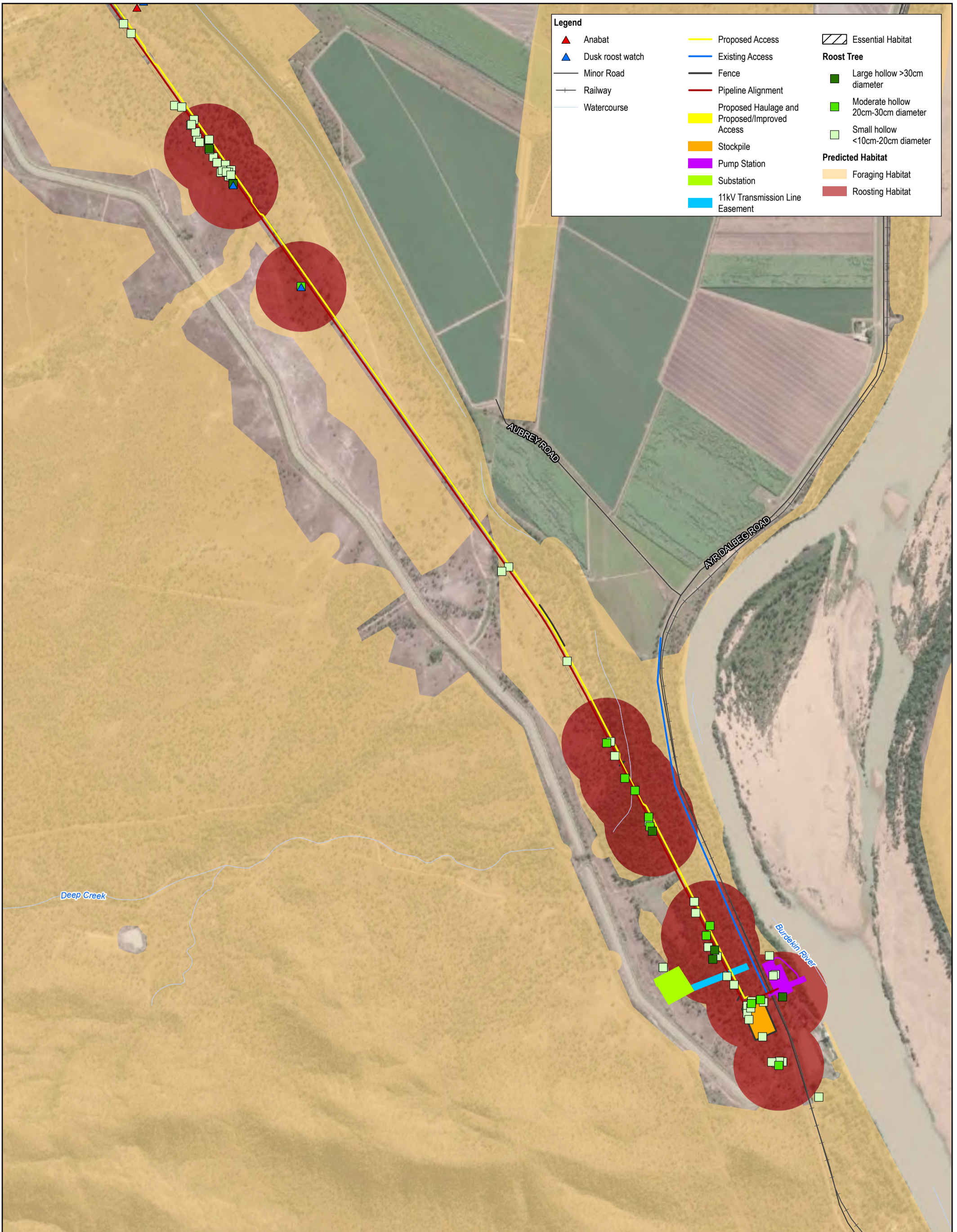


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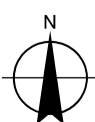
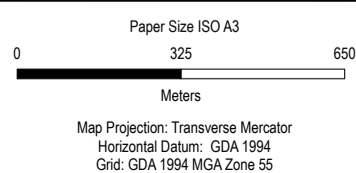
Distribution of predicted bare-rumped sheath-tail bat habitat within and surrounding the Project area

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FIGURE 6-2



Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



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FIGURE 6-2

6.2.6 Threatening processes

Threats to the bare-rumped sheath-tail bat (TSSC 2016) include:

- Habitat loss and fragmentation
- Competition for tree hollows
- Too frequent burning.

6.2.7 Potential impacts

Potential impacts on bare-rumped sheath-tail bat populations and habitat within the Project area include:

- Loss of habitat and fragmentation
- Disturbance from increased light, noise and vibration
- Habitat degradation by increased dust, runoff and sedimentation
- Introduction and spread of weed species.

These are discussed below.

6.2.7.1 Loss of habitat and fragmentation

The Project is anticipated to result in a disturbance footprint of 153.9 ha. In total, these habitats comprise of 92.23 ha of potential habitat (in aggregate) for the bare-rumped sheath-tail bat. This comprises of 43.12 ha of roost habitat and 85.54 ha of potential foraging habitat (of which 36.44 ha of habitat overlaps between roosting and foraging).

Vegetation loss will be localised along a narrow linear alignment for the pipeline, with trees retained on both sides of the impact area. Indiscriminate clearing in areas for the pump station, stockpiles and other ancillary infrastructure will also result in the loss of potential habitat for the species, however potentially suitable habitat adjacent to the Project area will persist in adjacent areas and will not be impacted by the Project. The Project is not anticipated to result in fragmentation of habitat for the species. Although portions of the Project area have been historically cleared for grazing pastures, with agriculture persisting to the east, substantial connectivity is present in woodland and open woodland, especially in the southern portion of the Project area. The central and northern portion of the Project area contain areas existing as immature woodland to open woodland with grassy understorey. The Project area is connected to large areas of potentially suitable foraging habitat for the species to the north, west and south.

The Project is anticipated to result in the loss of 10 large hollow-bearing trees and 27 moderate *E. platyphylla* hollow-bearing trees which represent potential roosting habitat for the bare-rumped sheath-tail bat. The loss of 325 small hollow-bearing *E. platyphylla* trees represents a loss of future potential roosting trees for the species. The presence of large and moderate hollow-bearing trees are scattered across the Project area, however a cluster of potential roosting habitat for the species is present in the southern section of the Project area (Figure 6.2). Although the loss of hollows within the footprint is anticipated to be significant for the species, potentially suitable roosting hollows in *E. platyphylla* will persist in similar densities outside of the Project area. Hollow formation is dependent on a tree's history, its species and location. Small hollows with narrow entrances take approximately 100 years to form. Hollows of a medium size will take around 200 years to form, and larger and deeper hollows can take a lot longer (Mackowski 1984; Menkorst 1984; and Scotts 1991). The anticipated loss of hollow-bearing trees, particularly large and moderate hollows that represent potential roosting trees for the bare-rumped sheath-tail bat is expected to be significant for the species.

6.2.7.2 Injury and mortality

Vegetation clearance during construction of the Project has the potential to cause injury and/or mortality to bare-rumped sheath-tail bats roosting in hollow-bearing trees within the Project area.

6.2.7.3 Disturbance from increased light, noise and vibration

Construction will result in a substantial, localised increase in vehicle movements in the short-term, which will increase light, noise and vibration disturbance to local wildlife. Increased light, noise and vibration can alter individual species' behaviours, and disrupt the balance of inter-species interactions. Such disruptions typically favour feral predators and generalist species that owe their success to broad ecological tolerances and possess the ability to tolerate or actively exploit disturbed environments (Hero et al. 2004). The bare-rumped sheath-tail bat is a relatively high-flying species, with a capacity to fly large distances and cross open areas (TSSC 2016c). As such, this species may be less susceptible to indirect disturbance than some lower-flying microbat species.

6.2.7.4 Habitat degradation by increased dust, runoff and sedimentation

Construction activities have the potential to generate localised dust, erosion, run-off and sedimentation through increased vehicle movements, clearance of vegetation and earthworks. This can reduce the abundance and diversity of adjacent terrestrial and aquatic habitats by physically smothering vegetation, changing nutrient levels, impeding the growth and germination of plant species, encouraging weed incursions and altering the movement and behaviour of fauna species.

The receiving environment has already been subject to high levels of erosion and sedimentation as a result of existing land-clearing and grazing activities. Nevertheless, sensitive ecological receptors (e.g. larger open woodland remnants and aquatic habitats) are particularly susceptible to adverse impacts associated with dust, run-off, erosion and sedimentation. These areas require protection through the implementation of sediment and erosion control measures during construction.

Adverse weather conditions during construction can exacerbate the potential impact of erosion and sedimentation. High rainfall has the potential to remove exposed topsoil, destabilise creek beds and distribute sediment through creek lines. Strong winds have the potential to spread exposed topsoil, decreasing the likelihood of recolonisation by vegetation and potentially distributing dust into nearby sensitive environments.

6.2.7.5 Introduction and spread of weed species

The Project has the potential to adversely impact habitat for the bare-rumped sheath-tail bat by introducing or spreading exotic weed species. The species is reliant on roosting habitat within mature hollow-bearing trees. As such, the introduction and spread of weeds can substantially reduce the ability for recruitment, longevity and growth of roost trees such as *E. platyphylla* and other tree species utilised by the bare-rumped sheath-tail bat. Foraging habitat within the Project area is already highly degraded by weeds. The Project has the potential to exacerbate the loss through introduction and spread of weeds. Clearing native vegetation creates areas of disturbance that are naturally susceptible to colonisation by invasive weed species. These can form a local source of future weed infestations within the surrounding landscape.

6.2.7.6 Disturbance of surface waterways and waterbodies

Construction activities within and/or in the vicinity of watercourses have the potential to cause degradation of riparian habitats through:

- Removal of riparian vegetation
- Run-off, sedimentation and erosion
- Point-source pollution (chemical and fuel spills)
- Disturbance associated with noise, vibration and/or artificial lighting.

The pipeline and associated haulage and access tracks intersect a number of ephemeral watercourses and drainage lines. The pump station, power supply works, and stockpile areas have been sited to minimise the number of water crossings; however, mapped watercourses and ephemeral creek lines are still located in close proximity to some of these Project components. These areas are ecologically important for movement of wildlife, as habitat and drinking sites and are potentially susceptible to construction-related disturbance.

6.2.8 Measures to avoid, reduce or mitigate impacts

6.2.8.1 Loss of habitat

Planning phase measures that have been employed to avoid and reduce the direct loss of habitat include:

- Minimising impacts to remnant woodland by locating laydown areas in open areas that have been subject to historical land clearing and cattle grazing
- Minimising impacts to watercourses
- Utilising existing tracks and locating proposed tracks within previously disturbed areas.

During the construction phase of the Project, the following mitigation measures will be employed:

- Land clearing will be restricted to the minimal amount necessary for the construction of the Project and will not extend outside of the Project area
- The extent of vegetation clearing (and any no-go areas) will be clearly identified on construction plans and in the field using high visibility fencing or flagging in the vicinity of high conservation significant areas. Clearing extents will be communicated to construction supervisors
- Where infrastructure crosses waterways, the Project area has been minimised to a 20 m wide construction corridor. Infrastructure is sited within 57.57 ha of non-remnant vegetation (part of substation and access roads), the Project area is sited within 96.34 ha of remnant and regrowth vegetation
- A CEMP will be prepared to inform actions with regards to managing weed hygiene, erosion, fuels and hazardous substances, fire, etc. and the CESC and ESCPs will include additional erosion and sediment control measures
- All construction personnel will attend environmental training as part of the site induction process prior to entering the work site. As part of this training, all personnel will be instructed on their obligations in regard to vegetation clearing protocols. Areas identified for vegetation clearance are to be clearly defined and detailed in site inductions.
- Potential large roost trees will be protected from direct and indirect impact by avoiding the removal of these potential roost trees where possible. Where avoidance is not possible in the remnant watercourse areas, these areas will be replanted with *E. platyphylla* tubestock to increase the availability of future roosting habitat.

6.2.8.2 Injury and mortality

While the bare-rumped sheath-tail bat may be susceptible to injury and mortality during clearing, the risks can be effectively managed using routine management measures targeted at the species. The following measures will be implemented to avoid/minimise injury and/or mortality to the bare-rumped sheath-tail bat during construction of the Project:

- Pre-clearance surveys will specifically target areas of habitat identified within the clearing footprint. Pre-clearance surveys will be undertaken to mark the locations of potential roosting hollows
- Vehicles to be restricted to 40 km/hr along access tracks
- All large and moderate-sized hollows in *E. platyphylla* that are subject to clearing will be inspected prior to works to confirm the species' presence, document roost dimensions and plan for their safe relocation out of the clearing zone
- Clearing of all hollows, particularly all moderate and large hollows will be supervised by suitably qualified and experienced fauna spotter-catchers. This will involve relocating any resident fauna to the nearest suitable, safe habitat outside the clearing footprint
- Where deemed necessary by the fauna spotter-catcher, temporary exclusion fencing may be required in specific areas of high ecological sensitivity to prevent wildlife from returning to work areas
- Adverse incident response procedures will be developed to detail actions to be taken in the event of wildlife injury or mortality during clearing

- A Traffic Management Plan will be developed for the Project with designated access routes, speed limits and identified sensitive ecological areas (particularly areas where bare-rumped sheathtail bat have the potential to roost and forage)
- The CEMP will comprise protocols to limit injury and mortality to fauna including management of risks associated with vegetation clearing, waterbodies and responses and reporting for adverse incident protocols
- A high risk SMP will be prepared in accordance with the requirements of Section 335 of the Nature Conservation (Animals) Regulation 2020.

6.2.8.3 Disturbance from increased light, noise and vibration

Routine mitigation measures will be undertaken to minimise the impact that noise, light, vibration and disturbance have on local wildlife populations. This is particularly important within the vicinity of habitat for conservation significant fauna species, including the bare-rumped sheathtail bat. The following measures will be used to minimise the impacts of light, noise and vibration during construction:

- Site lighting will be kept to the minimum (security) required for safety. Placement and orientation of lighting to be directed away from sensitive fauna habitat. Direction of lighting beam downwards or use of shields and baffles to limit light spill beyond site boundary
- Wherever practicable, construction activities will be limited to daylight hours to reduce the need for lighting and resultant light spill into adjacent habitat. However, it is noted that some of the road crossings may require night works for traffic management reasons
- A Traffic Management Plan will be developed for the construction site to control vehicle movements and reduce the unnecessary generation of vehicular noise
- All construction vehicles will comply with maintenance schedules and operational restrictions designed to limit noise impacts during construction.

6.2.8.4 Habitat degradation by increased dust, run-off and sedimentation

The following mitigation measures will be used to minimise the impacts of dust, run off and sedimentation during construction of the Project:

- Erosion and sediment controls have been developed as part of the CEMCP and will be expanded on by the construction Contractor as part of their ESCPs
- Routine dust suppression and monitoring will be undertaken throughout construction and operation
- Duration of in-stream works will be minimised wherever practicable to reduce the potential for sedimentation
- Erosion and sediment control measures will be installed where in-stream disturbance must be undertaken during flow conditions
- Areas subject to clearing will be stabilised as soon as practicable
- All vehicle movement will be restricted to designated tracks located within the Project area
- Weather conditions will be monitored during the construction stage and temporary controls will be established during extreme weather events
- Construction activities during adverse weather conditions will be managed in accordance with the CEMP.

6.2.8.5 Introduction and spread of weed species

The following measures will be implemented to minimise the introduction and spread of weeds:

- Weed management actions are included in the CEMP and include:
 - Hygiene protocols restricting the movement of vegetation and soil between impacted areas and areas of significantly lower weed infestation
 - Protocols for monitoring and management of weeds to identify and appropriately respond to significant changes in weed distribution and density
- All vehicles / equipment travelling from a declared restricted place or quarantine area will be required to wash down and possess a current weed hygiene inspection certificate before moving to a weed free area or

commencing construction works onsite. The weed hygiene inspection certificate is to be obtained from an inspector who is deemed competent and is certified in line with DAF requirements

- Vehicle access will be restricted to within the Project area and existing roads and tracks.

6.2.8.6 Disturbance of surface waterways and waterbodies

The following mitigation measures will be used to minimise the disturbance of waterways and waterbodies during construction of the Project:

- Wherever practicable, watercourse crossings have been located at established crossing points on existing access tracks. Where this is not practicable, the disturbance area is restricted to within the Project area
- Erosion and sediment controls will be developed as part of the CЕСP and ESCPs
- Dust suppression activities will be undertaken where appropriate. Stabilisation of disturbed areas will be undertaken as soon as practicable after disturbance
- Refuelling will be undertaken away from waterways
- Storage of fuels, chemicals, wastes and other potentially environmentally hazardous substances will be banded or otherwise contained areas away from waterways
- Emergency response protocols and procedures will be developed as part of the CEMP for implementation in the event of a contaminant spill or leak and provision of spill response equipment.

6.2.9 Residual impacts on bare-rumped sheathtail bat and bare-rumped sheathtail bat habitat

A summary of the Project's potential impacts on the bare-rumped sheathtail bat and mitigation measures is presented in Table 6-6. The risk ratings are presented in Appendix D.

Table 6-6 Residual impact assessment for the bare-rumped sheathtail bat

Impact	Initial impact rating	Mitigation measures	Residual impact	Effectiveness
Total disturbance of 92.23 ha comprising (36.44 ha overlap of suitable habitat): 43.12 ha roosting 85.54 ha foraging	Severe	Utilise existing tracks where possible Land clearing restricted to minimal amount necessary and will not extend outside of the Project area Establishing no-go areas Where infrastructure crosses waterways existing disturbed areas to be selected where possible Preparation of a CEMP	High	Low effectiveness
Loss of roost trees including 10 large and 27 medium sized <i>E. platyphylla</i> hollows	Severe	Avoidance of large and medium sized <i>E. platyphylla</i> hollows. Where this is not possible, loss of roosting habitat will be mitigated through a land-based offset	Moderate	Moderate effectiveness
Loss of future potential roost trees including 325 small sized <i>E. platyphylla</i> hollows	Severe	Plant <i>E. platyphylla</i> tubestock to provide future potential roosting habitat within 400 of water sources.	Moderate	Moderate effectiveness
Injury or mortality due to vegetation clearing	High	Employ a fauna spotter catcher during clearing. Allow a fauna spotter catcher to check moderate to large hollow-bearing trees within the clearing footprints prior to clearing. Identify areas of potential habitat with signage and flagging tape.	Low	Moderate effectiveness

Impact	Initial impact rating	Mitigation measures	Residual impact	Effectiveness
Habitat fragmentation and reduced connectivity	Moderate	Plan haul roads to avoid fragmenting habitats. Reduce area cleared in specific habitats.	Low	Moderate effectiveness
Disturbance from increased light, noise and vibration	Moderate	Restricted sources of artificial lighting. Direct lighting away from sensitive areas for the species	Low	Moderate effectiveness
Habitat degradation through increased dust, run-off and sedimentation.	Low	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions or employ and water truck to reduce dust rates.	Negligible	High effectiveness
Introduction and spread of invasive weed species	Moderate	Implement measures for introduced flora and fauna (to be outlined in the CEMP). Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works. Educate staff on the impacts of weeds and their general environmental obligation. Identify areas of dense outcrops of introduced flora to eliminate construction vehicles from entering the area.	Low	Moderate effectiveness
Disturbance of surface waterways and waterbodies.	High	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions to reduce dust generation and potential sedimentation.	Low	Moderate effectiveness

6.2.10 Significance of impact assessment

An assessment of the significance of the Project's impacts on the bare-rumped sheath-tail bat was undertaken against the Commonwealth Significant impact guidelines (DoE 2013). The Project is likely to have a significant impact on the bare-rumped sheath-tail bat. Justification for this assessment is presented in Table 6-7.

Table 6-7 Significance of impact on the bare-rumped sheath-tail bat

Impact criteria	Potential to occur
<p>Lead to a long-term decrease in the size of an important population of a species.</p>	<p>Unlikely</p> <p>The local bare-rumped sheath-tail bat population could be considered an important population under the definition outlined in the Commonwealth Significant impact guidelines. The Project will result in the loss of 10 large, 27 moderate and 325 small hollow-bearing <i>E. platyphylla</i> trees, with the large and moderate hollows representing potential roosting trees and small hollows representing future potential roosting trees. Large and moderate <i>E. platyphylla</i> hollows will be avoided where possible, where this is not possible, loss of roosting habitat will be mitigated through a land-based offset. The Project will result in a loss of 92.23 ha of potential habitat (in aggregate) for the bare-rumped sheath-tail bat.</p> <p>The loss of habitat is small in the context of the local and regional landscape, which is localised along the pipeline with similar habitat persisting immediately adjacent to the impacted areas. Clearing of large hollow-bearing <i>E. platyphylla</i> has the potential to cause injury and mortality of bare-rumped sheath-tail bats, however this risk will be managed through employing the use of a fauna spotter catcher to undertake pre-clearance checks of large hollows. The Project is unlikely to have any substantial operational impacts on this species, with negligible vehicular movements and no restriction of movement or access to habitat. As such, the Project is therefore unlikely to lead to a long-term decrease in the size of an important population of a species.</p>
<p>Reduce the area of occupancy of an important population.</p>	<p>Unlikely</p> <p>The construction phase of the Project will result in the loss of 92.23 ha of potential habitat for the bare-rumped sheath-tail bat. The Project will result in the impact to 10 large, 27 moderate and 325 small hollow-bearing <i>E. platyphylla</i> representing potential roosting or potential future roosting sites for the species. However the Project will result in the loss of 325 small hollow-bearing trees. Potential large roost trees will be protected from direct and indirect impact by avoiding the removal of these potential roost trees where possible. Where avoidance is not possible in the remnant watercourse areas, these areas will be replanted with <i>E. platyphylla</i> tubestock to increase the availability of future roosting habitat. Given potential roosts are also dispersed along the length of the pipeline, with similar roosting resources present adjacent to the pipeline along its length, the loss of 43.12 ha of potential roosting habitat is unlikely to result in a localised disappearance of the species from a 2 km x 2 km area, such that there would be a reduction in the area of occupancy of an important population.</p>
<p>Fragment an existing important population into two or more populations.</p>	<p>Unlikely</p> <p>Within the Project area, bare-rumped sheath-tail bat habitat has already been subjected to a high level of fragmentation, occurring in sparse, modified grassland and open woodland habitats, where connectivity is loosely maintained to larger open woodland remnants and water sources. The Project will have minimal direct impact on habitat for the bare-rumped sheath-tail bat, resulting in the loss of 92.23 ha of potential habitat for the bare-rumped sheath-tail bat from a relatively dispersed area. The Project area generally supports hollows smaller than typically required by the species, with habitat localised along the Project area and similar habitat persisting immediately adjacent. Along the length of the Project alignment only 10 large and 27 medium sized hollows representing potentially suitable roosting habitat for the species will be subject to clearing. An additional 325 small hollows representing future roosting habitat will also be cleared. The Project will avoid clearance of large and medium sized <i>E. platyphylla</i> hollows. Where this is not possible, loss of roosting habitat will be mitigated through a land-based offset. The bare-rumped sheath-tail bat can fly large distances and can cross open ground (TSSC 2016c). As such, the species' habitat is unlikely to be fragmented by the small-scale clearing required for the Project. Accordingly, the Project is unlikely to fragment the important population into two or more populations.</p>
<p>Adversely affect habitat critical to the survival of a species.</p>	<p>Likely</p> <p>The Project will result in the loss of 43.12 ha of potential roosting habitat critical to the survival of the species, as well as the translocation of 10 large and 27 moderate <i>E. platyphylla</i> hollows, representing potential roosting habitat that would be considered habitat critical to the survival of the species. The formation of hollows suitable for roosting habitat for the species can take up to 200 years to form. Avoidance of large and medium sized <i>E. platyphylla</i> hollows. Where this is not possible, loss of roosting habitat will be mitigated through a land-based offset. The Project has the capacity to adversely impact habitat critical to the survival of the species.</p>

Impact criteria	Potential to occur
Disrupt the breeding cycle of an important population.	<p>Possible</p> <p>The Project will result in the loss of 43.12 ha of potential roosting habitat critical to the survival of the species, as well as the direct loss of 10 large, 27 medium sized and 325 small sized <i>E. platyphylla</i> hollows representing potential roosting habitat for the species. Avoidance of large and medium sized <i>E. platyphylla</i> hollows. Where this is not possible, loss of roosting habitat will be mitigated through a land-based offset. It is acknowledged that small hollows with narrow entrances take approximately 100 years to form. Hollows of a medium size will take around 200 years to form, and larger and deeper hollows can take a lot longer (Mackowski 1984; Menkorst 1984; and Scotts 1991). While an abundance of potential roosting habitat occurs adjacent to the Project area, the cryptic nature of the species means it is difficult to predict the implications resulting from the loss of potential roosting sites on the local breeding population. It is possible that the loss of future potential roosting habitat could disrupt the breeding cycle of the local bare-rumped sheath-tail bat population.</p>
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>Unlikely</p> <p>The local environment is subject to high levels of existing disturbance from weed infestation and habitat fragmentation. The Project will result in localised losses of habitat. However, the Project is unlikely to cause any indirect degradation of habitat over time. Routine weed and pest management measures will be implemented as part of construction controls. As such, other than the loss of habitat, the Project is not expected to result in any indirect impact on habitat. Despite this, the loss of potential roosting resources has the potential to cause the species to decline.</p> <p>Construction of the Project will result in the loss of 43.12 ha of potential roosting habitat critical to the survival of the species, as well as the loss of 10 large and 27 moderate <i>E. platyphylla</i> hollows, representing potential roosts, and 325 small <i>E. platyphylla</i> hollows, representing potential future roosts. Avoidance of large and medium sized <i>E. platyphylla</i> hollows. Where this is not possible, loss of roosting habitat will be mitigated through a land-based offset. As the potential roosting trees are localised along the Project area and dispersed over a large area, with similar roosting resources persisting immediately adjacent to the pipeline, the localised loss of roosting habitat for the species is unlikely to decrease the availability and quality of habitat to the extent the species will decline.</p>
Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species' habitat	<p>Unlikely</p> <p>Competition for hollows by feral species is listed as a likely or future threat to the bare-rumped sheath-tail bat. Feral species such as the common myna (<i>Acridotheres tristis</i>) and the Asian honey bee (<i>Apis cerana</i>) have the potential to directly compete with bare-rumped sheath-tail bat for hollow-bearing trees. The Project area is currently subject to high levels of weed infestation. Unmitigated, the Project has the potential to increase local weed densities and thereby threaten the potential the recruitment, longevity and growth of roost trees such as <i>E. platyphylla</i>. Implementation of standard weed management protocols during construction and operation is expected to mitigate this risk to high levels. The Project is unlikely to result in invasive species that are harmful to the bare-rumped sheath-tail bat becoming established in the species habitat.</p>
Introduce disease that may cause the species to decline, or	<p>Unlikely</p> <p>No diseases or pathogens are identified among current known threats to the bare-rumped sheath-tail bat, however it is listed as a likely or future threat. Diseases such as Australian Bat Lyssavirus (ABLV) have not been recorded for the species, but this may be a function of the lack of specimens presented for examination. The impact of diseases on the bare-rumped sheath-tail bat is unknown (DAWE 2021). The Project construction and operation is not expected to increase the risk of disease transmission for bare-rumped sheath-tail bats, and introduced disease that may cause the species to decline is therefore considered negligible.</p>

Impact criteria	Potential to occur
Interfere substantially with the recovery of the species.	<p>Possible</p> <p>Construction of the Project will result in the loss of 43.12 ha of potential roosting habitat critical to the survival of the species, as well as the loss of 10 large and 27 moderate-sized <i>E. platyphylla</i> hollows that represent potential roosts and 325 small <i>E. platyphylla</i> hollows that represent future potential roosts for the bare-rumped sheath-tail bat. While the loss of roosting resources is small in the context of the local and regional landscape and habitat is localised along the Project area with similar habitat persisting immediately adjacent, habitat loss and competition for tree hollows are listed as key threats for the species (DAWE 2021).</p> <p>Despite the impacts on foraging and roosting habitat, the Project is unlikely to have any substantial impact in terms of its impact during the operational phase. Operation of the Project is unlikely to have any impact on the behaviour or use of habitats for the bare-rumped sheath-tail bat. Implementation of a Weed Management Plan for the Project has the potential to increase the value of future habitat. Local noise disturbance and mortality threats associated with the Project are also expected to be low.</p> <p>The Project may possibly interfere substantially with the recovery of the species.</p>

6.2.11 Conclusion

The mitigation measures have substantially reduced the impact to the bare-rumped sheath-tail bat through avoidance, minimisation and mitigation. However, residual impacts on habitat critical to survival of the species will persist, with a loss of 43.12 ha of roosting habitat and the relocation of 10 large and 27 moderate-sized *E. platyphylla* hollows that represent potential roosting sites. On this basis, the Project is considered **likely** to have a significant impact on the bare-rumped sheath-tail bat.

6.3 Black-throated finch (southern)

6.3.1 Conservation status and documentation

The black-throated finch (southern) is listed as Endangered under the EPBC Act.

The southern subspecies is known to occur in the Townsville-Charters Towers region and in scattered sites in central Queensland including Ingham (DAWE 2021). It remains locally common at only a few sites near Townsville and Charters Towers (NSW and Queensland Governments 2004). The black-throated finch (southern) occurs mainly in grassy, open woodlands and forests, typically dominated by *Eucalyptus*, *Corymbia* and *Melaleuca*, and occasionally in tussock grasslands or other habitats (for example freshwater wetlands), often along or near watercourses, or in the vicinity of water. The subspecies is thought to require a mosaic of different habitats in which it can find seed during the wet season (DAWE 2021). The subspecies has occasionally been recorded in other habitats, including in heavily grazed paddocks. It is likely that permanent sources of water (and the habitat surrounding these) provide refuge for the subspecies during the dry season, especially during drought years (DAWE 2021).

The subspecies prefers habitat adjacent to water sources or riparian strips. Within this habitat, the subspecies requires access to: water sources, grass seeds and trees providing suitable nesting habitat. Any disruption between connectivity of these three resources has a serious impact on an area's ability to sustain the subspecies' populations (DEWHA 2009a). The subspecies is likely to traverse over uninhabitable sites if the distance is less than 1 km (DEWHA 2009a).

Black-throated finch (southern) nesting site selection is likely more closely related to location in regards to water sources, than tree structure itself. The subspecies nest in a range of tree structures including hollow tree limbs, pendulous branches, base of active raptor nests, bushy shrubs etc. During the nesting season, the proximity of the nests are typically within 400 m of a permanent water source (and rarely greater than 1 km) (DEWHA 2009a).

Waterbodies used by the subspecies include both natural and artificial water sources. The black-throated finch (southern) forages on grass seeds from native and invasive grasses. Foraging preferences shift with changing seed availability. When grass seed is abundant, the subspecies preferentially forage near the nesting sites, while dry conditions require the subspecies to forage progressively further (up to 3 km) (DEWHA 2009a). Perennial grasses are thought to dominate the subspecies diet, including *Urochloa*, *Enteropogon*, *Panicum*, *Dichanthium*, *Eragrostis* and *Themeda* (DEWHA 2009a).

6.3.2 Criteria used to map black-throated finch (southern) habitat

Commonwealth habitat definition: Black throated finch (southern) habitat is broadly defined as grassy open woodlands and forests, typically dominated by *Eucalyptus*, *Acacia* and *Melaleuca*. Within this habitat, the black throated finch (southern) requires access to three key resources:

- Water sources
- Grass seeds, and
- Trees providing suitable nesting habitat.

The subspecies has been recorded in 21 REs (all of which occur in Queensland) since 1994 (DAWE 2021).

Table 6-8 Criteria used to map black-throated finch (southern) habitat

Habitat	Commonwealth definition	Criteria used to map habitat
Important area	At sites around Townsville and Charters Towers, the Black-throated Finch (southern) is still considered locally common (BTF Recovery Team 2007). However, given that a reliable estimate of population size is currently not available, and that sightings have been infrequent in recent years (Barrett et al. 2003), recovery efforts should aim to	Areas within 5 km of a post-1995 record of the subspecies. As extensive surveys have not been undertaken to the guidelines in multiple seasons, a precautionary approach will be taken, the entire area is mapped as an important area, assuming that the subspecies will occur.

Habitat	Commonwealth definition	Criteria used to map habitat
	conserve all existing populations of the Black-throated Finch (southern).	
Nesting habitat	In the Townsville region the subspecies typically nest within 400 m of a water source and is rarely seen more than 1 km from permanent water during the breeding season (NRA 2005). Nesting sites also need to be near foraging habitat as observations suggest that during the breeding season the subspecies travels smaller distances than it does during the dry season (Mitchell 1996; NRA 2006; NRA 2007). During the breeding season black-throated finches (southern) typically nest in trees located within 400 m of seasonal water sources (NRA 2007), therefore the presence of suitable trees close to seasonal water sources is critical for the black-throated finch (southern).	<p>All remnant REs listed as essential habitat factors by DoR, or REs that align with the species preferred habitat, that occur within 1 km of permanent and seasonal water sources including watercourses, stock dams and wetlands. (Irrigation channels were not used as these are steep-sided channels with flowing water that do not present suitable drinking sites for the black-throated finch (southern). Res within a 10 km buffer relevant to the subspecies include:</p> <ul style="list-style-type: none"> – 9.12.1 <i>Eucalyptus crebra</i> and/or <i>E. xanthoclada</i> and/or <i>E. drepanophylla</i> low open woodland on igneous rocks – 9.12.4 <i>Eucalyptus shirleyi</i> and/or <i>E. melanophloia</i> and/or <i>Corymbia peltata</i> and/or <i>Callitris intratropica</i> low open woodland on igneous rocks – 9.12.19 <i>Eucalyptus crebra</i> or <i>E. granitica</i> +/- <i>Corymbia citriodora</i> subsp. <i>Citriodora</i> +/- <i>E. portuensis</i> mixed woodland on igneous hills – 9.12.22 <i>Eucalyptus drepanophylla</i>, <i>Corymbia clarksoniana</i> or <i>C. intermedia</i> and <i>C. dallachiana</i> woodland on steep rugged igneous ranges – 9.12.24 <i>Eucalyptus drepanophylla</i> or <i>E. crebra</i> and/or <i>E. xanthoclada</i> and <i>Corymbia peltata</i> woodland on igneous rocks – 11.3.4 <i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. Woodland on alluvial plains – 11.3.4a <i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict. – 11.3.7 <i>Corymbia</i> spp. open woodland on alluvial plains – 11.3.9 <i>Eucalyptus platyphylla</i>, <i>Corymbia</i> spp. Woodland on alluvial plains – 11.3.10 <i>Eucalyptus brownii</i> woodland on alluvial plains – 11.3.12 <i>Melaleuca viridiflora</i>, <i>M. argentea</i> +/- <i>M. dealbata</i> woodland on alluvial plains – 11.3.13 <i>Grevillea striata</i> open woodland on coastal alluvial plains – 11.3.25 <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines – 11.3.25b <i>Melaleuca leucadendra</i> and/or <i>M. fluviatilis</i>, <i>Nauclea orientalis</i> open forest – 11.3.27 Freshwater wetlands – 11.3.30 <i>Eucalyptus crebra</i>, <i>Corymbia dallachiana</i> woodland on alluvial plains – 11.3.31 <i>Ophiuros exaltatus</i>, <i>Dichanthium</i> spp. grassland on alluvial plains – 11.3.33 <i>Eremophila mitchellii</i> open woodland on alluvial plains – 11.3.35 <i>Eucalyptus platyphylla</i>, <i>Corymbia clarksoniana</i> woodland on alluvial plains – 11.3.35a <i>Corymbia tessellaris</i>, <i>C. clarksoniana</i> and <i>Eucalyptus platyphylla</i> woodland – 11.11.1 <i>Eucalyptus crebra</i> +/- <i>Acacia rhodoxylon</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding – 11.11.15 <i>Eucalyptus crebra</i> woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics – 11.12.1 <i>Eucalyptus crebra</i> woodland on igneous rocks – 11.12.9 <i>Eucalyptus platyphylla</i> woodland on igneous rocks

Habitat	Commonwealth definition	Criteria used to map habitat
Foraging habitat	All remnant REs listed as essential habitat factors by DoR that occur within 3 km of permanent water sources including watercourses and stock dams.	<p>All remnant Res with a native grassy understorey within 3 km of permanent water including watercourses and stock dams.</p> <p>REs within a 10 km buffer relevant to the subspecies include:</p> <ul style="list-style-type: none"> – 9.12.1 <i>Eucalyptus crebra</i> and/or <i>E. xanthoclada</i> and/or <i>E. drepanophylla</i> low open woodland on igneous rocks – 9.12.4 <i>Eucalyptus shirleyi</i> and/or <i>E. melanophloia</i> and/or <i>Corymbia peltata</i> and/or <i>Callitris intratropica</i> low open woodland on igneous rocks – 9.12.19 <i>Eucalyptus crebra</i> or <i>E. granitica</i> +/- <i>Corymbia citriodora</i> subsp. <i>Citriodora</i> +/- <i>E. portuensis</i> mixed woodland on igneous hills – 9.12.22 <i>Eucalyptus drepanophylla</i>, <i>Corymbia clarksoniana</i> or <i>C. intermedia</i> and <i>C. dallachiana</i> woodland on steep rugged igneous ranges – 9.12.24 <i>Eucalyptus drepanophylla</i> or <i>E. crebra</i> and/or <i>E. xanthoclada</i> and <i>Corymbia peltata</i> woodland on igneous rocks – 11.3.4 <i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. Woodland on alluvial plains – 11.3.4a <i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict. – 11.3.7 <i>Corymbia</i> spp. open woodland on alluvial plains – 11.3.9 <i>Eucalyptus platyphylla</i>, <i>Corymbia</i> spp. Woodland on alluvial plains – 11.3.10 <i>Eucalyptus brownii</i> woodland on alluvial plains – 11.3.12 <i>Melaleuca viridiflora</i>, <i>M. argentea</i> +/- <i>M. dealbata</i> woodland on alluvial plains – 11.3.13 <i>Grevillea striata</i> open woodland on coastal alluvial plains – 11.3.25 <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines – 11.3.25b <i>Melaleuca leucadendra</i> and/or <i>M. fluviatilis</i>, <i>Nauclea orientalis</i> open forest – 11.3.27 Freshwater wetlands – 11.3.30 <i>Eucalyptus crebra</i>, <i>Corymbia dallachiana</i> woodland on alluvial plains – 11.3.31 <i>Ophiuros exaltatus</i>, <i>Dichanthium</i> spp. grassland on alluvial plains – 11.3.33 <i>Eremophila mitchellii</i> open woodland on alluvial plains – 11.3.35 <i>Eucalyptus platyphylla</i>, <i>Corymbia clarksoniana</i> woodland on alluvial plains – 11.3.35a <i>Corymbia tessellaris</i>, <i>C. clarksoniana</i> and <i>Eucalyptus platyphylla</i> woodland – 11.11.1 <i>Eucalyptus crebra</i> +/- <i>Acacia rhodoxylon</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding – 11.11.15 <i>Eucalyptus crebra</i> woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics – 11.12.1 <i>Eucalyptus crebra</i> woodland on igneous rocks – 11.12.9 <i>Eucalyptus platyphylla</i> woodland on igneous rocks

6.3.3 Desktop results

The black-throated finch (southern) was identified within the PMST (Appendix B) as having potential to occur within a 30 km radius from a central point within the Project area. Essential habitat for the subspecies is mapped south-east, west, north and north-east of the Project area (Figure 6.3). A search of WildNet (Appendix B) reported 15 historical records within 30 km of the search coordinates. Records of the subspecies are confidential, accordingly, the locations of historical records within the desktop search extent were not able to be detailed. Historical records in Atlas of Living Australia show two records from 1892 and 2017, located approximately 20 km north and 30 km south of the Project area. However the geographical accuracy of these records are low, and are given a 10 km inaccuracy buffer to protect the location.

6.3.4 Survey results

Two black-throated finch (southern) were confirmed present in the southern extent of Project area during the 2021 field survey. Individuals were located in very sparse open woodland with *Corymbia dallachiana* and *Corymbia tessellaris* present in low densities and isolated patches of *Carisa lanceolata* and heavily grazed stylo and *Chloris inflata*.

The subspecies has been confirmed present within the Project area, and, under the *Significant impact guidelines for the endangered black-throated finch*, actions proposed within 5 km of confirmed post-1995 records of the subspecies require habitat assessment. Where suitable habitat exists, the subspecies should be considered present. Therefore, the Project area is considered to be within 5 km of a record (i.e. black-throated finches (southern) are presumed to be present).

Foraging habitat for the black-throated finch (southern) occurs broadly across the Project area in woodland to open woodland occupied by *Corymbia*, *Eucalyptus* and *Melaleuca* species including *Eucalyptus platyphylla*, *Corymbia tessellaris*, *Corymbia dallachiana*, *Corymbia clarksoniana* and *Melaleuca viridiflora*. Grass species present across the Project area suitable for foraging by the black-throated finch are provided below in Table 6-9. The number of suitable grass species present is likely to be under-represented due to the dry conditions and lack of reproductive material present at the time of the survey.

Table 6-9 Black-throated finch foraging grasses within the Project area

Scientific name	Common name
<i>Aristida holathera</i>	Erect kerosine grass
<i>Bothriochloa bladhii</i> subsp. <i>Bladhii</i>	Forest bluegrass
<i>Bothriochloa decipiens</i>	Pitted grass
* <i>Bothriochloa pertusa</i>	Indian bluegrass
* <i>Chloris gayana</i>	Rhodes grass
* <i>Chloris inflata</i>	Purpletop chloris
* <i>Dichanthium annulatum</i>	Sheda grass
* <i>Dichanthium aristatum</i>	Angleton grass
<i>Dichanthium sericeum</i> subsp. <i>Sericeum</i>	Queensland bluegrass
<i>Enteropogon ramosus</i>	Twirly windmill grass
<i>Eragrostis sororia</i>	-
<i>Eragrostis</i> sp (indet)	-
<i>Eriochloa pseudoacrotricha</i>	Early spring cupgrass
<i>Eulalia aurea</i>	Silky browntop
<i>Heteropogon contortus</i>	Black speargrass
* <i>Melinis repens</i>	Red natal grass
<i>Oryza australiensis</i>	Australian wild rice

Scientific name	Common name
<i>Panicum decompositum</i>	Australian millet
<i>Sporobolus jacquemontii</i>	Rat's tail grass
<i>Themeda triandra</i>	Kangaroo grass
* <i>Urochloa mutica</i>	Para grass

Note: '*' – introduced species

During the GHD 2022 field survey, no black-throated finch (southern) individuals were recorded within the Project area. Area searches around waterbodies in suitable nesting habitat for the subspecies were undertaken at 14 sites within the Project area, which included actively searching for the subspecies and their nests. A total of 27 nests were recorded during the area searches (Plate 6.5); the provenance of these nests (i.e. which species) was unable to be confirmed, as adult birds were not observed at these nests (or the nests were inactive). The structure of habitat (often very open) and the site of the nests (at least some in Chinese apple) is inconsistent with the known nesting behaviour/requirements of the subspecies. Other bird species, including the double-barred finch (*Taeniopygia bichenovii*), crimson finch (*Neochmia phaeton*) and red-backed fairy-wren (*Malurus melanocephalus*) were recorded within the Project area during the field survey. These species construct similar nests as the black-throated finch (southern) and were observed flying in and out of a number of nests that were recorded during the area searches. However, as the subspecies was recorded during the GHD 2021 field surveys, the subspecies is likely to nest in areas that are mapped as suitable nesting habitat for the subspecies. Location of potential black-throated finch (southern) nests are mapped in Figure 6.3.



Plate 6.5 Nests of unknown species observed within the Project area

The Project area intersects a number of watercourses. The Burdekin River and Scott Creek were the only watercourses observed to contain permanent wetted channels. With a few exceptions, the majority of watercourses within the Project area are classified as minor, non-perennial watercourses. During field surveys, most of these ephemeral watercourses were observed to be dry and are likely to retain water for short periods of time after rainfall events. A number of ephemeral waterbodies were observed to contain water during field surveys, additionally, dams were present in areas adjacent to the Project area. Permanent and ephemeral watercourses retained riparian vegetation, while stock dams and troughs typically contained disturbed ground layers with sparse canopy trees and shrubs. Substantial areas were heavily degraded by cattle grazing and with areas of groundcover dominated by *Sida* spp.

Foraging and nesting habitat has been identified and mapped in accordance with criteria defined on the basis of the habitat description outlined in the Commonwealth listing advice and locally occurring RE communities that are identified by the Queensland Government essential habitat mapping framework as essential habitat factors for the black-throated finch (southern). The Project will impact 96.34 ha of suitable habitat (in aggregate), comprising of 82.14 ha of nesting and foraging, and 14.19 ha of foraging habitat only.

The distribution of breeding and foraging habitat is mapped in Figure 6.3.



Plate 6.6 *Black-throated finch (southern) recorded in the Project area*

6.3.5 Significance of Project area

This section assesses the significance of black-throated finch (southern) habitats within the Project area, whether they constitute habitat critical to the survival of the subspecies, their importance in the context of the local population and whether the local population is important at a national level. The 'Significant impact guidelines for the endangered black-throated finch (southern) (*Poephila cincta cincta*)' states that loss of a stable population in the Townsville area would contribute significantly to the risk of extinction (DEWHA 2009a). Suitable nesting and foraging habitat for the subspecies is mapped within the surrounding the Project area. The Project is situated within a landscape that has been heavily disturbed by decades of land clearing for cattle grazing and agricultural purposes, habitat within the region is heavily fragmented resulting in large, disturbed areas with patches of open woodland interspersed throughout. The subspecies is known to occur within the region, with stronghold areas for the subspecies identified within the local Townsville region. Closest areas of important habitat for the black-throated finch (southern) is mapped at Giru and Artillery Hill further north of the Project area (DEWHA 2009a).

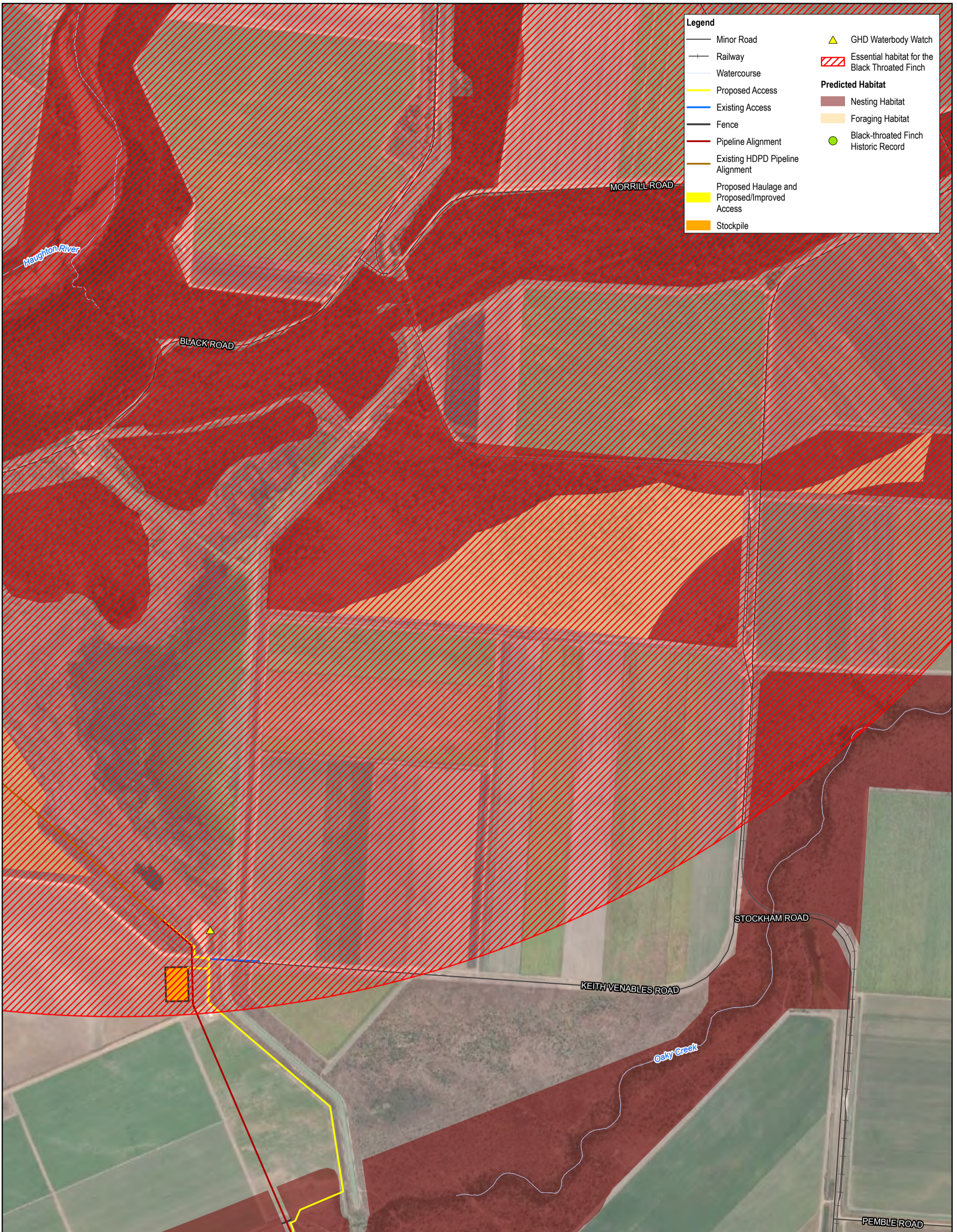
The Project will result in the loss of 82.14 ha of nesting and foraging habitat and 14.19 ha of foraging habitat only. Loss of habitat has the potential to exacerbate local impacts to individuals, and thus, management and mitigation measures will be implemented to reduce the long-term impacts of the Project on the subspecies. In addition, offsetting obligations as a result of the Project are intended to achieve net habitat gains for the subspecies' population within local and regional Greater Townsville setting.

6.3.5.1 Status as an important population

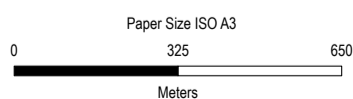
The black-throated finch (southern) is locally common in the greater Townsville region including Charters Towers (BTF Recovery Team 2007). It is noted that the concept of 'important population' does not pertain to the significant impact criteria for EPBC Act listed endangered species. However, the 'Significant impact guidelines for the endangered black-throated finch (southern) (*Poephila cincta cincta*)' identify 'important areas' for the BTF, defined as 'the habitat within five km of post-1995 sightings of the black-throated finch (southern)'. There is a small area of overlap between one such 'important area' and the northernmost extent of the proposed pipeline.

6.3.5.2 Status as habitat critical to the survival of the species

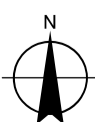
Habitat critical to the survival of the species has not been explicitly defined in the National Recovery Plan for the subspecies (Black-throated finch Recovery Team 2007) or the Significant impact guidelines for the black-throated finch (southern) (DEWHA 2009a). Habitat critical to the survival of the species is likely to include nesting habitat where this occurs in a proximity of water in a matrix of suitable foraging habitat. In the Townsville region the black-throated finch (southern) typically nests within 400 m of a water source, and is rarely seen more than one km from permanent water during the breeding season (NRA 2006). Nesting sites also need to be near foraging habitat as observations suggest that during the breeding season the subspecies travels smaller distances than it does during the dry season (Mitchell 1996; NRA 2006; NRA 2007). The presence of suitable trees close to seasonal water sources is critical for the black-throated finch. For the purposes of this assessment, all suitable nesting habitat within 1 km of water has been considered habitat critical to the survival of the species.



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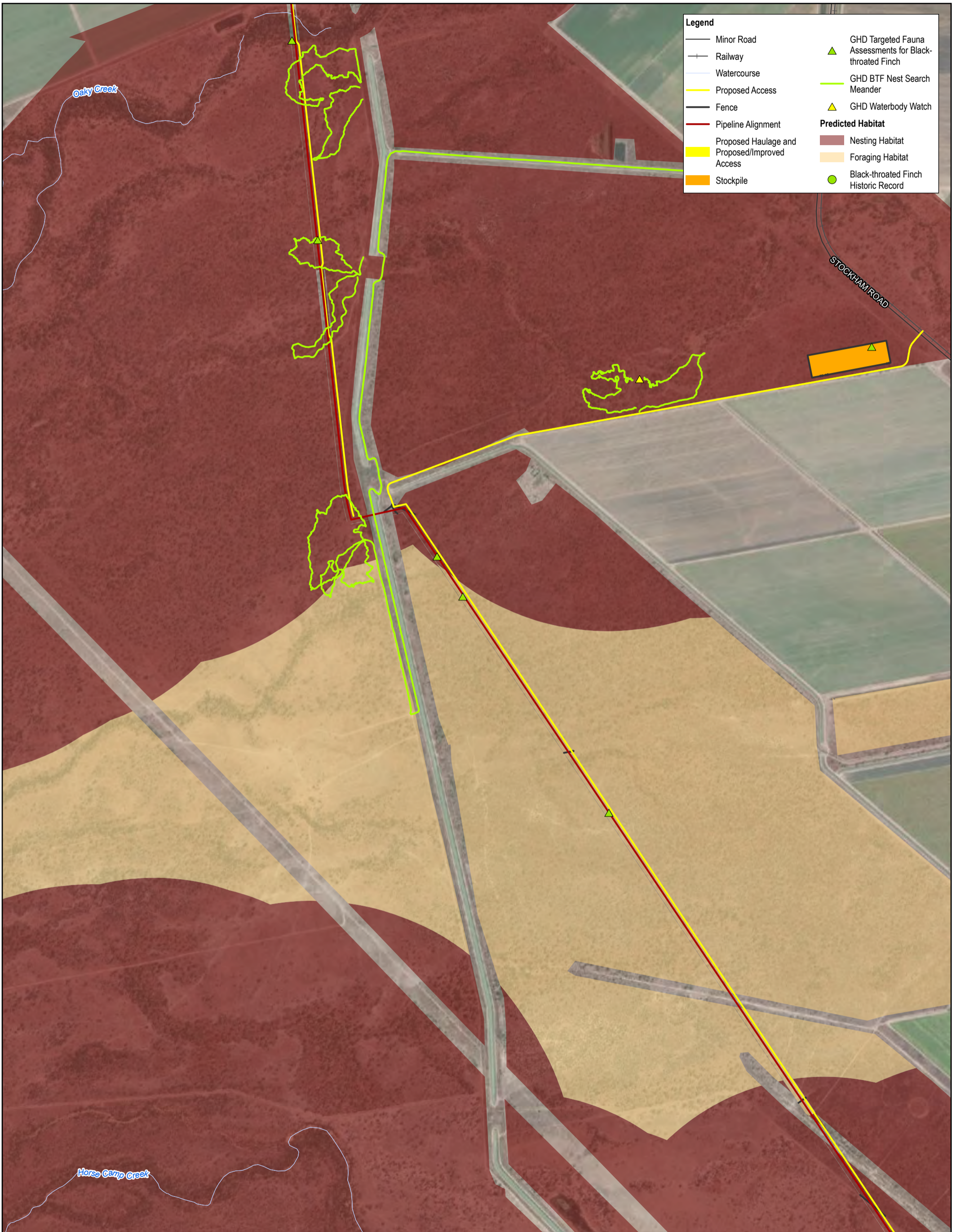
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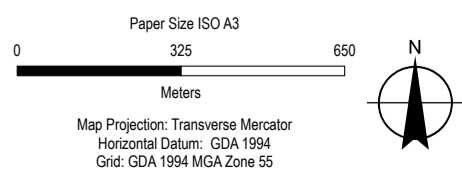
Townsville City Council
Haughton Pipeline Stage 2 - MNES Assessment
Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

Project No. 12537606
Revision No. 3
Date 9/25/2022

FIGURE 6-3



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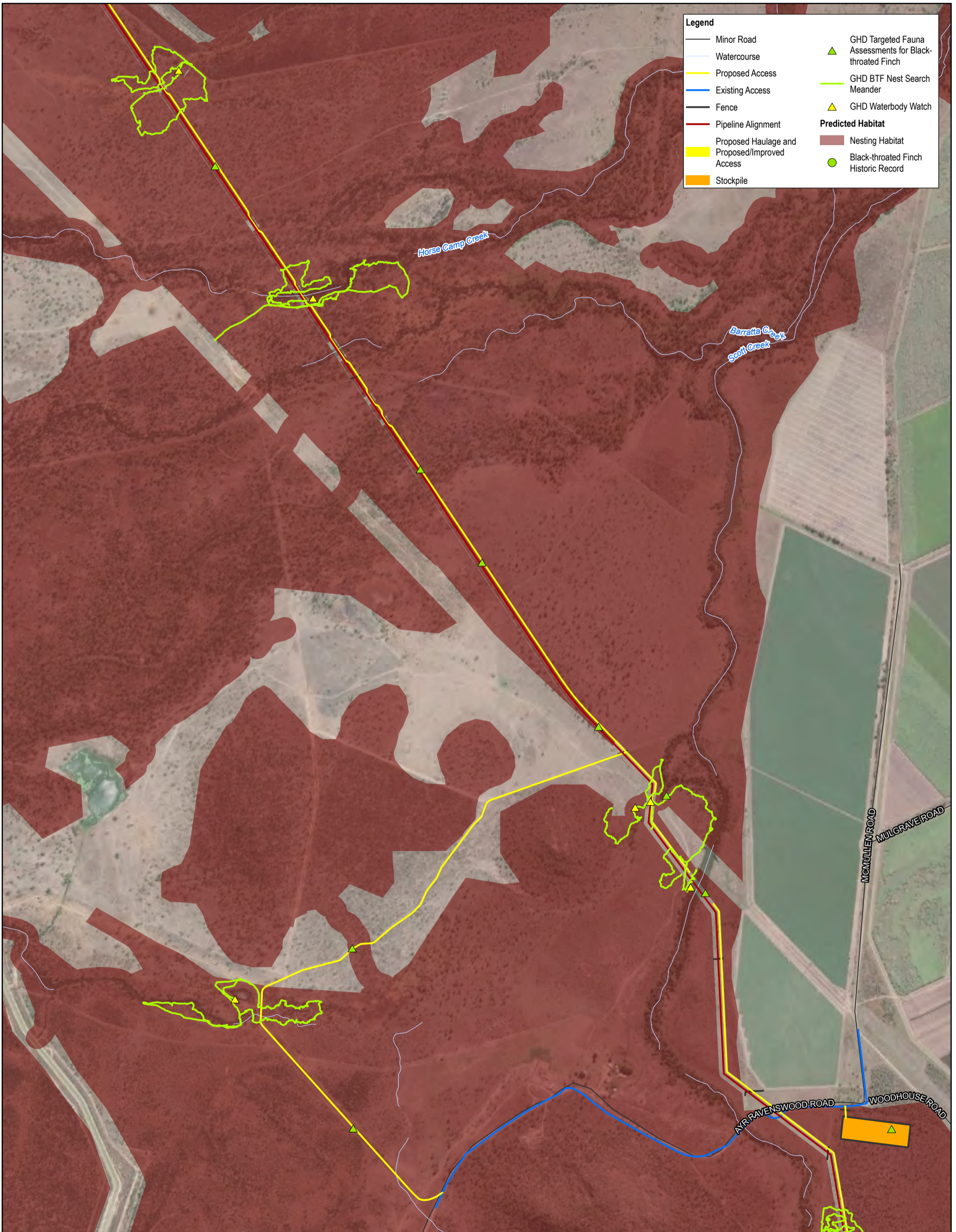


Townsville City Council
Haughton Pipeline Stage 2 - MNES Assessment

Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

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FIGURE 6-3



Legend

- Minor Road
- Watercourse
- Proposed Access
- Existing Access
- Fence
- Pipeline Alignment
- Proposed Haulage and Proposed/Improved Access
- Stockpile
- GHD Targeted Fauna Assessments for Black-throated Finch
- GHD BTF Nest Search Meander
- GHD Waterbody Watch

Predicted Habitat

- Nesting Habitat
- Black-throated Finch Historic Record

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Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

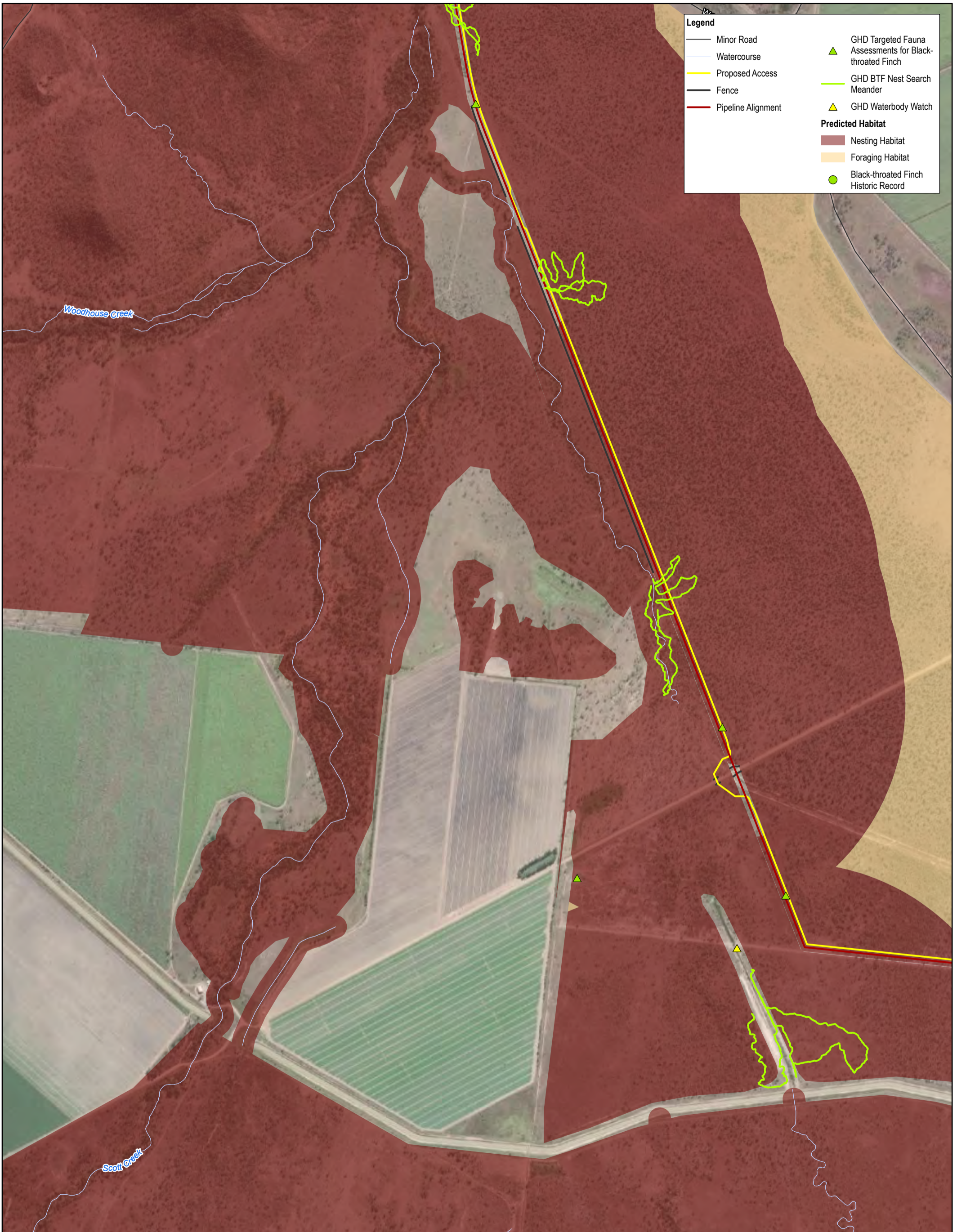


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FIGURE 6-3



Legend

- Minor Road
- Watercourse
- Proposed Access
- Fence
- Pipeline Alignment
- ▲ GHD Targeted Fauna Assessments for Black-throated Finch
- GHD BTF Nest Search Meander
- ▲ GHD Waterbody Watch

Predicted Habitat

- Nesting Habitat
- Foraging Habitat
- Black-throated Finch Historic Record

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Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

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FIGURE 6-3



Legend

— Minor Road	▲ GHD Targeted Fauna Assessments for Black-throated Finch
— Railway	— GHD BTF Nest Search Meander
— Watercourse	▲ GHD Waterbody Watch
— Proposed Access	Predicted Habitat
— Fence	■ Nesting Habitat
— Pipeline Alignment	■ Foraging Habitat
■ Proposed Haulage and Proposed/Improved Access	● Black-throated Finch Historic Record
■ Stockpile	

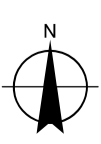
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Map Projection: Transverse Mercator
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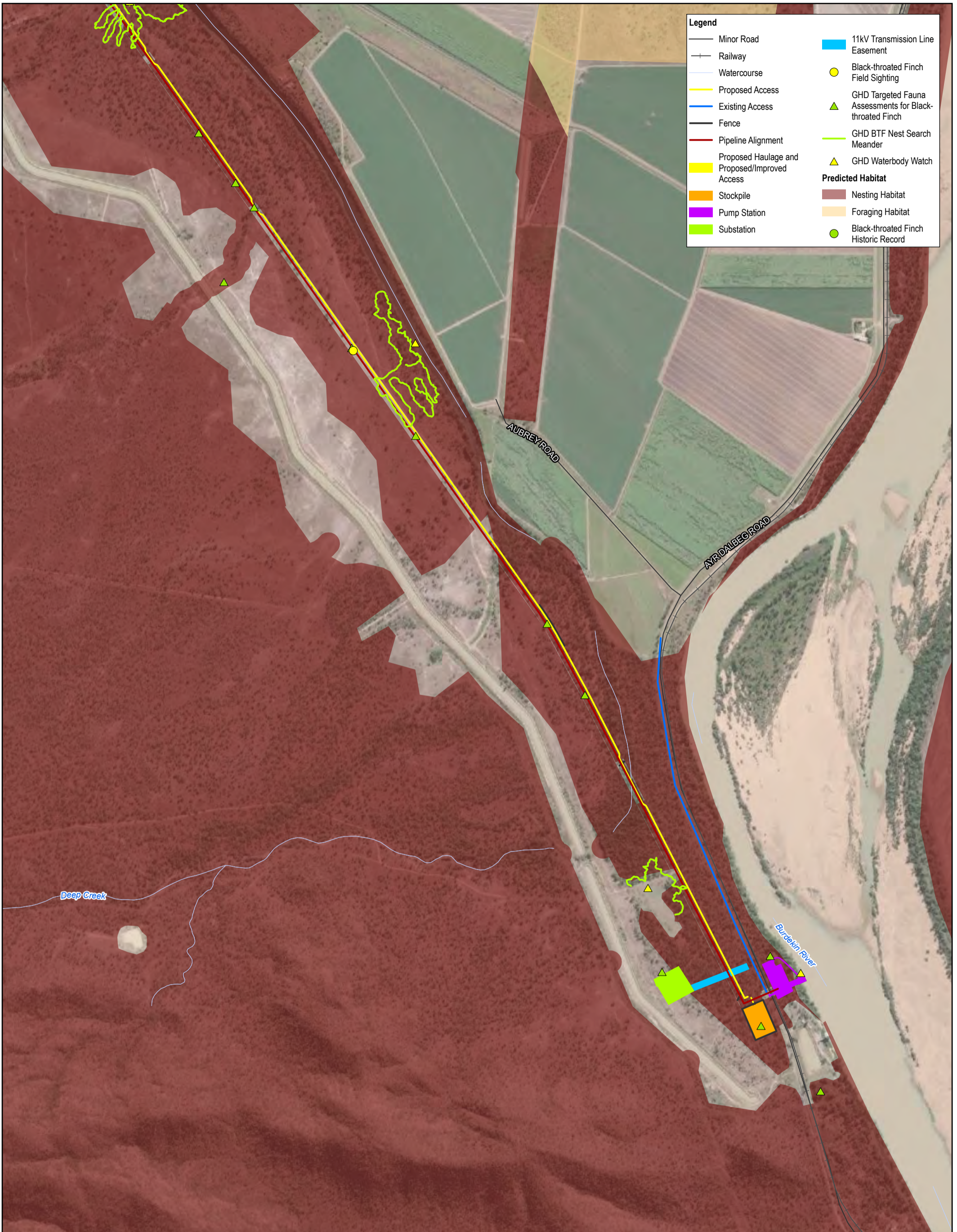


Townsville City Council
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Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

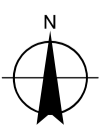
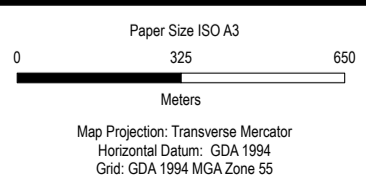
Project No. 12537606
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FIGURE 6-3



Legend	
— Minor Road	11kV Transmission Line Easement
— Railway	Black-throated Finch Field Sighting
— Watercourse	GHD Targeted Fauna Assessments for Black-throated Finch
— Proposed Access	GHD BTF Nest Search Meander
— Existing Access	GHD Waterbody Watch
— Fence	Predicted Habitat
— Pipeline Alignment	Nesting Habitat
Proposed Haulage and Proposed/Improved Access	Foraging Habitat
Stockpile	Black-throated Finch Historic Record
Pump Station	
Substation	

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Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

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FIGURE 6-3

6.3.6 Threatening processes

Threats to the black-throated finch (southern) include (DAWE 2021):

- Degradation of habitat by domestic livestock
- Clearance and fragmentation of habitat
- Alteration of habitat by changes in fire regimes
- Invasion of habitat by invasive weeds
- Illegal trapping
- Predation by introduced predators
- Hybridisation with the northern subspecies of black-throated finch.

6.3.7 Potential impacts

The Project is unlikely to have any substantial impact in terms of operational impacts to the black-throated finch, with negligible vehicular movements and maintenance occurring. Vehicle movements during operations are expected to be in the order of one to two light utility vehicles traversing designated access tracks once per week and impacts will be negligible.

Potential impacts to the black-throated finch that are likely to be experienced during the construction phase of the Project may include the following:

- Loss of habitat
- Injury and mortality
- Disturbance from increased light, noise and vibration
- Habitat degradation through increased dust, run-off and sedimentation
- Introduction and spread of invasive fauna species
- Introduction and spread of weed species
- Disturbance of surface waterways and waterbodies.

These impacts are described further in the following sections.

6.3.7.1 Loss of habitat

The Project area is considered an 'important area' under the Significant impact guidelines for the black-throated finch, as the entire Project area is considered to be 5 km from a post-1995 black-throated finch record. The Project is not expected to result in any loss of artificial dams and wetlands that represent drinking sites for the subspecies. The Project is anticipated to result in the loss of 96.34 ha of potential habitat critical to the survival of the species. Loss of habitat includes 82.14 ha of suitable habitat for nesting and foraging, and 14.19 ha of foraging habitat. Nesting and foraging habitat is mapped broadly across the landscape in which the Project area is situated. Vegetation loss will be localised along a narrow linear alignment for the pipeline, with vegetation retained on both sides of the impact area. Indiscriminate clearing of trees in areas within 1 km of water is required in localised areas such as the pump station, stockpiles and other ancillary infrastructure. Loss of habitat for the black-throated finch (southern) is summarised in Table 6-10 according to habitat type and nature of impact. Rehabilitation commitments for the Project are outlined in Section 4.2.1, with the mitigation measures provided in Section 6.3.8.

Table 6-10 *Black-throated finch (southern) loss of habitat*

Habitat type	Area (ha)
Foraging only	14.19
Nesting and foraging	82.14
Total	96.34

6.3.7.2 Injury and mortality

Vegetation clearance during construction of the Project will potentially cause injury and/or mortality to black-throated finch hatchlings during breeding. In the Townsville area, breeding typically occurs during the wet season, usually between February and May (DAWE 2021).

6.3.7.3 Disturbance from increased light, noise and vibration

Construction will result in a substantial, localised increase in vehicle movements in the short-term, which will increase light, noise and vibration disturbance to local wildlife. Increased light, noise and vibration can alter individual species' behaviours, and disrupt the balance of inter-species interactions. Such disruptions typically favour feral predators and generalist species that owe their success to broad ecological tolerances and possess the ability to tolerate or actively exploit disturbed environments (Hero et al. 2004).

6.3.7.4 Habitat degradation by increased dust, run-off and sedimentation

Construction activities have the potential to generate localised dust, erosion, run-off and sedimentation through increased vehicle movements, clearance of vegetation and earthworks. This can reduce the abundance and diversity of adjacent terrestrial and aquatic habitats by physically smothering vegetation, changing nutrient levels, impeding the growth and germination of plant species, encouraging weed incursions and altering the movement and behaviour of fauna species.

The receiving environment has already been subject to high levels of erosion and sedimentation as a result of existing land-clearing and grazing activities. Nevertheless, sensitive ecological receptors (e.g. larger woodland remnants and aquatic habitats) are particularly susceptible to adverse impacts associated with dust, run-off, erosion and sedimentation. These areas require protection through the implementation of sediment and erosion control measures during construction.

Adverse weather conditions during construction can exacerbate the potential impact of erosion and sedimentation. High rainfall has the potential to remove exposed topsoil, destabilise creek beds and distribute sediment through creek lines. Strong winds have the potential to spread exposed topsoil, decreasing the likelihood of recolonisation by vegetation and potentially distributing dust into nearby sensitive environments.

6.3.7.5 Introduction and spread of pest fauna species

Pest fauna species recorded within the Project area included the cat (*Felis catus*), wild dog (*Canis lupus*) and pig (*Sus scrofa*). The Commonwealth listing advice identifies predation by introduced predators as a key threat to the species (DAWE 2021). The Project is already subject to high levels of disturbance and cats and other introduced predators are likely to be ubiquitous in the landscape. While construction of new tracks can facilitate the movement of feral predators, the network of existing farm tracks is such that the Project is unlikely to exacerbate movement of feral animals across the Project area. Management measures will be incorporated to avoid increasing the abundance or distribution of introduced pests throughout the Project area as part of the Project's CEMP.

6.3.7.6 Introduction and spread of weed species

The Project has the potential to adversely impact habitat for the black-throated finch (southern) by introducing or spreading exotic weed species. The subspecies is reliant on a mosaic of different habitats in which it can find native grass seed during the wet season. As such, the introduction and spread of weeds, particularly exotic pasture grasses can substantially reduce the availability and quality of foraging habitat. Foraging habitat within the Project area is already highly degraded by weeds and grazing. The Project has the potential to exacerbate the loss through introduction and spread of weeds. Clearing native vegetation creates areas of disturbance that are naturally susceptible to colonisation by invasive weed species. These can form a local source of future weed infestations within the surrounding landscape.

6.3.7.7 Disturbance of surface waterways and waterbodies

Construction activities within and/or in the vicinity of watercourses have the potential to cause degradation of riparian habitats through:

- Removal of riparian vegetation

- Run-off, sedimentation and erosion
- Point-source pollution (chemical and fuel spills)
- Disturbance associated with noise, vibration and/or artificial lighting.

The pipeline and associated haulage and access tracks intersect a number of ephemeral watercourses and drainage lines. The pump station, power supply works, and stockpile areas have been sited to minimise the number of water crossings; however, mapped watercourses and ephemeral creek lines are still located in close proximity to some of these Project components. These areas are ecologically important for movement of wildlife, as habitat and drinking sites and are potentially susceptible to construction-related disturbance.

6.3.8 Measures to avoid, reduce or mitigate impacts

6.3.8.1 Loss of habitat

Planning phase measures that have been employed to avoid and reduce the direct loss of habitat include:

- Locating the Project area in open areas that have been subject to historical land clearing and cattle grazing
- Minimising impacts to watercourses
- Utilising existing tracks and locating proposed tracks within previously disturbed areas.

During the construction phase of the Project, the following mitigation measures will be employed:

- Land clearing will be restricted to the minimal amount necessary for the construction of the Project and will not extend outside of the Project area
- The extent of vegetation clearing (and any no-go areas) will be clearly identified on construction plans and in the field using high visibility fencing or flagging in the vicinity of high conservation significant areas. Clearing extents will be communicated to construction supervisors
- Where infrastructure crosses waterways, the Project area has been minimised to a 20 m wide construction corridor. Infrastructure is sited within 57.57 ha of non-remnant vegetation (part of substation and access roads), the Project area is sited within 96.34 ha of remnant and regrowth vegetation
- A CEMP will be prepared to inform actions with regards to managing weed hygiene, erosion, fuels and hazardous substances, fire, etc. and the CESC and ESCPs will include additional erosion and sediment control measures
- All construction personnel will attend environmental training as part of the site induction process prior to entering the work site. As part of this training, all personnel will be instructed on their obligations in regard to vegetation clearing protocols. Areas identified for vegetation clearance are to be clearly defined and detailed in site inductions
- A large portion of the Project area will be revegetated with locally occurring grasses and trees and will therefore retain foraging and nesting habitat values for the black-throated finch.

6.3.8.2 Injury and mortality

While the black-throated finch (southern) hatchlings may be susceptible to injury and mortality during construction Projects undertaken in the breeding season, the risks can be effectively managed using routine management measures targeted at the subspecies. The following measures will be implemented to avoid/minimise injury and/or mortality to black-throated finch (southern) during construction of the Project:

- Pre-clearance surveys will specifically target areas of habitat identified within the clearing footprint. Pre-clearance surveys will be undertaken to mark the locations of potential breeding nests
- Vehicles to be restricted to 40 km/hr along access tracks
- All clearing will be supervised by suitably qualified and experienced fauna spotter-catchers. This will involve relocating any resident fauna to the nearest suitable, safe habitat outside the clearing footprint
- Where deemed necessary by the fauna spotter-catcher, temporary exclusion fencing may be required in specific areas of high ecological sensitivity to prevent wildlife from returning to work areas
- Adverse incident response procedures will be developed to detail actions to be taken in the event of wildlife injury or mortality during clearing

- A Traffic Management Plan, will be developed for the Project with designated access routes, speed limits and identified sensitive ecological areas (particularly areas where black-throated finch have the potential to nest and forage)
- The CEMP will comprise protocols to limit injury and mortality to fauna including management of risks associated with vegetation clearing, waterbodies and responses and reporting for adverse incident protocols
- A high risk SMP will be prepared in accordance with the requirements of Section 335 of the Nature Conservation (Animals) Regulation 2020.

6.3.8.3 Disturbance from increased light, noise and vibration

Routine mitigation measures will be undertaken to minimise the impact that noise, light, vibration and disturbance have on local wildlife populations. This is particularly important within the vicinity of habitat for conservation significant fauna species, including the black-throated finch (southern). The following measures will be used to minimise the impacts of light, noise and vibration during construction:

- Site lighting will be kept to the minimum (security) required for safety. Placement and orientation of lighting to be directed away from sensitive fauna habitat. Direction of lighting beam downwards or use of shields and baffles to limit light spill beyond site boundary
- Wherever practicable, construction activities will be limited to daylight hours to reduce the need for lighting and resultant light spill into adjacent habitat. However, it is noted that some of the road crossings may require night works for traffic management reasons
- A Traffic Management Plan will be developed for the construction site to control vehicle movements and reduce the unnecessary generation of vehicular noise
- All construction vehicles will comply with maintenance schedules and operational restrictions designed to limit noise impacts during construction.

6.3.8.4 Habitat degradation by increased dust, run-off and sedimentation

The following mitigation measures will be used to minimise the impacts of dust, run off and sedimentation during construction of the Project:

- Erosion and sediment controls have been developed as part of the CEMCP and will be expanded on by the construction Contractor as part of their ESCPs
- Routine dust suppression and monitoring will be undertaken throughout construction and operation
- Duration of in-stream works will be minimised wherever practicable to reduce the potential for sedimentation
- Erosion and sediment control measures will be installed where in-stream disturbance must be undertaken during flow conditions
- Areas subject to clearing will be stabilised as soon as practicable
- All vehicle movement will be restricted to designated tracks located within the Project area
- Weather conditions will be monitored during the construction stage and temporary controls will be established during extreme weather events
- Construction activities during adverse weather conditions will be managed in accordance with the CEMP.

6.3.8.5 Introduction and spread of pest fauna species

Although the Project area is already exposed to relatively high levels of pest infestation, mitigation measures will be required to limit any spread of pest fauna that could result from construction activities. The following mitigation measures will be used to minimise the introduction and spread of pest fauna and weed species during construction for the Project:

- Responsible waste management practices (e.g. not leaving out food waste and not feeding wildlife) will be implemented and followed by all construction personnel. All waste will be stored in secure temporary holding containers and transported off site
- Waste management actions to be included in the CEMP:

- Requirements for details on the location and specifications for disposal and removal of waste from the construction site
- All putrescible waste to be stored in secure temporary holding containers and transported off site
- As part of CEMP, the Project will implement feral pest control measures
- Construction staff will not bring domestic animals to the Project area
- All construction personnel shall attend environmental training as part of site inductions. As part of this training, all personnel will be instructed on their responsibilities related to avoiding and minimising the introduction/attraction to the construction site of pest animals.

6.3.8.6 Introduction and spread of weed species

The following measures will be implemented to minimise the introduction and spread of weeds:

- Weed management actions are included in the CEMP and include:
 - Hygiene protocols restricting the movement of vegetation and soil between impacted areas and areas of significantly lower weed infestation
 - Protocols for monitoring and management of weeds to identify and appropriately respond to significant changes in weed distribution and density
- All vehicles / equipment travelling from a declared restricted place or quarantine area will be required to wash down and possess a current weed hygiene inspection certificate before moving to a weed free area or commencing construction works onsite. The weed hygiene inspection certificate is to be obtained from an inspector who is deemed competent and is certified in line with DAF requirements
- Vehicle access will be restricted to within the Project area and existing roads and tracks.

6.3.8.7 Disturbance of surface waterways and waterbodies

The following mitigation measures will be used to minimise the disturbance of waterways and waterbodies during construction of the Project:

- Wherever practicable, watercourse crossings have been located at established crossing points on existing access tracks. Where this is not practicable, the disturbance area is restricted to within the Project area.
- Erosion and sediment controls will be developed as part of the CEMCP and ESCPs
- Dust suppression activities will be undertaken where appropriate. Stabilisation of disturbed areas will be undertaken as soon as practicable after disturbance
- Refuelling will be undertaken away from waterways
- Storage of fuels, chemicals, wastes and other potentially environmentally hazardous substances will be banded or otherwise contained areas away from waterways
- Emergency response protocols and procedures will be developed as part of the CEMP for implementation in the event of a contaminant spill or leak and provision of spill response equipment.

6.3.9 Residual impacts on the black-throated finch (southern) and its' habitat

A summary of the Project's potential impacts on the black-throated finch (southern) and mitigation measures is presented in Table 6-15. The risk ratings are presented in Appendix D.

Table 6-11 Residual impact assessment for the black-throated finch (southern)

Impact	Initial impact rating	Mitigation measures	Residual impact	Effectiveness
Total disturbance of 96.34 ha (in aggregate) comprising Nesting and foraging habitat 82.14 ha (habitat critical to the survival of the species) Foraging habitat only 14.19 ha	Severe	Utilise existing tracks where possible Land clearing restricted to minimal amount necessary and will not extend outside of the Project area Establishing no-go areas Where infrastructure crosses waterways existing disturbed areas to be selected where possible Preparation of a CEMP	High	Low effectiveness
Injury or mortality due to vegetation clearing	Severe	Employ a fauna spotter catcher during clearing. Reduce speed limits within areas of potential habitat Allow a fauna spotter catcher to walk through clearing footprints prior to clearing. Identify areas of potential habitat with signage and flagging tape.	Moderate	Moderate effectiveness
Habitat fragmentation and reduced connectivity	High	Infrastructure sited within existing disturbed habitat (i.e. part of access tracks, part of substation, some access tracks)	Moderate	Low effectiveness
Disturbance from increased light, noise and vibration	Moderate	Restricted sources of artificial lighting. Direct lighting away from sensitive areas for the species	Low	Moderate effectiveness
Habitat degradation through increased dust, run-off and sedimentation.	High	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions or employ and water truck to reduce dust rates.	Moderate	Low effectiveness
Introduction and spread of invasive fauna and weed species	High	Implement measures for introduced flora and fauna (to be outlined in the CEMP). Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works. Educate staff on the impacts of weeds and their general environmental obligation. Identify areas of dense outcrops of introduced flora to eliminate construction vehicles from entering the area.	Moderate	Low effectiveness
Disturbance of surface waterways and waterbodies.	High	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions to reduce dust generation and potential sedimentation.	Low	Moderate effectiveness

6.3.10 Significance of impact assessment

An assessment of the significance of the Project's impacts on the black-throated finch(southern) was undertaken against the thresholds detailed in the Significant impact guidelines for the black-throated finch (southern) (DEWHA 2009a) presented in Table 6-12 and against the criteria outlined in the Commonwealth Significant impact guidelines (DoE 2013), presented in Table 6-13.

Vegetation clearing for the Project will not result in vegetation loss greater than 1 km (in an east-west direction). While small and narrow areas (i.e. 40 m alignment width) will be cleared for the Project, the subspecies is known

to traverse across inhabitable areas where distances are less than a kilometre (DEWHA 2009c). The Project is located in a landscape with existing fragmentation, particularly to the east of the Project area where large areas of vegetation have been historically cleared for sugar cane farming.

To determine the Project's impact on the regions black-throated finch (southern), a coarse demonstration of the Project's connectivity to other areas of black-throated finch (southern) habitat in the context of the greater Townsville population was undertaken. The area of remnant woodland and forest vegetation (based on Queensland Government version 12.1 Regional Ecosystem mapping) occurring within 'Important areas' in the greater Townsville region mapped in Figure 2 of the Significant impact guidelines for the endangered black-throated finch (southern) (*Poephila cincta cincta*) (DEWHA 2009a) was quantified. This map of important areas in the greater Townsville area, as well as in relation to mapped potential habitat for the subspecies within the Project area is shown in Figure 6.3. This exercise revealed that approximately 230,285 ha of remnant vegetation corresponding with Commonwealth-defined 'important areas' for the subspecies occurs in the greater Townsville region. Importantly this 230,285 ha is not a definitive representation of habitat for the subspecies – it is coarsely indicative of where the black-throated finch (southern) may occur given the presence of remnant woodland and forest in locations that are considered important for the subspecies, without accounting for on-ground condition, threats and habitat composition and structure.

The loss of 96.34 ha in a landscape in which the subspecies is known to occur, risks contributing to the decline of the subspecies in the greater Townsville area. However, when considered in context (the loss represents 0.04% of *potential* habitat in the greater Townsville area (an even smaller area if also considering the lower Burdekin/Ayr/Home Hill region)), and noting strict application of the mitigation hierarchy to address the impacts of the Project, it is concluded that the Project is not likely to exacerbate declines to/contribute to the regional extinction of the black-throated finch in the greater Townsville region.

Table 6-12 Significance of impact on black-throated finch (southern) assessed against criteria outlined in DEWHA 2009a

Impact criteria	Potential to occur
Net loss or degradation of water sources (either permanent or seasonal) in the locality	Unlikely The Preliminary route selection has been sited to avoid net loss of water sources for the subspecies. The pipeline and access tracks intersect a number of ephemeral watercourses and drainage lines, during the construction phase of the pipeline and access tracks, impacts to ephemeral watercourses may result in degradation of watercourses. However, these impacts will be temporary and localised, mitigation measures will be implemented including erosion and sediment controls, rehabilitation of cleared areas adjacent to waterways, dust suppression and stabilisation of disturbed areas. No net loss or degradation of water sources will result from the operational phase of the Project. Accordingly, the Project is unlikely to result in a net loss of water sources in the locality.
Widespread or indiscriminate loss of trees, including known nest trees within one km of a water source	Likely Loss of trees will be localised along a narrow linear alignment, with trees and grasses retained on both sides of the pipeline. As the Project largely intersects open woodland habitat, where the density of trees is low – vegetation clearing will result in small losses of trees in any local area. The construction of the Project will impact 82.14 ha of suitable nesting habitat critical to the survival of the species, most of this represents a targeted loss of individual trees within the linear corridor, which due to the retention of trees adjacent to the pipeline would not constitute indiscriminate loss of potential nesting resources. The Project is committed to rehabilitation of vegetation to reduce the impact of the Project on black-throated finch (southern) nesting habitat. Rehabilitation of 61.33 ha, including planting of tubestock <i>E. platyphylla</i> trees will be undertaken in select areas of the Project area. Despite this, locally concentrated clearing of two stockpiles (one at the southern end of McMullen Road and one at the southern end of the pipeline) and the pump station site will result in the indiscriminate clearing of trees within 1 km of water. This will account for a localised loss of 13.2 ha of potential nesting habitat, which would constitute habitat critical to the survival of the species. This clearing would result in an indiscriminate loss of trees within 1 km of water and would still result in a significant impact on the subspecies.
A decrease in tree recruitment capacity which limits the area's ability to be self-sustaining	Unlikely The Project will result in the localised loss of trees within the Project area and will not limit the potential for tree recruitment immediately adjacent to the pipeline, stockpiles, access tracks, pump station and power supply areas.

Impact criteria	Potential to occur
The degradation of foraging habitat (grassland) where known black throated finch (southern) records exist, including the intensification of biomass reduction or stocking rates.	Unlikely The Project will result in the loss of 96.34 ha of potential foraging habitat for the subspecies. The Project will involve the disturbance footprint areas (i.e. pipeline construction corridor, access and haulage tracks and stockpile areas) and permanent disturbance footprint areas (i.e. buried pipeline, 4 m wide pipeline access road, pump station, intake structure, substation and power supply works). Land clearing will be restricted to the minimal amount necessary for the construction of the Project and will not extend outside of the Project area. The clearing of foraging habitat in these areas is unlikely to result in degradation and the substantial intensification of biomass reduction or stocking rates. The construction of the Project is unlikely to result in the degradation of foraging habitat where known black-throated finch (southern) records exist.

Table 6-13 Significance of impact on black-throated finch (southern) assessed against criteria outlined in DoE 2013

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Response
Lead to a long-term decrease in the size of a population of a species; or	Unlikely The Project will result in the loss of 82.14 ha of potential nesting habitat for the subspecies. Retention of trees within the surrounding areas would provide ongoing nesting resources for the subspecies. Localised loss of potential nesting habitat is associated with temporary clearing of laydown areas which will be revegetated after construction. While clearing of trees within the pump station will cause a local adverse impact on habitat critical to the survival of the species, the small scale of impact is unlikely to have implications at a population level.
Reduce the area of occupancy of the species; or	Unlikely As detailed above, loss of habitat critical to the survival of the species is mostly attributed to a linear footprint in a landscape in which habitats are broadly available. Suitable nesting habitat is abundant in the surrounding region. The scale of the impact is unlikely to cause the subspecies to disappear from an area of sufficient size to reduce the area of occupancy of the subspecies at the scale measured by the IUCN (i.e. from a 2 km x 2 km area).
Fragment an existing population into two or more populations; or	Unlikely Clearing of habitat will occur within a narrow footprint, with no broad-scale fragmentation of habitat resulting or barriers to movement imposed. Localised clearance of habitat will not restrict ongoing access to riparian habitats or the capacity for the subspecies to move between habitats within the region.
Adversely affect habitat critical to the survival of a species; or	Likely As detailed above, a series of targeted measures have been undertaken to reduce the loss of nesting habitat through strategic replanting of <i>E. platyphylla</i> and hydromulching with a mix of native food grass species for the black-throated finch (southern). As detailed in Table 6-10, the Project will result in the loss of 82.14 ha of nesting habitat critical to the survival of the species. This includes 13.2 ha of locally concentrated clearing (at two stockpile locations and the pump station site) that would result in locally indiscriminate loss of potential nesting resources. This loss of nesting habitat would constitute a significant adverse impact on habitat critical to the survival of the species.
Disrupt the breeding cycle of a population; or	Possible As detailed above and in Table 6-10, the Project will result in the loss of 82.14 ha of nesting habitat critical to the survival of the species. The loss of habitat is localised and forms a small proportion of nesting resources available within the surrounding landscape. The loss could disrupt the breeding cycle of the local black-throated finch (southern) population in the short term.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; or	Unlikely The Project will remove up to 82.14 ha of potential nesting habitat critical to the survival of the species. The loss of habitat is from a relatively narrow footprint, within a broader landscape in which suitable nesting habitat is widely available. Large parts of the Project area will be revegetated after construction. The localised loss of potential nesting and foraging habitat is not likely to impact the species' survival in the region. As such, it is

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Response
	unlikely the Project will 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 an endangered species becoming established in the endangered species' habitat; or	<p>Unlikely</p> <p>The Project area is already subject to high levels of weed infestation that would reduce the value of foraging habitats. While land clearing and construction activities have the potential to exacerbate weed infestations, implementation of a site-specific CEMP will control the potential for weed spread. Mitigation areas will be rehabilitated and sown with native grass species using a mix of species to maximise food availability for the black-throated finch (southern). Weed management will be undertaken as part of the rehabilitation management plan. As such, the Project is not expected to result in invasive species that are harmful to the black-throated finch (southern) becoming established in the subspecies habitat.</p>
Introduce disease that may cause the species to decline; or	<p>Unlikely</p> <p>The black-throated finch (southern) is not known to be adversely affected by any disease. Hygiene protocols during clearing will limit any potential for novel diseases.</p>
Interfere substantially with the recovery of the species.	<p>Unlikely</p> <p>While the Project will result in a localised loss of potential nesting habitat, this is not at a scale that would interfere substantially with the recovery of the subspecies.</p>

6.3.11 Conclusion

While the mitigation measures have substantially mitigated impact to the subspecies, residual impacts on potential habitat remain with a total loss of 96.34 ha of suitable habitat (in aggregate), comprising of 82.14 ha of nesting and foraging habitat (constituting habitat critical to the survival of the species) and 14.19 ha of suitable foraging (only) habitat. Accordingly, the Project is considered **likely** to have a significant impact on the black-throated finch (southern).

6.4 Squatter pigeon (southern)

6.4.1 Conservation status and documentation

The squatter pigeon (southern) is listed as Vulnerable under the EPBC Act.

Its current distribution extends from central Queensland, west to Longreach and Charleville, and south to New South Wales (TSSC 2015). The species occurs in remnant and regrowth open forest and woodland dominated by *Eucalyptus*, *Corymbia*, *Acacia* and *Callitris* species with tussock grassy understorey within 3 km of water sources (TSSC 2015). Soils are generally a good predictor of their foraging and breeding habitat, which is generally restricted to well-draining, gravelly, sandy or loamy soils. These typically have a patchy ground layer composed of native perennial tussock grasses or a mix of native perennial tussock grasses and low shrubs or forbs (Squatter Pigeon Workshop 2011).

Breeding habitats are typically on stony rises within 1 km of permanent water (Squatter Pigeon Workshop 2011). In Queensland, the Commonwealth listing advice specifically nominates RE Land Zone 3 (recent Quaternary alluvial systems), RE Land Zone 5 (well-draining, sandy or loamy soils on low, gently sloping, flat to undulating plains and foothills) and RE Land Zone 7 (lateritic (duplex) soils on low 'jump-ups' and escarpments) as suitable foraging and breeding habitat for the species. Ground-level vegetation is typically patchy with vegetation cover rarely exceeding 33 percent (Squatter Pigeon Workshop 2011). Waterbodies that are suitable for the squatter pigeon (southern) occur on RE Land Zones 10, 3 and 4 (DAWE 2021). Hence, where natural foraging or breeding habitat occurs (i.e. on RE Land Zones 3, 5 and 7), the squatter pigeon (southern) may be found in vegetation types growing on the above soil types (DAWE 2021).

6.4.2 Criteria used to map squatter pigeon (southern) habitat

Commonwealth habitat definition: Squatter Pigeon (southern) habitat is generally defined as open-forests to sparse, open-woodlands and scrub that are (Baldwin 1975; Beruldsen 1972; Cooper et al. 2014; EPA 2006; Frith 1982b; Leach 1988; North 1913-14; Squatter Pigeon Workshop 2011):

- Mostly dominated in the overstorey by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species
- Remnant, regrowth or partly modified vegetation communities, and
- Within 3 km of waterbodies or watercourses.

Soil landscapes are good indicators of where foraging and breeding habitats for the Squatter Pigeon (southern) occur (Squatter Pigeon Workshop 2011). Well-draining, gravelly, sandy or loamy soils support the open-forest to woodland communities with patchy, tussock-grassy understoreys that support the subspecies' foraging and breeding requirements. Given that the subspecies nests in shallow depressions in the ground, it requires well-draining soils.

Table 6-14 Criteria used to map squatter pigeon (southern) habitat

Habitat	Commonwealth definition	Criteria used to map habitat
Critical to survival of the species	Habitat critical to the survival of the squatter pigeon (southern) has not been formally defined in the Commonwealth conservation advice for the subspecies. In the absence of a formal definition, the definition outlined in the Commonwealth Significant impact guidelines applies.	All foraging and breeding habitat (as summarised below) aligns broadly with the definition of habitat critical to the survival of the subspecies. However, a determination of this habitat's value to the subspecies in this part of its range is detailed further hereabouts, with respect to its role in supporting the ongoing persistence and viability of the subspecies.

Habitat	Commonwealth definition	Criteria used to map habitat
Foraging	<p>Natural foraging habitat for the Squatter Pigeon (southern) is any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by <i>Eucalyptus</i>, <i>Corymbia</i>, <i>Acacia</i> or <i>Callitris</i> species, on sandy or gravelly soils, within 3 km of a suitable, permanent or seasonal waterbody (Squatter Pigeon Workshop 2011). In Queensland, Squatter Pigeon (southern) foraging and breeding habitat is known to occur on alluvial river and creek flats (i.e. Queensland RE Land Zone 3 (recent Quaternary alluvial systems), well-draining, sandy or loamy soils on low, gently sloping, flat to undulating plains and foothills (i.e. Queensland RE Land Zone 5), and lateritic (duplex) soils on low 'jump-ups' and escarpments (i.e. Queensland RE Land Zone 7) (Squatter Pigeon Workshop 2011). Clay soils usually support denser vegetation types which the Squatter Pigeon (southern) is unlikely to use as foraging or breeding habitat. However, given that clay soil types tend to form in lower lying areas where the drainage and storage of water naturally occurs in the landscape, the subspecies is known to utilise forests or woodlands occurring on these soils to move between patches of foraging or breeding habitat and suitable waterbodies (Squatter Pigeon Workshop 2011).</p>	<p>Any remnant and regrowth REs within 3 km of permanent or seasonal waterbodies (including watercourses, irrigation channels, stock dams and natural wetlands) on suitable soil (i.e. Land Zone 3, 5 or 7 RE as included in the approved conservation advice).</p> <p>No REs of Land Zone 5 or 7 were present within the Project area. The Project area exclusively overlaps Land Zone 3 and Land Zone 12.</p> <p>Woodland vegetation on Land Zone 3 is likely to provide foraging habitat, noting that individual squatter pigeons were recorded at the Project area. REs within the Project area that are likely suitable foraging habitat include:</p> <ul style="list-style-type: none"> – 11.3.4 <i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. Woodland on alluvial plains – 11.3.4a <i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict – 11.3.7 <i>Corymbia</i> spp. Open woodland on alluvial plains – 11.3.9 <i>Eucalyptus platyphylla</i>, <i>Corymbia</i> spp. Woodland on alluvial plains – 11.3.10 <i>Eucalyptus brownii</i> woodland on alluvial plains – 11.3.12 <i>Melaleuca viridiflora</i>, <i>M. argentea</i> +/- <i>M. dealbata</i> woodland on alluvial plains – 11.3.13 <i>Grevillea striata</i> open woodland on coastal alluvial plains – 11.3.25 <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines – 11.3.25b <i>Melaleuca leucadendra</i> and/or <i>M. fluviatilis</i>, <i>Nauclea orientalis</i> open forest – 11.3.25f Main river channels. Open water or exposed stream beds and bars. Usually devoid of emergent vegetation although scattered trees and shrubs such as <i>Melaleuca viminalis</i> or <i>Melaleuca</i> spp. May be present and aquatic species may be abundant particularly in water holes and lagoons. Occurs in river channels. – 11.3.30 <i>Eucalyptus crebra</i>, <i>Corymbia dallachiana</i> woodland on alluvial plains – 11.3.31 <i>Ophiuros exaltatus</i>, <i>Dichanthium</i> spp. grassland on alluvial plains – 11.3.35 <i>Eucalyptus platyphylla</i>, <i>Corymbia clarksoniana</i> woodland on alluvial plains – 11.3.35a <i>Corymbia tessellaris</i>, <i>C. clarksoniana</i> and <i>Eucalyptus platyphylla</i> woodland
Breeding	<p>Breeding habitat occurs on stony rises occurring on sandy or gravelly soils, within 1 km of a suitable, permanent waterbody (Squatter Pigeon Workshop 2011).</p>	<p>Any remnant or regrowth RE occurs on suitable soil (i.e. Land Zone 3, 5 or 7 RE as outlined in the Commonwealth 'SPRAT' profile for the subspecies)) within 1 km of permanent or seasonal waterbodies (including watercourses, irrigation channels, stock dams and wetlands).</p> <p>No REs of Land Zone 5 or 7 were present within the Project area. .</p> <p>Woodland vegetation on Land Zone 3 is likely to provide breeding habitat, noting that individual squatter pigeons were recorded at the Project area.</p>

Habitat	Commonwealth definition	Criteria used to map habitat
		<p>REs within the Project area that are likely suitable breeding habitat include:</p> <ul style="list-style-type: none"> - 11.3.4 <i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. Woodland on alluvial plains - 11.3.4a <i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict - 11.3.7 <i>Corymbia</i> spp. Open woodland on alluvial plains - 11.3.9 <i>Eucalyptus platyphylla</i>, <i>Corymbia</i> spp. Woodland on alluvial plains - 11.3.10 <i>Eucalyptus brownii</i> woodland on alluvial plains - 11.3.12 <i>Melaleuca viridiflora</i>, <i>M. argentea</i> +/- <i>M. dealbata</i> woodland on alluvial plains - 11.3.13 <i>Grevillea striata</i> open woodland on coastal alluvial plains - 11.3.25 <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines - 11.3.25b <i>Melaleuca leucadendra</i> and/or <i>M. fluviatilis</i>, <i>Nauclea orientalis</i> open forest - 11.3.25f Main river channels. Open water or exposed stream beds and bars. Usually devoid of emergent vegetation although scattered trees and shrubs such as <i>Melaleuca viminalis</i> or <i>Melaleuca</i> spp. May be present and aquatic species may be abundant particularly in water holes and lagoons. Occurs in river channels. - 11.3.30 <i>Eucalyptus crebra</i>, <i>Corymbia dallachiana</i> woodland on alluvial plains - 11.3.31 <i>Ophiuros exaltatus</i>, <i>Dichanthium</i> spp. grassland on alluvial plains - 11.3.35 <i>Eucalyptus platyphylla</i>, <i>Corymbia clarksoniana</i> woodland on alluvial plains - 11.3.35a <i>Corymbia tessellaris</i>, <i>C. clarksoniana</i> and <i>Eucalyptus platyphylla</i> woodland.
Drinking and dispersal	<p>The Squatter Pigeon (southern) is known to access suitable waterbodies to drink on a daily basis. Waterbodies suitable for the subspecies include permanent or seasonal rivers, creeks, lakes, ponds and waterholes, and artificial dams. Waterbodies that are suitable for the subspecies occur on the lower, gentle slopes and plateaus of sandstone ranges (equivalent to Queensland Regional Ecosystem Land Zone 10), alluvial clay soils on river or creek flats (represented by Queensland Regional Ecosystem Land Zone 3) or non-alluvial clay soils on flats or plains which are not associated with current alluvial deposits (represented by Queensland Regional Ecosystem Land Zone 4). Hence, where natural foraging or breeding habitat occurs (i.e. on Queensland Regional Ecosystem Land Zones 5 and 7), the Squatter Pigeon (southern) may be found in vegetation types growing on the above soil types. Squatter Pigeon (southern) dispersal habitat is any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies. Such patches of vegetation tend not to be suitable for the subspecies' foraging or breeding but facilitate the local movement of the subspecies between patches of foraging habitat, breeding habitat</p>	<p>Any remnant or regrowth forest or woodland occurring between patches of foraging or breeding habitat that facilitates movement between patches of foraging habitat, breeding habitat and/or waterbodies.</p> <p>REs within the Project area that are likely suitable for dispersal habitat include:</p> <p>11.12.1 <i>Eucalyptus crebra</i> woodland on igneous rocks.</p> <p>–</p>

Habitat	Commonwealth definition	Criteria used to map habitat
	<p>and/or waterbodies, or the wider dispersal of individuals in search of reliable water sources during the dry season or during droughts (Squatter Pigeon Workshop 2011). Clay soils usually support denser vegetation types which the Squatter Pigeon (southern) is unlikely to use as foraging or breeding habitat. However, given that clay soil types tend to form in lower lying areas where the drainage and storage of water naturally occurs in the landscape, the subspecies is known to utilise forests or woodlands occurring on these soils to move between patches of foraging or breeding habitat and suitable waterbodies (Squatter Pigeon Workshop 2011). The subspecies is unlikely to move far from woodland trees which provide protection from predatory birds (Squatter Pigeon Workshop 2011). Where scattered trees still occur, and the distance of cleared land between remnant trees or patches of habitat does not exceed 100 m, individuals may be found foraging in, or moving across modified or degraded environments (Squatter Pigeon Workshop 2011).</p>	

6.4.3 Desktop results

The squatter pigeon (southern) was not identified within the PMST (Appendix B) as having potential to occur within a 30 km radius from a central point within the Project area, completed in November 2021. A search of WildNet (Appendix B) reported two historical records within 30 km of the search coordinates. Records viewed on Biomaps detailed dates of historical records from 1970 and 2011 in Ravenswood in disturbed non-remnant habitat adjacent to Ravenswood gold mine.

6.4.4 Survey results

Nineteen squatter pigeons were confirmed present across the Project area and surrounds in open woodland to very sparse open woodland or highly disturbed pastures for cattle grazing. Squatter pigeons were recorded within 1 km of permanent or seasonal waterbodies and near tussocky grasses.

Suitable foraging and breeding habitat for the squatter pigeon (southern) occurs broadly across the Project area in open woodland and pastures occupied by tussocky grass species nearby permanent or seasonal waterbodies including ephemeral watercourses and drainage lines, stock dams, irrigation channels and wetlands. The squatter pigeon (southern) was also recorded in areas heavily degraded by cattle grazing. Substantial groundcover in the mid-north section of the Project area were dominated by dense *Sida* spp., rendering the habitat unsuitable for the squatter pigeon (southern). Drinking and dispersal habitat occurs between areas of suitable foraging and breeding habitat and on land zone 12.

Potential habitat has been identified and mapped in accordance with criteria defined on the basis of the habitat description outlined in the Commonwealth 'SPRAT' profile for the squatter pigeon (southern) (DAWE 2022a) and locally occurring RE communities that are identified by the Queensland Government essential habitat mapping framework as essential habitat factors for the squatter pigeon (southern).

In sum, 82.33 ha of foraging and breeding habitat, 13.31 ha of foraging only habitat and 0.68 ha of drinking and dispersal habitat is present within the Project area, and is mapped in Figure 6.4.



Plate 6.7 *Squatter pigeons recorded adjacent to the Project area*

6.4.5 Significance of Project area

This section assesses the significance of squatter pigeon (southern) habitats within the Project area, whether they constitute habitat critical to the survival of the species, their importance in the context of the local population and whether the local population is important at a national level.

6.4.5.1 Status as an important population

The Project area is not south of the Carnarvon Ranges. Accordingly, as per the Commonwealth definition of important populations for the squatter pigeon (southern), the local population is not an important population under the definition outlined in the EPBC Act (Squatter Pigeon Workshop 2011; DAWE 2021).

6.4.5.2 Habitat critical to the survival of the species

Habitat critical to the survival of the squatter pigeon (southern) has not been formally defined in the Commonwealth listing advice for the species. In the absence of a formal definition, the definition outlined in the Commonwealth Significant impact guidelines applies. 'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary: for activities such as foraging, breeding, roosting, or dispersal; for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators); to maintain genetic diversity and long term evolutionary development, or; for the reintroduction of populations or recovery of the species or ecological community.

In that context, habitat critical to the survival of the squatter pigeon (southern) would include all foraging, breeding, roosting or dispersal habitat necessary for maintaining the viability of important populations. Important populations of the squatter pigeon (southern) are nominated in the listing advice as those occurring at the southern extent of the species range, including all small and sparsely distributed sub-populations south of Carnarvon Range (Squatter Pigeon Workshop 2011). While impacts to local habitats for the squatter pigeon (southern) that arise from the Project will be managed and mitigated, unavoidable losses would not constitute an adverse impact to habitat critical to the survival of the species. This is on the basis of: the Project area is located outside of an 'important population' of the subspecies, the small quantum of impact to habitat noting the availability of resources for the subspecies within the local and regional landscape, and the fact that of the impact sub-categories of impacted habitat (i.e. breeding, foraging, drinking), none is limiting (in terms of extent) in the Project area, the local landscape or the broader (e.g. Burdekin) region. On this last point, loss of particularly categories of habitat associated with this project are not likely to be significant in the context of impacts to habitat critical to the survival of the species, as these habitat categories (i.e. breeding, foraging etc.) frequently co-occur, and none are especially restricted in extent (relative to the other categories of habitat). While the disturbance will have negligible implications for movement, the Project is not likely to lead to a decline in the local, let alone whole-of-range, population of the squatter pigeon (southern). Although suitable breeding and foraging habitat is mapped within the impact area, an 'important population' of the subspecies is not located within the Project area. As such, the Project

will not impact habitat critical to the survival of an important population, and thus, the Project is considered **unlikely** to result in a significant impact on the squatter pigeon (southern).

It is also important to note that the distribution of the squatter pigeon (southern) per the subspecies' Commonwealth 'SPRAT' profile (August 2022) does not extend as far north as the Project area (the northernmost extent of the 'likely to occur' range is represented by an east-west line to the north of Mackay). It is recognised that a large (north-south) intergrade zone exists where the northern and southern subspecies' ranges overlap, and where hybridisation is known to occur. The Project area exists within this zone. The SPRAT profile notes that: "For the purposes of the EPBC Act, hybrids are not considered to be *Geophaps scripta scripta*". The Project area occurs outside of the core distribution of the listed threatened subspecies, and the taxonomy of the birds observed in the field cannot be conclusively identified as the southern subspecies. This further underscores the conclusion that the habitat in the Project area is not considered critical to the survival of the subspecies.



Legend

— Minor Road	— Proposed Access
— Railway	— Existing Access
— Watercourse	— Fence
Potential Habitat	— Pipeline Alignment
■ Breeding Habitat	— Existing HDPD Pipeline Alignment
■ Foraging Habitat	— Proposed Haulage and Proposed/Improved Access
	■ Stockpile
	● Point_edit_layer

Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

Paper Size ISO A3

0 325 650

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

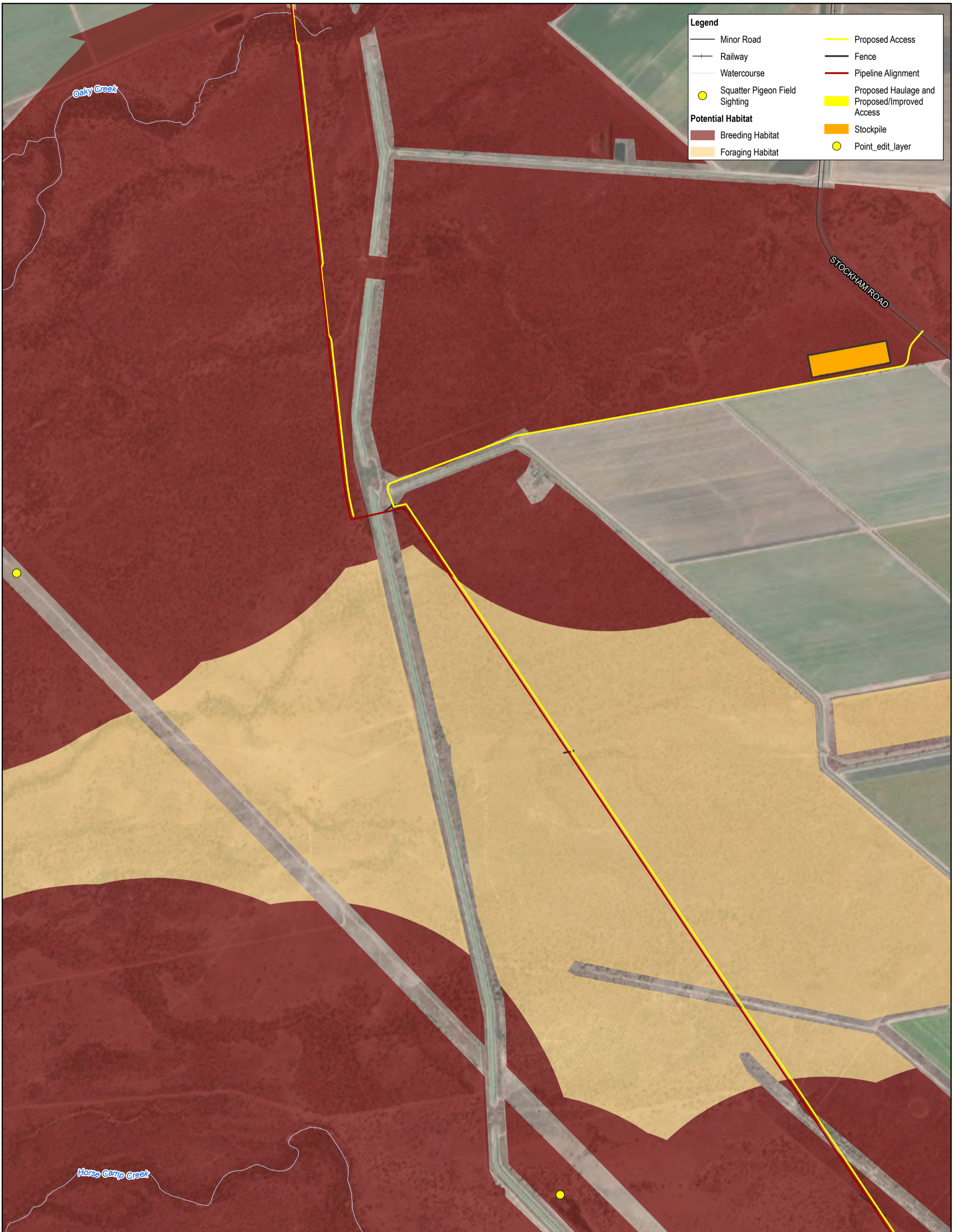


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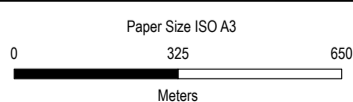
Distribution of potential habitat for squatter pigeon (southern) habitat within and surrounding the Project area

Project No. 12537606
Revision No. 4
Date 9/25/2022

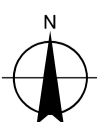
FIGURE 6-4



Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

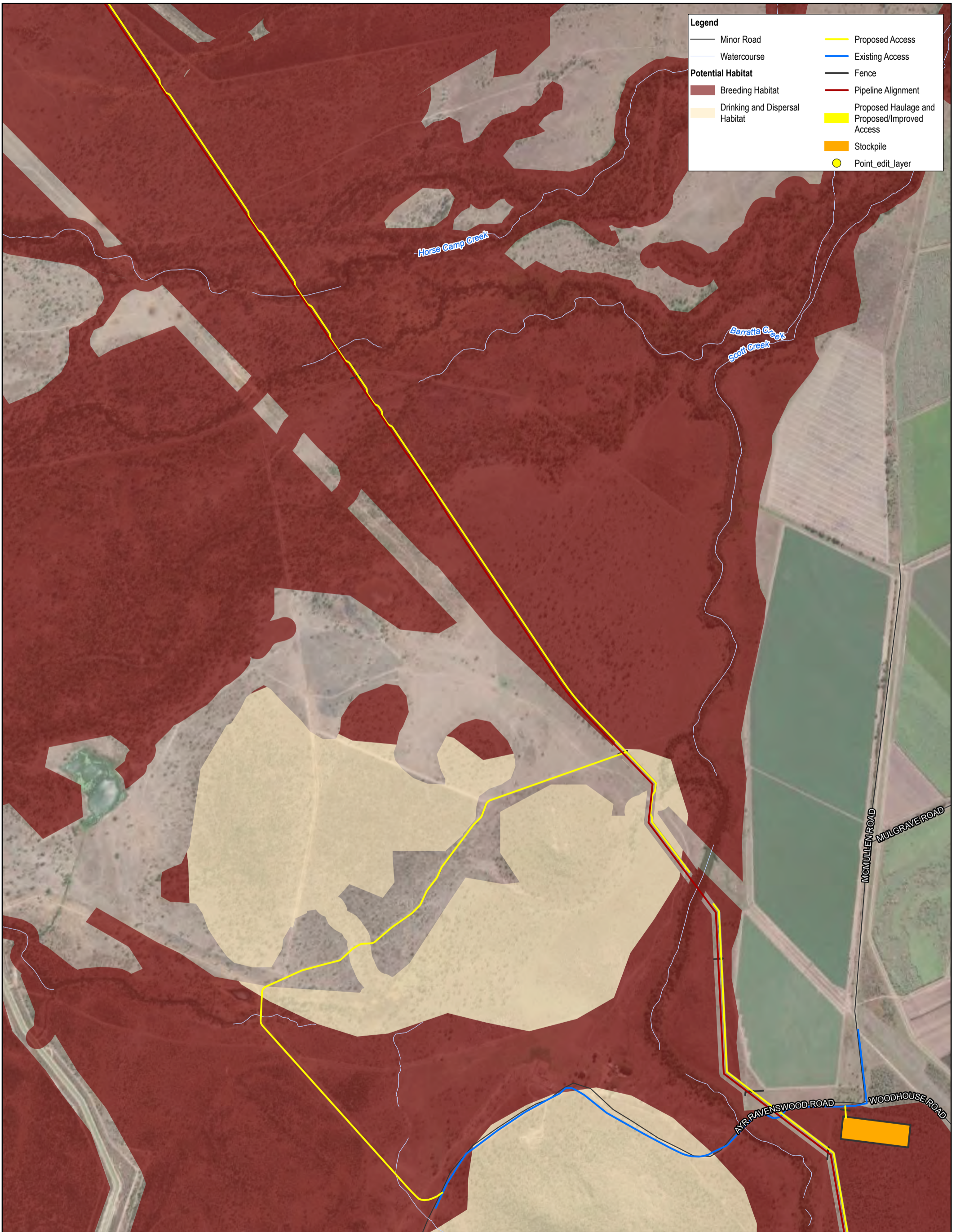


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Distribution of potential habitat for squatter pigeon (southern) habitat within and surrounding the Project area

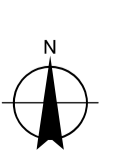
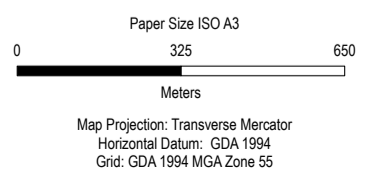
Project No. 12537606
Revision No. 4
Date 9/25/2022

FIGURE 6-4



Legend	
— Minor Road	— Proposed Access
— Watercourse	— Existing Access
Potential Habitat	
■ Breeding Habitat	— Fence
■ Drinking and Dispersal Habitat	— Pipeline Alignment
	■ Proposed Haulage and Proposed/Improved Access
	■ Stockpile
	● Point_edit_layer

Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



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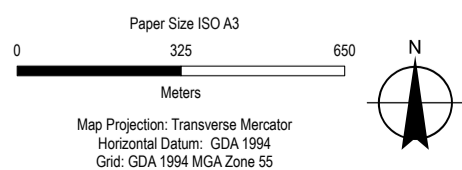
Distribution of potential habitat for squatter pigeon (southern) habitat within and surrounding the Project area

Project No. 12537606
Revision No. 4
Date 9/25/2022

FIGURE 6-4



Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

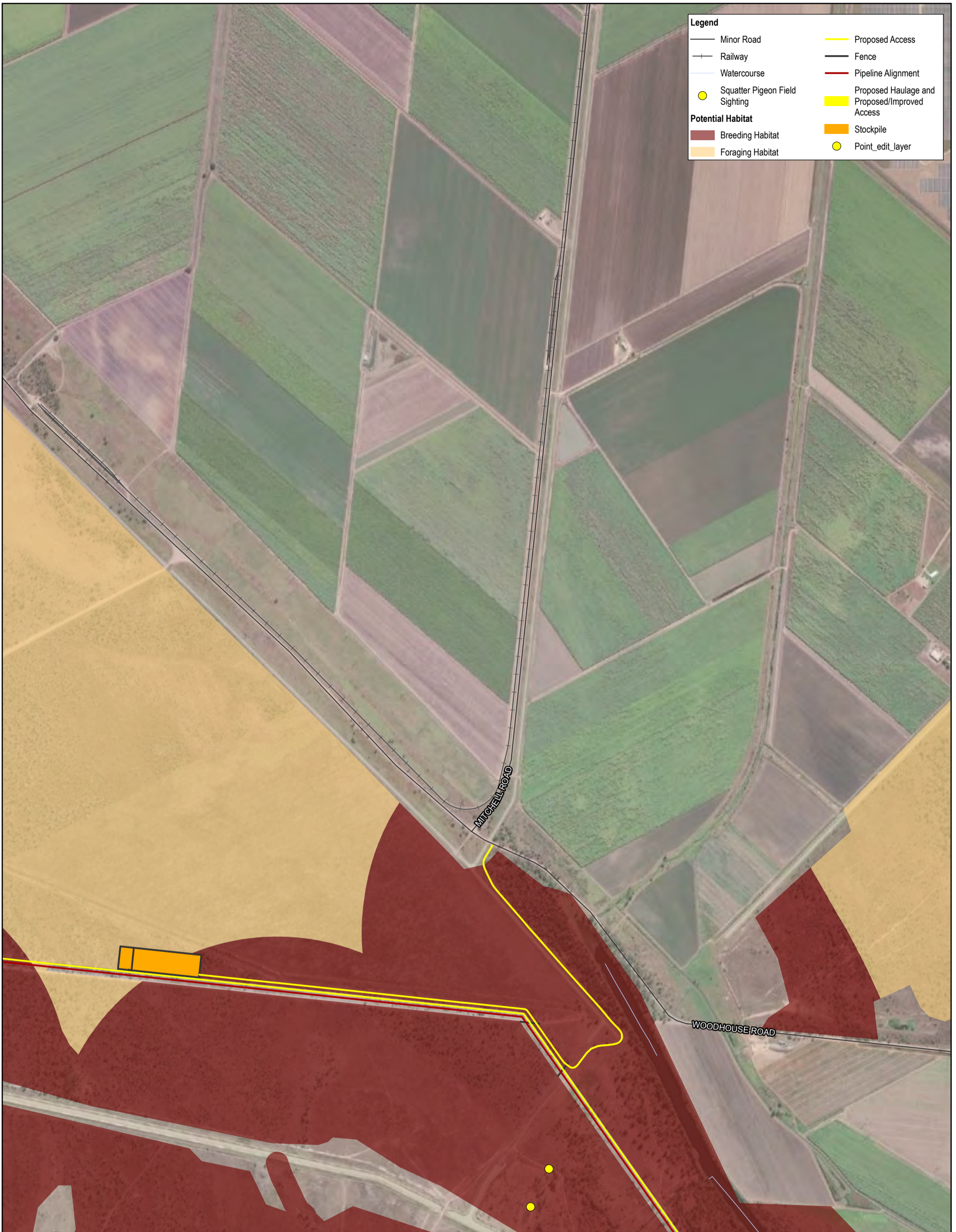


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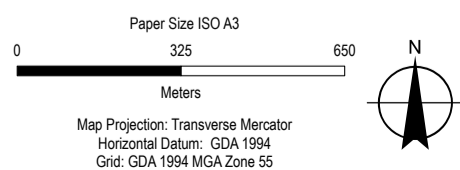
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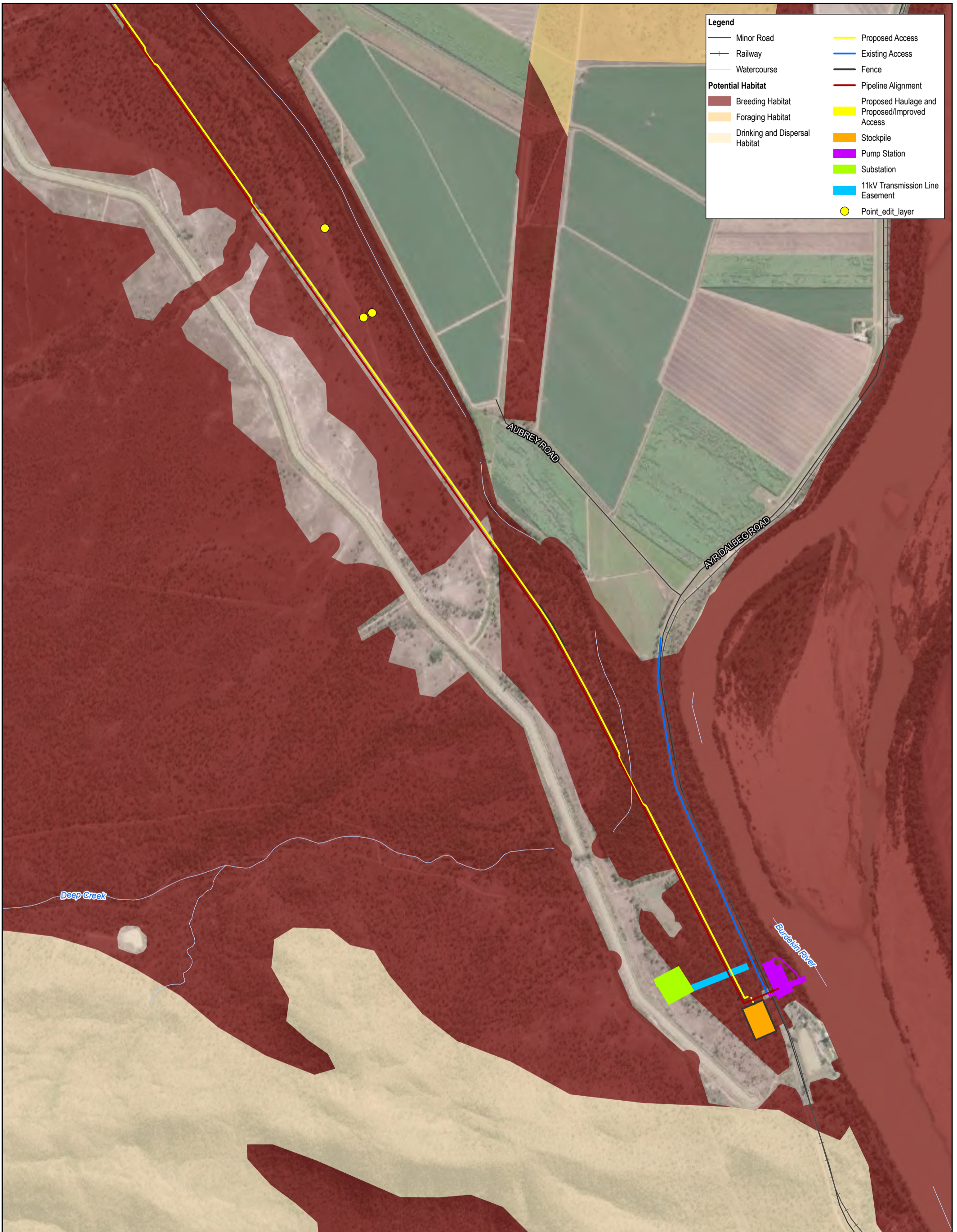


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Distribution of potential habitat for
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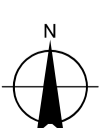
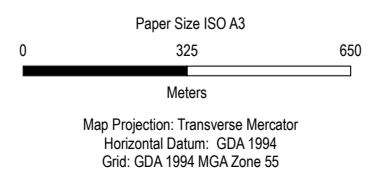
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FIGURE 6-4



Legend	
— Minor Road	— Proposed Access
— Railway	— Existing Access
— Watercourse	— Fence
Potential Habitat	
■ Breeding Habitat	— Pipeline Alignment
■ Foraging Habitat	■ Proposed Haulage and Proposed/Improved Access
■ Drinking and Dispersal Habitat	■ Stockpile
	■ Pump Station
	■ Substation
	— 11kV Transmission Line Easement
	● Point_edit_layer

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FIGURE 6-4

6.4.6 Threatening processes

Squatter pigeon (southern) populations have declined rapidly during the late 19th and early 20th centuries in southern Queensland, as much of its original habitat has been replaced with improved pastures for cattle grazing (Cooper et al., 2014; Higgins and Davies, 1996; Garnett and Crowley, 2000 in TSSC, 2015). The TSSC (2015) lists a large range of current threats including ongoing vegetation clearance and fragmentation, loss of habitat through overgrazing by livestock and feral herbivores, such as rabbits, introduction of weeds, inappropriate fire regimes, thickening of understorey vegetation, predation by feral cats and foxes, trampling of nests by domestic stock and illegal shooting.

6.4.7 Potential impacts

The Project is unlikely to have any substantial impact in terms of operational impacts to the squatter pigeon (southern) (noting above assessments with respect to 'important populations'; 'habitat critical to the survival'), with negligible vehicular movements and maintenance occurring. Vehicle movements during operations are expected to be in the order of one to two light utility vehicles traversing designated access tracks once per week and impacts will be negligible.

Potential impacts to the squatter pigeon (southern) that are likely to be experienced during the construction phase of the Project may include the following:

- Loss of habitat
- Injury and mortality
- Disturbance from increased light, noise and vibration
- Habitat degradation through increased dust, run-off and sedimentation
- Introduction and spread of invasive fauna species
- Introduction and spread of weed species
- Disturbance of surface waterways and waterbodies.

These impacts are described further in the following sections.

6.4.7.1 Loss of habitat

The Project is not expected to result in any loss of habitat critical to the survival of the subspecies. The Project is anticipated to result in the loss of 82.33 ha of potential foraging and breeding habitat, 13.31 ha of foraging habitat only and 0.68 ha of drinking and dispersal habitat. The loss of habitat is small in the context of the local and regional landscape and include impacts within a 40 m wide pipeline alignment. Within the Project area, the squatter pigeon (southern) already utilises habitats that have been subject to a high level of disturbance, occurring in sparse, modified grassland and open woodland habitats, where connectivity is loosely maintained to larger open woodland remnants and water sources.

6.4.7.2 Injury and mortality

Vegetation clearance during construction of the Project will potentially cause injury and/or mortality to squatter pigeons (southern) sheltering within ground-level microhabitats. Increased vehicular movements during the construction phase will also increase the risk of injury and mortality, due to the squatter pigeon's (southern) sedentary nature and habit of foraging on access tracks.

6.4.7.3 Disturbance from increased light, noise and vibration

Construction will result in a substantial, localised increase in vehicle movements in the short-term, which will increase light, noise and vibration disturbance to local wildlife. Increased light, noise and vibration can alter individual species' behaviours, and disrupt the balance of inter-species interactions. Such disruptions typically favour feral predators and generalist species that owe their success to broad ecological tolerances and possess the ability to tolerate or actively exploit disturbed environments (Hero et al. 2004).

6.4.7.4 Habitat degradation by increased dust, run-off and sedimentation

Construction activities have the potential to generate localised dust, erosion, run-off and sedimentation through increased vehicle movements, clearance of vegetation and earthworks. This can reduce the abundance and diversity of adjacent terrestrial and aquatic habitats by physically smothering vegetation, changing nutrient levels, impeding the growth and germination of plant species, encouraging weed incursions and altering the movement and behaviour of fauna species.

The receiving environment has already been subject to high levels of erosion and sedimentation as a result of existing land-clearing and grazing activities. Nevertheless, sensitive ecological receptors (e.g. larger open woodland remnants and aquatic habitats) are particularly susceptible to adverse impacts associated with dust, run-off, erosion and sedimentation. These areas require protection through the implementation of sediment and erosion control measures during construction.

Adverse weather conditions during construction can exacerbate the potential impact of erosion and sedimentation. High rainfall has the potential to remove exposed topsoil, destabilise creek beds and distribute sediment through creek lines. Strong winds have the potential to spread exposed topsoil, decreasing the likelihood of recolonisation by vegetation and potentially distributing dust into nearby sensitive environments.

6.4.7.5 Introduction and spread of pest fauna species

Pest fauna species recorded within the Project area included cat (*Felis catus*) and wild dog (*Canis lupus*). The Commonwealth listing advice identifies predation by cats and foxes and to a lesser extent, dingos, birds of prey and snakes as key threats to the species (DAWE 2021). The Project is already subject to high levels of disturbance and cats and potentially foxes are likely to be ubiquitous in the landscape. The Commonwealth listing advice also identifies overgrazing of habitat by livestock and feral herbivores such as rabbits as a key threat to the species (DAWE 2021). The Project is already subject to ongoing grazing pressure within the Project area by cattle. While construction of new tracks can facilitate the movement of feral predators, the network of existing farm tracks is such that the Project is unlikely to exacerbate movement of feral animals across the Project area. Management measures will be incorporated to avoid increasing the abundance or distribution of introduced pests throughout the Project area as part of the Project's CEMP.

6.4.7.6 Introduction and spread of weed species

The Project has the potential to adversely impact habitat for the squatter pigeon (southern) by introducing or spreading exotic weed species. The squatter pigeon (southern) is reliant on foraging habitat within native tussocky grasses. As such, the introduction and spread of weeds, particularly exotic pasture grasses can substantially reduce the availability and quality of foraging habitat. Foraging habitat within the Project area is already highly degraded by weeds. The Project has the potential to exacerbate the loss through introduction and spread of weeds. Clearing native vegetation creates areas of disturbance that are naturally susceptible to colonisation by invasive weed species. These can form a local source of future weed infestations within the surrounding landscape.

6.4.7.7 Disturbance of surface waterways and waterbodies

Construction activities within and/or in the vicinity of watercourses have the potential to cause degradation of riparian habitats through:

- Removal of riparian vegetation
- Run-off, sedimentation and erosion
- Point-source pollution (chemical and fuel spills)
- Disturbance associated with noise, vibration and/or artificial lighting.

The pipeline and associated haulage and access tracks intersect a number of ephemeral watercourses and drainage lines. The pump station, power supply works, and stockpile areas have been sited to minimise the number of water crossings; however, mapped watercourses and ephemeral creek lines are still located in close proximity to some of these Project components. These areas are ecologically important for movement of wildlife, as habitat and drinking sites and are potentially susceptible to construction-related disturbance.

6.4.8 Measures to avoid, reduce or mitigate impacts

6.4.8.1 Loss of habitat

Planning phase measures that have been employed to avoid and reduce the direct loss of habitat include:

- Locating the Project area in open areas that have been subject to historical land clearing and cattle grazing
- Minimising impacts to watercourses
- Utilising existing tracks and locating proposed tracks within previously disturbed areas.

During the construction phase of the Project, the following mitigation measures will be employed:

- Land clearing will be restricted to the minimal amount necessary for the construction of the Project and will not extend outside of the Project area
- The extent of vegetation clearing (and any no-go areas) will be clearly identified on construction plans and in the field using high visibility fencing or flagging in the vicinity of high conservation significant areas. Clearing extents will be communicated to construction supervisors
- Where infrastructure crosses waterways, the Project area has been minimised to a 20 m wide construction corridor. Infrastructure is sited within 57.57 ha of non-remnant vegetation (part of substation and access roads), the Project area is sited within 96.34 ha of remnant and regrowth vegetation
- A CEMP will be prepared to inform actions with regards to managing weed hygiene, erosion, fuels and hazardous substances, fire, etc. and the CESC and ESCPs will include additional erosion and sediment control measures
- All construction personnel will attend environmental training as part of the site induction process prior to entering the work site. As part of this training, all personnel will be instructed on their obligations in regard to vegetation clearing protocols. Areas identified for vegetation clearance are to be clearly defined and detailed in site inductions
- A large portion of the Project area will be revegetated with locally occurring grasses and will therefore retain habitat values for the squatter pigeon (southern).

6.4.8.2 Injury and mortality

While the squatter pigeon (southern) is susceptible to injury and mortality during construction Projects, the risks can be effectively managed using routine management measures targeted at the species. The following measures will be implemented to avoid/minimise injury and/or mortality to squatter pigeons (southern) during construction of the Project:

- Pre-clearance surveys will specifically target areas of habitat identified within the clearing footprint. Pre-clearance surveys will be undertaken to mark the locations of potential breeding places
- Vehicles to be restricted to 40 km/hr along access tracks
- Areas of habitat for the squatter pigeon (southern) will be flushed immediately prior to clearing (i.e. spotter-catcher to walk in front of clearing machinery)
- All clearing will be supervised by suitably qualified and experienced fauna spotter-catchers. This will involve relocating any resident fauna to the nearest suitable, safe habitat outside the clearing footprint
- Where deemed necessary by the fauna spotter-catcher, temporary exclusion fencing may be required in specific areas of high ecological sensitivity to prevent wildlife from returning to work areas
- Adverse incident response procedures will be developed to detail actions to be taken in the event of wildlife injury or mortality during clearing
- A Traffic Management Plan will be developed for the Project with designated access routes, speed limits and identified sensitive ecological areas (particularly areas where squatter pigeons (southern) have the potential to occur on access roads)
- Squatter pigeon (southern) awareness will be included in all worker inductions and in the Traffic Management Plan
- A register of squatter pigeon (southern) sightings will be maintained to identify areas that have a high risk of collision

- The CEMP will comprise protocols to limit injury and mortality to fauna including management of risks associated with open excavations, trenching, waterbodies and responses and reporting for roadkill and adverse incident protocols
- A high risk SMP will be prepared in accordance with the requirements of Section 335 of the Nature Conservation (Animals) Regulation 2020.

6.4.8.3 Disturbance from increased light, noise and vibration

Routine mitigation measures will be undertaken to minimise the impact that noise, light, vibration and disturbance have on local wildlife populations. This is particularly important within the vicinity of habitat for conservation significant fauna species, including the squatter pigeon(southern). The following measures will be used to minimise the impacts of light, noise and vibration during construction:

- Site lighting will be kept to the minimum (security) required for safety. Placement and orientation of lighting to be directed away from sensitive fauna habitat. Direction of lighting beam downwards or use of shields and baffles to limit light spill beyond site boundary
- Wherever practicable, construction activities will be limited to daylight hours to reduce the need for lighting and resultant light spill into adjacent habitat. However, it is noted that some of the road crossings may require night works for traffic management reasons
- A Traffic Management Plan will be developed for the construction site to control vehicle movements and reduce the unnecessary generation of vehicular noise
- All construction vehicles will comply with maintenance schedules and operational restrictions designed to limit noise impacts during construction.

6.4.8.4 Habitat degradation by increased dust, run-off and sedimentation

The following mitigation measures will be used to minimise the impacts of dust, run off and sedimentation during construction of the Project:

- Erosion and sediment controls have been developed as part of the CEMCP and will be expanded on by the construction Contractor as part of their ESCPs
- Routine dust suppression and monitoring will be undertaken throughout construction and operation
- Duration of in-stream works will be minimised wherever practicable to reduce the potential for sedimentation
- Erosion and sediment control measures will be installed where in-stream disturbance must be undertaken during flow conditions
- Areas subject to clearing will be stabilised as soon as practicable
- All vehicle movement will be restricted to designated tracks located within the Project area
- Weather conditions will be monitored during the construction stage and temporary controls will be established during extreme weather events
- Construction activities during adverse weather conditions will be managed in accordance with the CEMP.

6.4.8.5 Introduction and spread of pest fauna species

Although the Project area is already exposed to relatively high levels of pest infestation, mitigation measures will be required to limit any spread of pest fauna that could result from construction activities. The following mitigation measures will be used to minimise the introduction and spread of pest fauna and weed species during construction for the Project:

- Responsible waste management practices (e.g. not leaving out food waste and not feeding wildlife) will be implemented and followed by all construction personnel. All waste will be stored in secure temporary holding containers and transported off site
- Waste management actions to be included in the CEMP:
 - Requirements for details on the location and specifications for disposal and removal of waste from the construction site
 - All putrescible waste to be stored in secure temporary holding containers and transported off site

- As part of CEMP, the Project will implement feral pest control measures
- Construction staff will not bring domestic animals to the Project area
- All construction personnel shall attend environmental training as part of site inductions. As part of this training, all personnel will be instructed on their responsibilities related to avoiding and minimising the introduction/attraction to the construction site of pest animals.

6.4.8.6 Introduction and spread of weed species

The following measures will be implemented to minimise the introduction and spread of weeds:

- Weed management actions are included in the CEMP and include:
 - Hygiene protocols restricting the movement of vegetation and soil between impacted areas and areas of significantly lower weed infestation
 - Protocols for monitoring and management of weeds to identify and appropriately respond to significant changes in weed distribution and density
- All vehicles / equipment travelling from a declared restricted place or quarantine area will be required to wash down and possess a current weed hygiene inspection certificate before moving to a weed free area or commencing construction works onsite. The weed hygiene inspection certificate is to be obtained from an inspector who is deemed competent and is certified in line with DAF requirements
- Vehicle access will be restricted to within the Project area and existing roads and tracks.

6.4.8.7 Disturbance of surface waterways and waterbodies

The following mitigation measures will be used to minimise the disturbance of waterways and waterbodies during construction of the Project:

- Wherever practicable, watercourse crossings have been located at established crossing points on existing access tracks. Where this is not practicable, the disturbance area is restricted to within the Project area
- Erosion and sediment controls will be developed as part of the CEMCP and ESCPs
- Dust suppression activities will be undertaken where appropriate. Stabilisation of disturbed areas will be undertaken as soon as practicable after disturbance
- Refuelling will be undertaken away from waterways
- Storage of fuels, chemicals, wastes and other potentially environmentally hazardous substances will be banded or otherwise contained areas away from waterways
- Emergency response protocols and procedures will be developed as part of the CEMP for implementation in the event of a contaminant spill or leak and provision of spill response equipment.

6.4.9 Residual impacts on squatter pigeon (southern)

A summary of the Project's potential impacts on the squatter pigeon (southern) and mitigation measures is presented in Table 6-15. The risk ratings are presented in Appendix E.

Table 6-15 Residual impact assessment for the squatter pigeon (southern)

Impact	Initial impact rating	Mitigation measures	Residual impact	Effectiveness
Habitat loss of: 82.33 ha of potential foraging and breeding habitat 13.31 ha of potential foraging only habitat 0.68 ha of drinking and dispersal habitat	High	Utilise existing tracks where possible Land clearing restricted to minimal amount necessary and will not extend outside of the Project area Establishing no-go areas Where infrastructure crosses waterways existing disturbed areas to be selected where possible Preparation of a CEMP	Low	Moderate effectiveness

Impact	Initial impact rating	Mitigation measures	Residual impact	Effectiveness
Injury or mortality due to vegetation clearing	High	Employ a fauna spotter catcher during clearing. Reduce speed limits within areas of potential habitat Allow a fauna spotter catcher to walk through clearing footprints prior to clearing. Identify areas of potential habitat with signage and flagging tape.	Low	Moderate effectiveness
Habitat fragmentation and reduced connectivity	Moderate	Infrastructure sited within existing disturbed habitat (i.e. part of access tracks, part of substation, some access tracks)	Low	Moderate effectiveness
Disturbance from increased light, noise and vibration	Moderate	Restricted sources of artificial lighting. Direct lighting away from sensitive areas for the species	Low	Moderate effectiveness
Habitat degradation through increased dust, run-off and sedimentation.	Low	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions or employ and water truck to reduce dust rates.	Negligible	High effectiveness
Introduction and spread of invasive fauna and weed species	Moderate	Implement measures for introduced flora and fauna (to be outlined in the CEMP). Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works. Educate staff on the impacts of weeds and their general environmental obligation. Identify areas of dense outcrops of introduced flora to eliminate construction vehicles from entering the area.	Low	Moderate effectiveness
Disturbance of surface waterways and waterbodies.	Moderate	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions to reduce dust generation and potential sedimentation.	Low	Moderate effectiveness

6.4.10 Significance of impact assessment

An assessment of the significance of the Project's impacts on the squatter pigeon (southern) was undertaken against the Commonwealth Significant impact guidelines (DoE 2013) and presented in Table 6-16. The squatter pigeon (southern) significant impact assessment concluded the Project is **unlikely** to result in a significant residual impact. This is on the basis of: the Project area is located outside of an 'important population' of the subspecies, the small quantum of impact to habitat noting the availability of resources for the subspecies within the local and regional landscape, and the fact that of the impact sub-categories of impacted habitat (i.e. breeding, foraging, drinking), none is limiting (in terms of extent) in the Project area, the local landscape or the broader (e.g. Burdekin) region. On this last point, loss of particularly categories of habitat associated with this project are not likely to be significant in the context of impacts to habitat critical to the survival of the species, as these habitat categories (i.e. breeding, foraging etc.) frequently co-occur, and none are especially restricted in extent (relative to the other categories of habitat). While the disturbance will have negligible implications for movement, the Project is not likely to lead to a decline in the local, let alone whole-of-range, population of the squatter pigeon (southern). Although suitable breeding and foraging habitat is mapped within the impact area, an 'important population' of the subspecies is not located within the Project area. As such, the Project will not impact habitat critical to the survival of an important population, and thus, the Project is considered **unlikely** to result in a significant impact on the squatter pigeon (southern).

Table 6-16 Significance of impact on squatter pigeon (southern)

Impact criteria	Potential to occur
Lead to a long-term decrease in the size of an important population of a species.	<p>Unlikely</p> <p>The local squatter pigeon (southern – although uncertainty about taxonomy in intergrade zone) population is not classified as an important population under the definition outlined in Commonwealth documentation for the subspecies (Squatter Pigeon Workshop 2011). The Project will result in a direct loss of 82.33 ha of potential foraging and breeding habitat, 13.31 ha of foraging only habitat and 0.68 ha of drinking and dispersal habitat. The loss of habitat is small in the context of the local and regional landscape. Much of the habitat that is impacted by the construction phase of the Project for the pipeline will be reinstated, therefore the loss is not permanent. Increased vehicular movements during construction has the potential to increase the risk of mortality and injury of squatter pigeons (southern), however this will be managed through implementing speed limits and signage in areas that may support the species. The Project is unlikely to have any substantial operational impacts on this subspecies, with negligible vehicular movements. Permanent speed limits and signage on internal roads and education of staff during inductions will minimise the risk of direct mortality by operational vehicles. As such, the Project is therefore unlikely to lead to a long-term decrease in the size of an important population of a species.</p>
Reduce the area of occupancy of an important population.	<p>Unlikely</p> <p>As detailed above the local squatter pigeon (southern – although uncertainty about taxonomy in intergrade zone) population is not among the listed important populations of the subspecies. The Project will result in the direct loss of 82.33 ha of potential foraging and breeding habitat, 13.31 ha of foraging only habitat and 0.68 ha of drinking and dispersal habitat. The Project is unlikely to have any substantial impact on the subspecies in the operation phase. The species is locally abundant. The Project area represents a minor local loss that will not result in the species' disappearance from any 2km x 2 km area (the scale at which the area of occupancy is measured under the IUCN). Given the Project is unlikely to have any substantial impact on the species in the operational phase, and the continued presence of suitable habitat within the local area, the Project is unlikely to reduce the area of occupancy of the local squatter pigeon (southern) population.</p>

Impact criteria	Potential to occur
Fragment an existing important population into two or more populations.	<p>Unlikely</p> <p>As detailed above the local squatter pigeon (southern – although uncertainty about taxonomy in intergrade zone) population is not among the listed important populations of the subspecies. Within the Project area, the squatter pigeon (southern) already utilises habitats that have been subject to a high level of fragmentation, occurring in sparse, modified grassland and open woodland habitats, where connectivity is loosely maintained to larger open woodland remnants and water sources. The Project will have minimal direct impact on habitat for the squatter pigeon (southern), resulting in a loss of 96.32 ha from a relatively dispersed area. The pipeline will be buried and reinstated with native grasses – and will not form a barrier to movement. Habitat connectivity will be maintained among areas of habitat both within the Project area and adjacent to it by maintaining ground-level substrates and vegetation and by retaining existing unsealed tracks that provide pathways for local squatter pigeon (southern) movement. Accordingly, the Project is unlikely to fragment the important population into two or more populations.</p>
Adversely affect habitat critical to the survival of a species.	<p>Unlikely</p> <p>The Project will result in the direct loss of 82.33 ha of potential foraging and breeding habitat, 13.31 ha of foraging only habitat and 0.68 ha of drinking and dispersal habitat. As the pipeline will be buried, reinstated and revegetated with native grasses, the Project will have negligible long-lasting impacts to habitat availability in the immediate vicinity of the Project area.</p> <p>It is important to note that the distribution of the squatter pigeon (southern) per the subspecies' Commonwealth 'SPRAT' profile does not extend as far north as the Project area (the northernmost extent of the range is represented by an east-west line to the north of Mackay) (August 2022). It is recognised that a large (north-south) intergrade zone exists where the northern and southern subspecies' ranges overlap, and where hybridisation is known to occur. The Project area exists within this zone. The SPRAT profile notes that: "For the purposes of the EPBC Act, hybrids are not considered to be <i>Geophaps scripta scripta</i>". Given that the Project area occurs outside of the core distribution of the listed threatened subspecies and that the taxonomy of the birds observed in the field cannot be conclusively identified as the southern subspecies, the habitat is not considered critical to the survival of the subspecies.</p>
Disrupt the breeding cycle of an important population.	<p>Unlikely</p> <p>As detailed above the local squatter pigeon (southern – although uncertainty about taxonomy in intergrade zone) population is not among the listed important populations of the species. Connectivity will be maintained with adjacent drinking sources. Critical drinking sources such as dams and water troughs will be maintained where practicable to support the viability of local breeding habitats. Construction activities have the potential to cause short-term disruption to breeding activities immediately adjacent to construction areas. The impact will be temporary and is unlikely to result in a loss of an entire annual cohort as the species is expected to continue to breed in some areas that are located further from construction areas and the species is known to breed all year round (Squatter Pigeon Workshop 2011). The Project is therefore not expected to disrupt the breeding cycle of the population.</p>
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>Unlikely</p> <p>As the Project will not impose any barriers to squatter pigeon (southern) movement it will not restrict ongoing access to resources during the operation phase. Habitat impacts will be limited to a loss of 82.33 ha of potential foraging and breeding habitat, 13.31 ha of foraging only habitat and 0.68 ha of drinking and dispersal habitat. The impact is dispersed over a large area and affects areas of habitat that are already substantially degraded by cattle grazing. The Project will cause localised, temporary loss of dispersal habitat. The loss of habitat will be temporary, the pipeline will be buried, reinstated and revegetated with native grasses. On this basis, the loss is considered unlikely to cause the species to decline. Furthermore, the 96.32 ha includes areas such as stockpile areas that will be reinstated and utilised by the species for foraging and/or dispersal during the operation phase. Weed and feral pest management measures will be implemented over the lifetime of the Project. As there is currently no strategic weed or pest management in the area, these management measures are likely to increase the quality of foraging habitats by reducing competition with weeds and limiting predation by foxes and cats.</p>

Impact criteria	Potential to occur
Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species' habitat	<p>Unlikely</p> <p>Known feral predators of the squatter pigeon (southern) (i.e. cats, dogs and foxes) are considered to be present in low densities in the Project area region. The Project will not introduce any external food sources that could increase the local densities of these feral predators. The Project area is currently subject to high levels of weed infestation. Unmitigated, the Project has the potential to increase local weed densities and thereby threaten the potential for squatter pigeons (southern) to move through the landscape. Implementation of standard weed management protocols during construction and operation is expected to mitigate this risk to high levels. The Project is unlikely to result in invasive species that are harmful to the squatter pigeon (southern) becoming established in the species habitat.</p>
Introduce disease that may cause the species to decline, or	<p>Unlikely</p> <p>No diseases or pathogens are identified among current known threats to the squatter pigeon (southern). The weed-wash down and hygiene protocols that will be implemented through construction to manage the on-site spread or export of weeds will also act to reduce the potential for transmission of disease. This risks to squatter pigeons (southern) associated with disease transmission are therefore considered negligible.</p>
Interfere substantially with the recovery of the species.	<p>Unlikely</p> <p>Noting that the project is not considered to affect any 'important populations', nor 'habitat critical to the survival' of the subspecies, it is not expected to interfere substantially with recovery of the squatter pigeon (southern). The loss of habitat is small in the context of the local and regional landscape. The Project is unlikely to have any substantial impact in terms of its impact during the operational phase. Operation of the Project is unlikely to have any impact on the behaviour or use of habitats among the local squatter pigeon (southern) population. Implementation of a Weed Management Plan for the Project has the potential to increase the value of local habitats. Local noise disturbance and mortality threats associated with the Project are also expected to be low.</p>

6.4.11 Conclusion

Based on the Project area being located outside of an 'important population' of the subspecies, the small quantum of impact to habitat, the availability of resources for the subspecies within the local and regional landscape, and that disturbance will have negligible implications for movement, the Project is not likely to lead to a decline in the local, let alone whole-of-range, population of the squatter pigeon (southern). Accordingly, the Project is considered **unlikely** to result in a significant impact on the squatter pigeon (southern).

6.5 White-throated needletail

6.5.1 Conservation status and documentation

The white-throated needletail is listed as Vulnerable and Migratory under the EPBC Act.

The species is almost exclusively aerial, occurring from heights of less than 1 m up to more than 1,000 m above the ground (Coventry 1989; Tarburton 1993, cited in TSSC 2019). The species forages at heights up to cloud height over a range of habitat types including woodland, open forest, rainforest, heathland and partly cleared pasture and agricultural land (Higgins 1999, cited in TSSC 2019). The species does not breed in Australia; it breeds in the Northern Hemisphere and migrates south for the boreal winter. The species roosts in trees amongst dense foliage in the canopy or in hollows, however the number of references probably over-emphasises such occurrences (Higgins 1999). Recent research has shown that while the species is predominantly aerial, the white-throated needletail does roost on land at least occasionally, with roosts typically located in tall woodland on ridgelines and clifftops, where the birds can easily alight (Tarburton 2021). The species is not reliant on terrestrial habitat types. The species has been suggested that they also sometimes roost aerially (DAWE 2021).

6.5.2 Criteria used to map habitat for the white-throated needletail

Commonwealth general habitat definition: white-throated needletail is mostly aerial, from heights of less than 1 m up to more than 1000 m above the ground. Although they occur over most types of habitat, they are recorded most often above wooded areas, including open forest and rainforest, and may also fly below the canopy between trees or in clearings (DAWE 2021).

Table 6-17 Criteria used to map white-throated needletail habitat

Habitat	Commonwealth definition	Criteria used to map habitat
Foraging	The species almost always forage aerially, at heights up to 'cloud level', above a wide variety of habitats ranging from heavily treed forests to open habitats, such as farmland, heathland or mudflats	All habitat above the Project area and surrounds were considered potential foraging habitat for the species. As the species is almost exclusively aerial and is therefore not directly dependent on ground habitat, no foraging habitat was mapped for the white-throated needletail.
Roosting	The species roosts in trees amongst dense foliage in the canopy or in hollows (DAWE 2021)	The Project area consisted of open woodland. In Australia, confirmed and high confidence records of white-throated needletail roosting indicate the species roosts in dense foliage of canopy trees in large tracts of treed remnant vegetation along or contiguous with mountain ranges (Nature Advisory, 2021). Given the absence of suitable roosting habitat, no roosting habitat for the white-throated needletail has been mapped for the Project area.

6.5.3 Desktop results

The white-throated needletail was identified within the PMST (Appendix B) as having potential to occur within a 30 km radius from a central point within the Project area. A search of WildNet (Appendix B) reported one historical record within 30 km of the search coordinates. Records were unable to be loaded from the DES database. Historical records from the Atlas of Living Australia database recorded approximately seven historical records within a 30 km buffer of a central point of the Project area. The records are located from the southernmost area of Bowling Green Bay National Park to south of the Project area along the Burdekin River. Geographical accuracy of five of seven records were low (between 9 km to 54 km inaccuracy buffer). The historical records from ALA were recorded between 1969 and 2019.

6.5.4 Survey results

The white-throated needletail was not recorded during field surveys however, the species has been historically recorded nearby.

6.5.5 Significance of Project area

This section assesses the significance of white-throated needletail habitats within the Project area, their importance in the context of the local population and whether the local population is important at a national level.

6.5.5.1 Status as an important population

'Important population' for the white-throated needletail has not been formally defined in the Commonwealth listing advice for the species. In the absence of a formal definition, the definition outlined in the Commonwealth Significant impact guidelines applies. 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.

Given the species capacity for large-scale migration, the species is unlikely to have localised important populations. As the Project area is not near the edges of the species known range and is a non-breeding visitor to Australia, it is unlikely to be an important population under the Commonwealth Significant impact guidelines.

6.5.5.2 Status as habitat critical for survival of the white-throated needletail

Habitat critical to the survival of the species has not been specified in the Commonwealth conservation advice for the white-throated needletail. However, using the general definition in the Commonwealth Significant impact guidelines (DoE 2013), this is likely to include 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 or ecological community, such as pollinators)
- To maintain genetic diversity and long-term evolutionary development
- For the reintroduction of populations or recovery of the species.

Utilisation of the airspace above the Project area was consistent with general foraging that would be undertaken over a broad area in the surrounding landscape. The species does not breed in Australia, so is not reliant on any breeding resources locally. While roosting habitat is likely to represent habitat critical to the survival of the species, this is typically associated with heavily vegetated woodland on mountainous terrain. No suitable roosting habitat occurs within the Project area. On that basis, the Project area would not provide habitat critical to the survival of the white-throated needletail.

6.5.6 Threatening processes

There is evidence of white-throated needletails colliding with wind turbines, overhead wires, windows and lighthouses in Australia; however the scale of impact at the population level requires further investigation (TSSC 2019). Other threatening processes identified as possible causes of decline of the white-throated needletail in Australia include the use of insecticides and the loss of roosting sites (Tarbuton 2014, cited in TSSC 2019). Loss of forest and woodland habitats may have also resulted in reduction in invertebrate prey (TSSC 2019).

The greatest risk posed to the white-throated needletail occurs in the northern hemisphere where logging of forests has occurred in breeding grounds and where the species was formerly hunted in its breeding grounds (TSSC 2019).

6.5.7 Potential impacts

As the white-throated needletail is exclusively aerial, it does not have typical associations with habitat. Clearing for the Project is unlikely to have a significant impact on the species' local abundance. The species occurs in Australia during the non-breeding season and as such the Project has no capacity to impact on more sensitive breeding habitat.

6.5.8 Significance of impact assessment

An assessment against the Commonwealth Significant impact guidelines (DoE 2013) with regards to the white-throated needletail was undertaken and the outcomes provided in Table 6-18.

Table 6-18 Significance of impact on the white-throated needletail

Impact criteria	Potential to occur
Lead to a long-term decrease in the size of an important population of a species.	Unlikely Important populations of the white-throated needletail have not been formally defined in the Commonwealth listing advice. Given the species capacity for large-scale migration, the species is unlikely to have localised important populations. As the Project area is not near the edges of the species known range and is a non-breeding visitor to Australia, it is unlikely to be an important population. The white-throated needletail is exclusively aerial and does not have typical associations with habitat (DAWE 2021). As such, clearing for the Project is unlikely to have a significant impact on the species' local abundance or lead to long-term decrease in the population.
Reduce the area of occupancy of an important population.	Unlikely The Project will not result in loss of habitat for the white-throated needletail.
Fragment an existing important population into two or more populations.	Unlikely The white-throated needletail is not directly dependent on habitats at ground level and has the capacity to fly over cleared and fragmented areas. As such, the Project has no capacity to fragment the population into two or more populations.
Adversely affect habitat critical to the survival of a species.	Unlikely The white-throated needletail does not have conventional habitat requirements. Accordingly, vegetation clearing for the Project will not adversely impact habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population.	Unlikely The white-throated needletail does not breed in Australia, spending its breeding season in Asia, from central and south-eastern Siberia and Mongolia, east to the Maritime Territories of Russia, Sakhalin and the Kuril Islands and south to northern Japan and north-eastern China (DAWE 2021). As such, the Project will not disrupt the breeding cycle of an important population of this species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely As detailed above, the white-throated needletail does not have conventional terrestrial habitat requirements. Accordingly, vegetation clearing for the Project will not 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	Unlikely No invasive species are identified as threats to the white-throated needletail. The Project is unlikely to cause any increase in invasive species that could threaten local abundance of white-throated needletails.
Introduce disease that may cause the species to decline	Unlikely Disease is not identified as a key threat to the white-throated needletail. It is almost exclusively aerial habit means it is unlikely to have many opportunities to contract diseases that could threaten the viability of local populations. The Project is therefore unlikely to introduce disease that cause the species to decline.
Interfere substantially with the recovery of the species.	Unlikely The species does not have conventional habitat requirements and remains almost exclusively aerially. The species is a non-breeding visitor to Australia, as such, the Project is unlikely to interfere with the recovery of the species.

6.5.9 Conclusion

The Project is **unlikely** to have a significant impact on the white-throated needletail. This is on the basis that the species is an almost exclusive aerial forager and does not have typical associations with habitat. Additionally, the species is a non-breeding visitor.

7. Summary of MNES impacts

7.1 Summary of significant impact assessment

Despite the general mitigation measures proposed in Section 4.2.1, a significant residual impact is still anticipated on three species, the koala, black-throated finch (southern) and bare-rumped sheath-tail bat. The Project's significant residual impacts on MNES after mitigation measures have been considered and are summarised in Table 7-1.

Table 7-1 Summary of impacts on MNES

Matter	Impact	Impact on important habitat/habitat critical to the survival of the species	Significance of impact
Flora species			
<i>Eucalyptus raveretiana</i>	Maximum removal of four individuals	No impact	Not significant
Fauna species			
Koala	Loss of habitat that constitutes habitat critical to the survival of the species (134.19 ha) Total habitat disturbance comprised of 85.94 ha of forest or woodland and 48.25 ha of non-remnant (e.g. road-side, paddock trees) vegetation.	Loss of 134.19 ha of habitat critical to the survival of the species.	Significant
Bare-rumped sheath-tail bat	Loss of 10 large and 27 moderate-sized <i>E. platyphylla</i> hollows that represent potential roosting habitat (i.e. habitat critical to the survival of the species) Loss of 325 small <i>E. platyphylla</i> hollows that represent future potential roosting habitat Loss of 92.23 ha of suitable habitat (in aggregate) (36.44 ha of foraging and roosting habitat overlap), comprising: – Foraging habitat 85.54 ha – Roosting habitat 43.12 ha	Loss of 10 large and 27 moderate-sized <i>E. platyphylla</i> hollows that represent potential roosting habitat (i.e. habitat critical to the survival of the species) Loss of 92.23 ha of suitable habitat (in aggregate) (36.44 ha of foraging and roosting habitat overlap), comprising: – Foraging habitat 85.54 ha – Roosting habitat 43.12 ha	Significant
Black-throated finch (southern)	Indiscriminate loss of trees within 1 km of water Loss of 96.34 ha of suitable habitat (in aggregate), comprising: – Nesting and foraging 82.14 ha – Foraging only 14.19 ha	Indiscriminate loss of trees within 1 km of water associated with pump station and laydown areas Total habitat disturbance of 96.34 ha (in aggregate), comprising 82.14 ha of nesting and foraging and 14.19 ha of foraging only	Significant
Squatter pigeon (southern)	Loss of habitat 96.32 ha of suitable habitat (in aggregate), comprising: – Foraging and breeding 82.33 ha – Foraging only 13.31 ha – Dispersal only 0.68 ha	No impact	Not significant
White-throated needletail	No impact – almost exclusively aerial forager and does not have typical associations with habitat. Non-breeding visitor	No impact	Not significant

In summary, the Project's strict adherence to the mitigation hierarchy, underpinned by careful consideration of statutory documents including relevant recovery plans, conservation advice/s, and/or threat abatement plans, will embed a framework of management of MNES that achieves outcomes consistent with the Convention on

Biological Diversity (including the proposed Post-2020 Global Biodiversity Framework) – in broad terms, maintaining species populations, and enhancing the extent and quality of ecosystems. These endeavours, which will be designed to be consistent with Commonwealth statutory documents for MNES species conservation and recovery, will also satisfy applicable objectives of the APIA Convention, while trade in endangered species is not applicable to this Project (e.g. CITES).

The Project will accommodate increased water demand in the Townsville region by transporting water from the Burdekin River to Ross River Dam. The transported water will be used for various domestic and industrial uses; where this water use enables new development or exacerbates impacts of existing water users, any such impacts to MNES should be considered in the context of potential referral to the Commonwealth under the EPBC Act.

7.1.1 Cumulative impacts

Cumulative impacts inclusive of the HPDP (Stage 1 and Stage 1.1) have been reviewed. While the construction and operation of the HPDP resulted in impacts to several MNES also identified in the proposed HPS2, including, black-throated-finch (southern), bare-rumped sheathtail bat, black ironbox and squatter pigeon (southern), significant impact assessments concluded the HPDP was unlikely to result in significant residual impacts. When considered in aggregate, and noting the implementation of avoidance, minimisation and mitigation measures (undertaken/committed to – Stage 1, Stage 1.1; proposed – Stage 2), species' declines resulting from the entirety of the action are considered unlikely. Expanding upon this, the carefully managed losses from Stage 1 and Stage 1.1 are unlikely to be amplified by Stage 2 of the Project, recognising the narrow, linear nature of the development, the minimal implications for species' movement, the strict application of controls to minimise indirect impacts, and adherence to construction and operation protocols that avoid/minimise direct mortality of any MNES. From a landscape-level population/metapopulation dynamics perspective, in aggregate, these developments are not likely to affect local to landscape-level dispersal, exacerbate threats like weeds or invasive animals, nor cause the loss of areas of particular ecological importance such as key (known) breeding or aggregation sites. The outcome will thus be that of a narrow strip of vegetation removal which will have a small, and likely inconsequential effect on the ability of species like the black-throated finch (southern), squatter pigeon (southern), bare-rumped sheathtail bat, and notably for the Stage 2 action, koala, to access key life history requirements – namely, food, shelter and breeding places.

Nonetheless, the HPS2 is concluded to result in significant residual impacts to three MNES due to the extent of vegetation removal. As such, environmental offsets are proposed for the black-throated finch (southern), bare-rumped sheathtail bat and koala, such that the key principles of the EPBC Act Environmental Offsets Policy are satisfied.

8. Ecologically Sustainable Development (ESD)

A key object of the EPBC Act is: *to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources* (Section 3(1)(a)). Section 3A of the EPBC Act outlines five principles of ecologically sustainable development. An analysis of the Project's alignment with the five principles of ecologically sustainable development as listed in Section 3A of the EPBC Act is provided in Table 8-1.

Table 8-1 Project alignment with the principles of ecologically sustainable development as outlined in Section 3A of the EPBC Act

Core objective or guiding principle	Project analysis
Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations	<p>The HPS2 Project is recognized as an enabler of economic development through the provision of additional water supply security, to accommodate both short term drought resilience and longer term increased water demand due to population growth and commercial development in the region.</p> <p>Mitigation and management measures have been developed to ensure there are no long-term adverse impacts to environmental values protected under Commonwealth law. Specifically, the mitigation hierarchy has been applied such that impacts to the environment, and especially MNES, have been avoided and minimised to the greatest extent possible, with <i>in situ</i> active and passive rehabilitation of much of the construction area to occur once the pipeline is operational. Recognising the potential for (significant) residual impacts to three species that are MNES, offsets will be provided where the objective is to achieve an outcome that maintains or improves the viability of these respective matters, as per the intent of the EPBC Act Environmental Offsets Policy 2012.</p>
If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation	<p>The Project design, site selections and investigative works has been undertaken to limit the risk of serious or irreversible environmental damage. Ecological assessments, cultural heritage assessments and stakeholder consultation were undertaken and a range of technical specialists were engaged to apply scientific rigour to the assessment of potential impacts, avoidance measures, mitigation and management measures. The Project is not considered likely to have serious or irreversible environmental impacts (i.e. contribute to the extinction of a species or subspecies), especially noting the detailed baseline studies that have been undertaken to describe the ecological values of the Project area and the local landscape in which it is situated, and accounting for the fact that impacts have been assessed and managed through rigorous application of the mitigation hierarchy in accordance with Commonwealth significant impact guidelines.</p>
The principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations	<p>The HPS2 Project represents a long-term investment in Queensland's water infrastructure with significant economic and social benefits for current and future generations</p> <p>The Project will facilitate and enable development in the region, thus benefiting the regional, state and national economies.</p> <p>Temporary construction benefits of the Project include:</p> <ul style="list-style-type: none"> – Direct Project employment during construction – Training and skills development opportunities – Direct procurement and supply opportunities. <p>Long-term operational benefits of the Project include:</p> <ul style="list-style-type: none"> – Increase water security and reliability – Direct Project employment opportunities. <p>While the Project may have short-term environmental impacts, a number of mitigation measures will be implemented to avoid and minimise serious, long-term and irreversible environmental damage – as described in rows above, this is founded on rigorous application of the mitigation hierarchy (including commitments to rehabilitation of disturbed areas post-construction <i>and</i> offsets), underpinned by detailed baseline ecological studies, all undertaken in accordance with Commonwealth significant impact guidelines and other associated policy..</p>

<p>The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making</p>	<p>Ecological and biocondition assessment surveys have been undertaken for the Project to identify and manage potential impacts on biological diversity and ecological integrity. The HPS2 Project site was established taking into consideration sensitive environmental areas and culturally significant areas. The Project is sited in a highly transformed landscape in which ecological integrity has been compromised by various land use regimes and pervasive threats (e.g. weeds altered fire regimes) – nonetheless, comprehensive baseline ecological surveys revealed matters of national environmental significance persist in habitats in this landscape. Noting the occurrence/likely occurrence of these MNES – namely, several threatened species – and recognising a broader need to progress this Project in an environmentally sensitive way in accordance with Queensland and Commonwealth requirements, a detailed impact management approach has been formulated. Specifically, the mitigation hierarchy has been applied such that impacts to the environment, and especially MNES, have been avoided and minimised to the greatest extent possible, with <i>in situ</i> active and passive rehabilitation of much of the construction area to occur once the pipeline is operational. Recognising the potential for (significant) residual impacts to three threatened species that are MNES, offsets will be provided where the objective is to achieve an outcome that maintains or improves the viability of these respective matters, as per the intent of the EPBC Act Environmental Offsets Policy 2012.</p>
<p>Improved valuation, pricing and incentive mechanisms should be promoted</p>	<p>The most significant benefit of the Project will be the increase in availability and reliability of water to accommodate increased water demand due to regional population growth. This report assesses the environmental consequences of the Project and identifies suitable mitigation and management measures for potential adverse impacts</p>

9. Conclusion

Substantial avoidance has been achieved by locating the Project area within areas of existing disturbance wherever possible. Key impacts during the construction phase include localised losses of vegetation and habitat, due to clearing for the pump station, stockpiles, access and haulage tracks and other ancillary infrastructure. The siting of this infrastructure will result in direct loss of habitat, potential mortality and injury of wildlife and indirect ecological impacts such as the disturbance footprint of wildlife through construction light, noise, vibration, increased vehicle movements, restricted fauna movement and barrier effects, as well as the degradation of adjacent habitats through erosion and sedimentation and weed and pest invasion. Rehabilitation of temporary works areas will be undertaken. The Project will have a significant residual impact on three MNES:

- Koala – due to the loss of 134.19 ha of habitat critical to the survival of the species (comprising 85.94 ha of forest or woodland and 48.25 ha of non-remnant road-side, rail vegetation and paddock trees)
- Bare-rumped sheath-tail bat – due to a residual loss of 43.12 ha of potential roosting habitat and the clearing and translocation of 10 large and 27 moderate *E. platyphylla* hollows representing potential roosting trees that would constitute habitat critical to the survival of the species
- Black-throated finch (southern) – due to indiscriminate loss of trees within 1 km of water, and a residual loss of 82.14 ha of potential nesting habitat representing habitat critical to the survival of the species.

TCC are assessing opportunities to reduce the impact on habitat through practical on-ground measures that may be deemed suitable including an appropriate offset strategy to manage the residual risks in accordance with the requirements of the EPBC Act and the Commonwealth Environmental Offsets Policy.

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Appendices

Appendix A

Likelihood of occurrence

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
Threatened ecological communities					
Poplar Box Grassy Woodland on Alluvial Plains	E	-	PMST	The TEC is typically a grassy woodland with a canopy dominated by <i>Eucalyptus populnea</i> and an understorey mostly of grasses and other herbs. The TEC is located west of the Great Dividing Range, typically less than 300 m above sea level and its broad distribution is generally located south of Charters Towers (DEE 2019).	<p>Unlikely to occur</p> <p>REs corresponding with the Poplar Box TEC were used as per Commonwealth conservation advice (including listing advice) for the Poplar Box Grassy Woodland on Alluvial Plains (DEE 2019) documentation.</p> <p>While Poplar Box TEC occurs in fragmented patches, the TEC was not recorded during field surveys and no REs diagnostic of the TEC were recorded within the Project area. Additionally, within a 2 km buffer of the Project area, no REs potentially corresponding to the Poplar Box TEC were identified within the desktop assessment. On this basis, the TEC is considered unlikely to occur.</p>
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions – endangered.	E	-	PMST	The TEC is an extreme form of dry seasonal subtropical rainforest. The TEC occurs within subtropical areas with seasonally dry climate on high to medium fertile soils and is characterised by a prominence of trees with microphyll sized leaves and swollen-stemmed bottle trees. The TEC is scattered from Townsville to Jandowae on the Queensland/NSW border (McDonald 2010).	<p>Unlikely to occur</p> <p>REs corresponding with the TEC were used as per Commonwealth National recovery plan for the "Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions" ecological community documentation.</p> <p>The TEC was not recorded during field surveys and no REs diagnostic of the TEC were recorded within the Project area. Additionally, within a 2 km buffer of the Project area, no REs potentially corresponding to the Semi-evergreen vine thicket TEC was identified within the desktop assessment.</p> <p>While potential SEVT TEC may occur 3 km south of the Project area in suitable mapped REs, the Project area does not contain REs or vegetation that is diagnostic of either TECs. On this</p>

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
					basis, the TEC is considered unlikely to occur.
Birds					
<i>Calidris ferruginea</i> Curlew sandpiper	CE, Mig	CE	PMST	The sandpiper mainly occurs along the coastlines of Australia. They are in smaller numbers across inland water of Queensland. Known to inhabit sheltered intertidal mudflats, and ephemeral and permanent lakes and dams (Higgins and Davies 1996).	Unlikely to occur This species has not been historically recorded from the desktop search extent. The nearest historical record is located approximately 27 km northeast of the pipeline alignment from 1971, associated with Jerona Fauna Reserve. Suitable habitat was observed to be lacking within the Project area.
<i>Erythrotriorchis radiatus</i> Red goshawk	V	E	PMST	The red goshawk occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia and nests in tall trees within 1 km of permanent water (DAWE 2021).	Unlikely to occur Potentially suitable habitat is present within the Project area. The closest record is approximately 55 km north-west of the pipeline alignment from 1998, associated with Bohle River tributary, Stoney Creek west of Ross River Dam, Townsville. Based on the suitability of habitat, the species has potential to occur. However, it has experienced a recent, rapid northward contraction, and is now rarely encountered south of southern Cape York in Queensland (Garnett and Baker 2020). On this basis the species is unlikely to occur at the Project area
<i>Falco hypoleucos</i> Grey falcon	V	V	PMST	The grey falcon occurs in arid and semi-arid Australia. The species is noted as being absent from east of the Great Dividing Range (TSSC 2020) and is mainly found in regions where the annual rainfall is less than 500 mm and is essentially confined to arid and semi-arid regions (TSSC 2020). They are an elusive species that occurs in arid to semi-arid environments in timbered lowland plains, shrublands, grasslands and open woodlands but have been observed hunting in open areas. They preference	Unlikely to occur The species has not been historically recorded in the desktop search extent. The species historical records are protected. According to ALA, the nearest historical record is 73 km southeast of the Project area from 1999. However this record is protected by a 10 km buffer. The species distribution does not encompass the Project area – indeed,

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
				habitat with tree-lined watercourses for nesting (DAWE 2019).	the Project area is located well to the east of the Great Dividing Range where the species is noted to be absent. Additionally, BoM long-term climate statistics for the 'Burdekin Shire Council' weather station (Station 033001) report that the average annual rainfall for the region is 1056 mm – well above the 500 mm annual rainfall threshold that constrains grey falcon occurrence.
<i>Geophaps scripta scripta</i> Squatter pigeon (southern)	V	V	WO	The species occurs in open-forests to sparse, open-woodlands and scrub that are dominated by <i>Eucalyptus</i> , <i>Corymbia</i> and <i>Acacia</i> or <i>Callitris</i> species, remnant and regrowth within 3 km of water (DAWE 2021).	Confirmed present Nineteen squatter pigeon (subspecies unconfirmed) were recorded across the Project area and surrounds in open woodland to very sparse open woodland or highly disturbed pastures for cattle grazing. Although the subspecies was unable to be confirmed, and hybrids have the potential to occur, conservatively, the southern subspecies is considered 'confirmed present' for the purpose of the likelihood of occurrence.
<i>Hirundapus caudacutus</i> White-throated needletail	V, Mig	V	PMST, WO	Almost exclusively aerial, it does prefer wooded, inland areas and heathland. In coastal areas they have been seen flying over mudflats and beaches. Widespread throughout eastern and south-eastern Australia. It has been recorded along all coastal regions of QLD and NSW (DAWE 2021).	Likely to occur According to ALA, the species has been historically recorded in the desktop search extent, approximately 4 km east of the Project area from 1969. The species has potential to forage aerially across the Project area.
<i>Neochmia ruficauda ruficauda</i> Star finch (eastern)	E	E	PMST	The star finch (eastern, southern) occurs in central Queensland including the Burdekin natural resource management region. The subspecies occurs in damp grasslands, sedgeland or grassy woodlands near permanent water (DAWE 2021).	Unlikely to occur The star finch (eastern, southern) has not been historically recorded in the desktop search extent. The closest records are near the Ross River Dam approximately 60 km north-west of the northernmost area of the pipeline alignment from 1986, associated with remnant vegetation (RE

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
					9.12.22/9.12.34). Limited suitable habitat was present in the north of the Project area. This bird is extremely uncommon in central Queensland, and may now be regionally extinct (Ward et al. 2022).
<i>Numenius madagascariensis</i> Eastern curlew	CE, Mig	E	PMST	The eastern curlew primarily occurs coastally and is rarely recorded inland. During the non-breeding season in Australia, the species is commonly associated with sheltered coasts, mudflats and sandflats (DoE 2015a).	Unlikely to occur The species has not been historically recorded in the desktop search extent. The closest record is approximately 16-20 km northwest of the Project area from 2008 to 2021, adjacent to the Haughton River and within Horseshoe Lagoon Conservation Park and next to Ironbark Creek and Haughton River. No suitable habitat was observed across the Project area.
<i>Poephila cincta cincta</i> Black-throated finch (southern)	E	E	PMST, WO	The black-throated finch (southern) is distributed across central Queensland with known populations near Townsville-Charters Towers. The species inhabits grassy woodland dominated by eucalypts, paperbarks or acacias, where there is access to seeding grasses and water (Black-throated Finch Recovery Team 2007).	Confirmed present Two individuals were observed in very sparse open woodland.
<i>Rostratula australis</i> Australian painted snipe	E	E	PMST	The species generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps, claypans and waterlogged grasslands (DAWE 2021).	Unlikely occur The species has not been historically recorded within the desktop search extent. The nearest historical record is located approximately 18 km east of the pipeline alignment from 1972, associated with what is now non-remnant agricultural land, adjacent to the Burdekin River. Suitable habitat was observed to be lacking in the Project area.
<i>Turnix olivii</i> Buff-breasted button-quail	E	E	PMST	The buff-breasted button-quail occurs in north-eastern Queensland, with records ranging from the Iron Range to Ingham. The species occurs in patches of short and sparse grassland, on a terrain of small stones, often on lower slopes of hills and ridges, and in open glades	Unlikely to occur The species has not been historically recorded within the desktop search extent. The DES species records are protected from public access. According

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
				amongst <i>Melaleuca</i> , <i>Acacia</i> , <i>Alphitonia</i> or <i>Tristania</i> in rainforest or open <i>Eucalyptus</i> woodland (DAWE 2021).	to ALA, the nearest historical record is located approximately 300 km north near Innisfail, this record is protected by a 10 km buffer. The species has not been definitively recorded in recent years. It is one the least known birds in Australia and has only been recorded in the Iron Range. No suitable habitat was observed in the Project area.
<i>Tyto novaehollandiae kimberli</i> Masked owl (northern)	V	V	PMST	The masked owl (northern) occurs from Cape York Peninsula south to Einasleigh-Burdekin divide. The species has been recorded from riparian forest, rainforest, open forest, Melaleuca swamps and the edges of mangroves, as well as along the margins of sugar cane fields (DAWE 2021).	Unlikely to occur The species has not been historically recorded within the desktop search extent. The nearest historical record is located approximately 54 km northwest from 1991, at Hervey's Range, Townsville. No suitable habitat was observed in the Project area.
Mammals					
<i>Dasyurus hallucatus</i> Northern quoll	E	LC	PMST, WO	The northern quoll occurs north to Weipa, south to Maleny and west to Carnarvon National Park. The species occurs across a range of habitats including rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands, beaches, grasslands and desert. Their habitat generally includes rocky areas for denning purposes (DAWE 2021).	Unlikely to occur Two records of the species have been historically recorded within the desktop search extent. Biomaps indicated one record was from 1973 associated with Bowling Green Bay National Park (30 km north of the Project area). The second record was from 1993 associated with grazing/agricultural land to the north-west of the Project area near Wangaratta, Queensland. The Project area is situated in a flat alluvial landscape with the southern extent of the alignment approximately 2 km from hilly terrain to the west. There is insufficient connectivity from shelter habitat to foraging/dispersal habitat within the Project area. Therefore, the species is considered unlikely to occur within the Project area.
<i>Hipposideros semoni</i>	V	E	PMST	The Semon's leaf-nosed bat occurs in its northern distribution from Cape York to south of Cooktown.	Unlikely to occur

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
Semon's leaf-nosed bat				Records of the species are also located on Mt Windsor Tableland and nearby Gladstone. The species is found in tropical rainforest, monsoon forest, wet sclerophyll forest and open savannah woodland. The species roosts in caves, mines, tree hollows and deserted buildings. It may share roosts on occasions with the Large-eared horseshoe bat, (<i>Rhinolophus philippinensis</i>) (DAWE 2021).	The species has not been historically recorded in the desktop search extent, DAWE note that an apparent record from Townsville is incorrect, as the specimen was collected from Cape Direction near Iron Range (DAWE 2021). The nearest historical records of the species are located in a cluster near Cooktown, approximately 500 km north of the pipeline alignment. These records were recorded between 1996 and 2016. Suitable habitat is present for the species with the presence of open woodland and hollow-bearing trees, however based on the distance to historical records, the species is considered unlikely to occur.
<i>Macroderma gigas</i> Ghost bat	V	E	PMST	The ghost bat occurs discontinuously with geographically disjunct colonies. The species' Queensland occurrence includes the Gulf of Carpentaria, from Cape York to Rockhampton, and western Queensland. The species roosts in deep natural caves or disused mines. The species occurs in habitats ranging from arid Australian locations to tropical savanna woodlands and rainforests (DAWE 2021).	May occur The species has not been historically recorded within the desktop search extent. The nearest historical record is located approximately 24 km northeast of the pipeline alignment from 2019 near Palm Creek. Although suitable foraging habitat was observed in the Project area, the species is known to forage on average within 1.9 km and typically less than 5 km from diurnal roosts (TSSC 2016a). The closest known roost is Cape Hillsborough (220 km southeast) (TSSC 2016a), although noting closer records indicate other roosts are likely to occur in the Lower Burdekin region. Given the presence of suitable foraging habitat, the species may occur.
<i>Phascolarctos cinereus</i> Koala	E	V	PMST, WO	In the region, the koala occurs through the Brigalow Belt North bioregion and Einasleigh Uplands bioregion. Throughout the species' range, koalas inhabit moist forests and woodlands mostly dominated by <i>Eucalyptus</i> species, and are also found in vegetation communities	Likely to occur The species has been historically recorded in the Project area. One record of the species is located approximately 2 km southwest of the

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
				dominated by Melaleuca or Casuarina species (DAWE 2021).	pipeline alignment from 1987. Essential habitat for the koala is associated with this record. Suitable habitat was observed during the field survey, accordingly the species is considered likely to occur in low densities
<i>Rhinolophus robertsi</i> Large-eared horseshoe bat	V	E	PMST	<p>The large-eared horseshoe bat occurs in north-eastern Queensland, from the tip of Cape York Peninsula to as far south as Townsville (Kutt 2005; Pavey and Kutt 2008 cited in TSSC 2016b). The species is found in lowland rainforest, forest-lined creeks within open eucalypt forest, <i>Melaleuca</i> forest with rainforest understorey, open savannah woodland and tall riparian woodland (Churchill 2009; Pavey and Kutt 2008 cited in DAWE 2021).</p> <p>Daytime roosting habitat includes caves, underground mines located in rainforest, and open eucalypt forest and woodland. Roosts have also been observed in road culverts, and it is suspected that the species uses basal hollows of large trees, dense vegetation, rockpiles and areas beneath creekbanks (DAWE 2021).</p>	<p>May occur</p> <p>The species has not been historically recorded within the desktop search extent. The DES historical records are protected from public access. According to ALA, the nearest historical record is located approximately 300 km north of the pipeline alignment near Millaa Millaa from 2019. Potentially suitable roosting habitat was observed in the Project area in the form of tree hollows. Given the presence of suitable foraging and roosting habitat, the species may occur.</p>
<i>Saccolaimus saccolaimus nudicluniatus</i> Bare-rumped sheath-tail bat	V	E	PMST	In Queensland, the species is known to occur from Ayr to the Iron Ranges (TSSC 2016c). Most historical records have been near-coastal locations. In Queensland, the species is known to be associated with coastal lowland rainforests, as well as open forests dominated by <i>Eucalyptus</i> or <i>Corymbia</i> species intermingled with coastal lowland rainforest. The species has been recorded using deep hollows for roosting and breeding (TSSC 2016c).	<p>Confirmed present</p> <p>The species was confirmed present. Anabats recorded 168 calls which were reliably attributed to the species. Suitable habitat was also observed during the field survey.</p>
<i>Xeromys myoides</i> Water mouse	V	V	PMST	The water mouse occurs across an extensive range in coastal and near-coastal south-east and south-central Queensland (TSSC 2021). The species occurs in aquatic environments including mangroves and the associated saltmarsh, sedgeland, clay pans, heathlands and freshwater wetlands (TSSC 2021).	<p>Unlikely to occur</p> <p>The species has not been historically recorded in the Project area. The nearest historical record is located approximately 155 km southeast, from 2017 at Waite Creek Cannonvale. No suitable habitat was observed during the field survey, accordingly the species is unlikely to occur</p>

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
Reptiles					
<i>Denisonia maculata</i> Ornamental snake	V	V	PMST	The ornamental snake is only known from the Brigalow Belt North and South bioregions. In the region, the species is known to occur in the Charters Towers area. The species' preferred habitat is close to that favoured by its prey – frogs. This includes woodlands and open forests associated with gilgai mounds and depressions in RE landzone 4. The species is likely to be found in association with <i>Acacia harpophylla</i> , <i>Acacia cambagei</i> , <i>Acacia argyrodendron</i> or <i>Eucalyptus coolabah</i> (DAWE 2021).	Unlikely to occur The species has not been historically recorded within the desktop search extent. The nearest historical record is located approximately 133 km southwest near Campaspe, along the Campaspe River in Wambiana Station from 2012 and 2013. No suitable habitat was observed in the Project area. Accordingly, the species is considered unlikely to occur.
<i>Egernia rugosa</i> Yakka skink	V	V	PMST	In the region, the yakka skink occurs in the Brigalow Belt North and Einasleigh Upland Bioregions. This species typically inhabits open dry sclerophyll forest, woodland and scrub. The species is typically found under partly buried rocks, logs, tree stumps, root cavities and abandoned burrows (DAWE 2021; DoE 2014b).	May occur The species has not been historically recorded within the desktop search extent. The DES historical records are protected from public access. According to ALA the nearest historical record is approximately 75 km southwest of the pipeline alignment from 1980, this record is protected by a 10 km buffer. Habitat of limited suitability was observed in the Project area. Accordingly, the species is considered to have a remote chance of occurring within the Project area.
<i>Lerista vittate</i> Mount Cooper striped lerista	V	V	PMST	The Mount Cooper striped skink occurs in the Mount Cooper area with a second population potentially occurring on the Chudleigh Plateau. The species inhabits ironbark (<i>E. crebra</i> , <i>E. melanophloia</i>) and bloodwood (<i>C. clarksoniana</i> , <i>C. intermedia</i>) dominated woodland with shrub and/or grassy ground layers on deep red earth (RE11.5.9), undulating plains and steep hills (RE9.12.1a), Semi-evergreen vine thicket TEC (RE11.5.15) and spinifex communities (DAWE 2021). The species is typically found under leaf litter, loose soil under logs and inside rotten logs (DAWE 2021).	May occur The species has not been historically recorded within the desktop search extent. The nearest historical records are approximately 73 km southwest of the pipeline alignment in a cluster at Mount Cooper station from 1980 to 1993. Habitat of limited suitability was observed in the Project area. On the basis of potentially suitable habitat, the species has a remote chance of occurring within the Project area.

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
Plants					
<i>Bulbophyllum globuliforme</i> Miniature moss-orchid	V	NT	PMST	The miniature moss-orchid is a host-specific species, and only grows on the hoop Pine (<i>Araucaria cunninghamii</i>), where it colonises the upper branches of mature trees (Jones 2006 cited DAWE 2021). The hoop pine occurs in upland (usually 100-900 m above sea level) (Jones 2006 cited DAWE 2021) subtropical rainforest communities that have a discontinuous distribution along the Australian east coast (NSW OEH 2012o, cited DAWE 2021).	Unlikely to occur The species has not been historically recorded within the desktop search extent. No hoop pines were recorded within the Project area or historically recorded within the desktop search extent. The DES records are protected from public access. According to ALA the species has been historically recorded near Gladstone. and the Gold Coast. Accordingly, the species is considered unlikely to occur.
<i>Dichanthium setosum</i> Bluegrass	V	LC	PMST	<i>Dichanthium setosum</i> has been reported from inland NSW and Queensland. Recorded on heavy basaltic black soils and red-brown loams with clay subsoil. <i>Dichanthium setosum</i> is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture (DAWE 2021).	Unlikely to occur Although suitable habitat was observed in the Project area, the species has not been historically recorded within the desktop search extent. The nearest record is located approximately 200 km southeast of the pipeline alignment, near Homevale National Park from 2006. Accordingly, the species is considered unlikely to occur.
<i>Eucalyptus raveretiana</i> Black ironbox	V	LC	PMST, WO	<i>Eucalyptus raveretiana</i> is found in the region between Ayr in the north to Rockhampton in the south, and inland to Nebo. The species is generally restricted to the riparian zone of watercourses (i.e. below the high bank), growing in loams and clay soils between altitudes of 0 – 300 m. It is usually co-dominant or sub-dominant with species such as <i>M. leucadendra</i> , <i>M.a fluviatilis</i> , <i>E. tereticornis</i> and <i>C. tessellaris</i> (DAWE 2021).	Confirmed present 13 individuals were recorded along the lower terrace and lower bank of the Burdekin River.
<i>Leichhardtia brevifolia</i> Previously listed as <i>Marsdenia brevifolia</i>	V	V	PMST	<i>Leichhardtia brevifolia</i> occurs in north and central Queensland where it is known from near Townsville, Springsure and north of Rockhampton. At Hidden Valley near Paluma, plants grow in woodland on granite soils dominated by <i>E. granitica</i> , <i>C. leichhardtii</i> and <i>E. acmenoides</i> (DAWE 2021).	Unlikely to occur The species has not been historically recorded within the desktop search extent. According to DES the nearest historical record is approximately 50 km northwest of the pipeline alignment from 1996 near Peach Hollow Knobs. No

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
					suitable habitat was observed in the Project area.
<i>Omphalea celata</i>	V	V	PMST	<i>Omphalea celata</i> is a small tree growing to 12 m. This species occurs within the Burdekin and Fitzroy (Queensland) Natural Resource Management Regions. The species is known from three sites in central east Queensland, including near Eungella, Bowen and Nebo. The species is known to occur in semi-evergreen vine thicket TEC and Araucaria microphyll vine forest (DEWHA 2008).	Unlikely to occur The species has not been historically recorded within the desktop search extent. The nearest historical records are located 195 km southeast of the Project area, from 1973 to 2007 from Hazlewood Gorge, Eungella Dam. No suitable habitat was observed in the Project area.
<i>Tephrosia leveillei</i>	V	LC	PMST	<i>Tephrosia leveillei</i> is known to occur in six locations in Queensland, including near Ravenswood. The species has been recorded in <i>Eucalyptus</i> and <i>Corymbia</i> woodland and tall open forest (DAWE 2021).	May occur The species has not been historically recorded within the desktop search extent. According to ALA, the species has been recorded near the Undara Volcanic National Park 310 km northwest of the pipeline alignment from 2008. Suitable habitat was observed in the Project area.
Fish					
<i>Pristis pristis</i> Freshwater sawfish	V, Mig	LC	PMST	The species is known from several drainages in Queensland, including the Gilbert River, Mitchell River, Norman River and Leichhardt River. Juveniles and sub-adult Freshwater Sawfish predominantly occur in rivers and estuaries, while large mature animals tend to occur more often in coastal and offshore waters up to 25 m depth. They are usually found in turbid channels of large rivers over soft mud bottoms (DAWE 2021).	Unlikely to occur The species has not been historically recorded within the desktop search extent. Suitable habitat was only observed adjacent to the Project area. The species has been historically recorded 43 km northwest of the Project area at the mouth of the Burdekin River from 1936. The nearest historical record is located 470 km northwest of the pipeline alignment from Lynd river junction from 1845.

Notes:

NC Act: LC (Least Concern), SL (Special Least Concern), NT (Near Threatened), V (Vulnerable), E (Endangered), CR (Critically Endangered)

EPBC Act: V (Vulnerable), E (Endangered), CE (Critically Endangered)

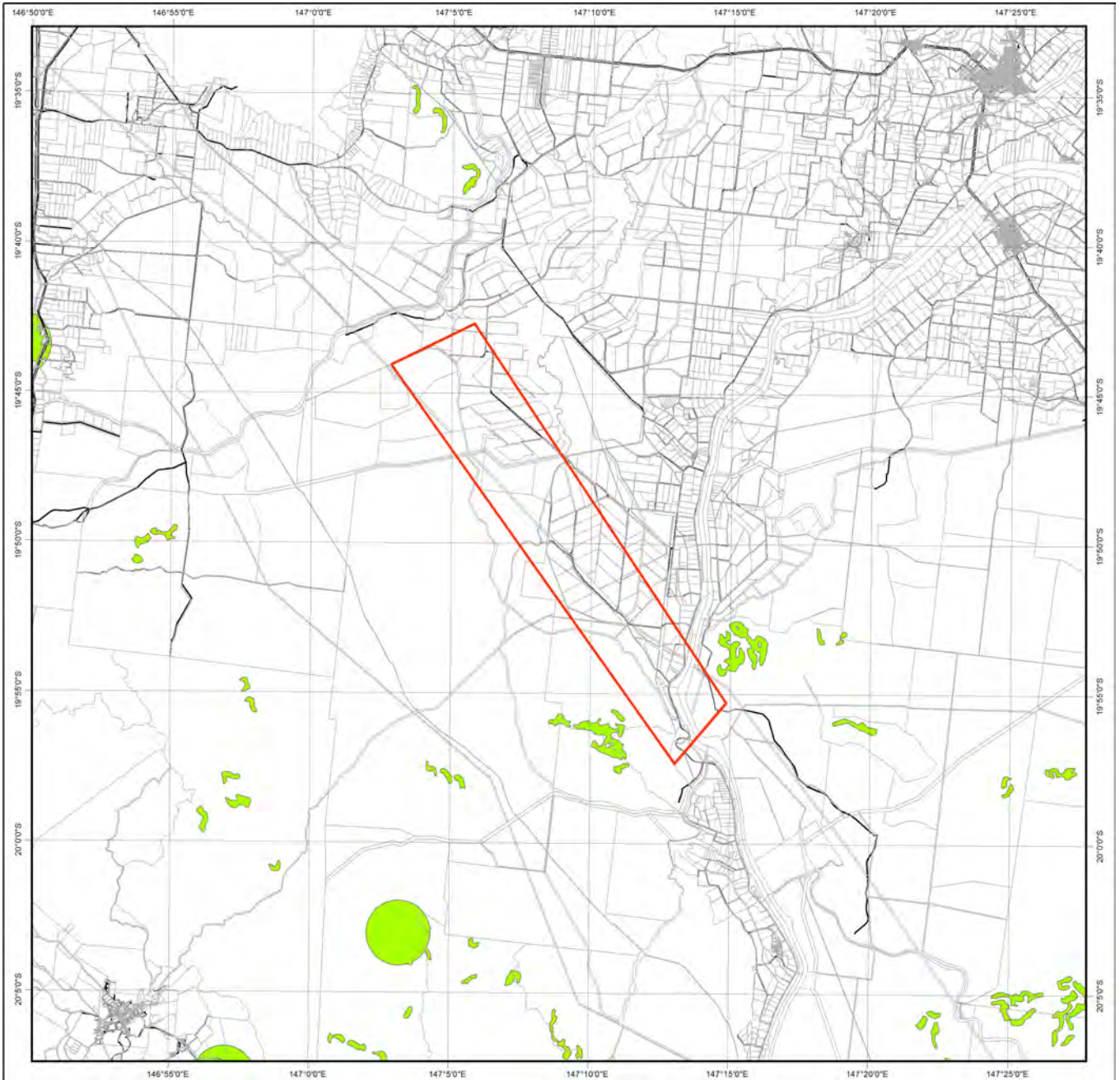
WO (Wildlife Online), PMST (DAWE Protected Matters Search Tool)

Appendix B

Desktop results






Appendix B

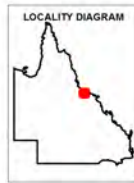
Desktop results



Protected Plants Flora Survey Trigger Map

Legend

-  polygon
-  High risk area
-  Other land parcel boundaries
-  Freeways / motorways / highways
-  Secondary roads / streets



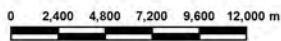
This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

Land parcel boundaries are provided as locational aid only.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Science at palm@des.qld.gov.au

Disclaimer:
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This product is projected into:
GDA 1994 Queensland Albers

Protected plants flora survey trigger map

The protected plants flora survey trigger map identifies 'high risk areas' where endangered, vulnerable or near threatened plants are known to exist or are likely to exist. Under the *Nature Conservation Act 1992* (the Act) it is an offence to clear protected plants that are 'in the wild' unless you are authorised or the clearing is exempt, for more information see [section 89](#) of the Act.

Please see the Department of Environment and Science webpage on the [clearing of protected plants](#) for information on what exemptions may apply in your circumstances, whether you may need to undertake a flora survey, and whether you may need a protected plants clearing permit.

Updates to the data informing the flora survey trigger map

The flora survey trigger map will be reviewed, and updated if necessary, at least every 12 months to ensure the map reflects the most up-to-date and accurate data available.

Species information

Please note that flora survey trigger maps do not identify species associated with 'high risk areas'. While some species information may be publicly available, for example via the [Queensland Spatial Catalogue](#), the Department of Environment and Science does not provide species information on request. Regardless of whether species information is available for a particular high risk area, clearing plants in a high risk area may require a flora survey and/or clearing permit. Please see the Department of Environment and Science webpage on the [clearing of protected plants](#) for more information.



Queensland Government

Department of Environment and Science

Environmental Reports

Matters of State Environmental Significance

For the selected area of interest

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or area of interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "central coordinates" option, the resulting assessment area encompasses an area extending for a 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: Planning.Support@des.qld.gov.au

Disclaimer

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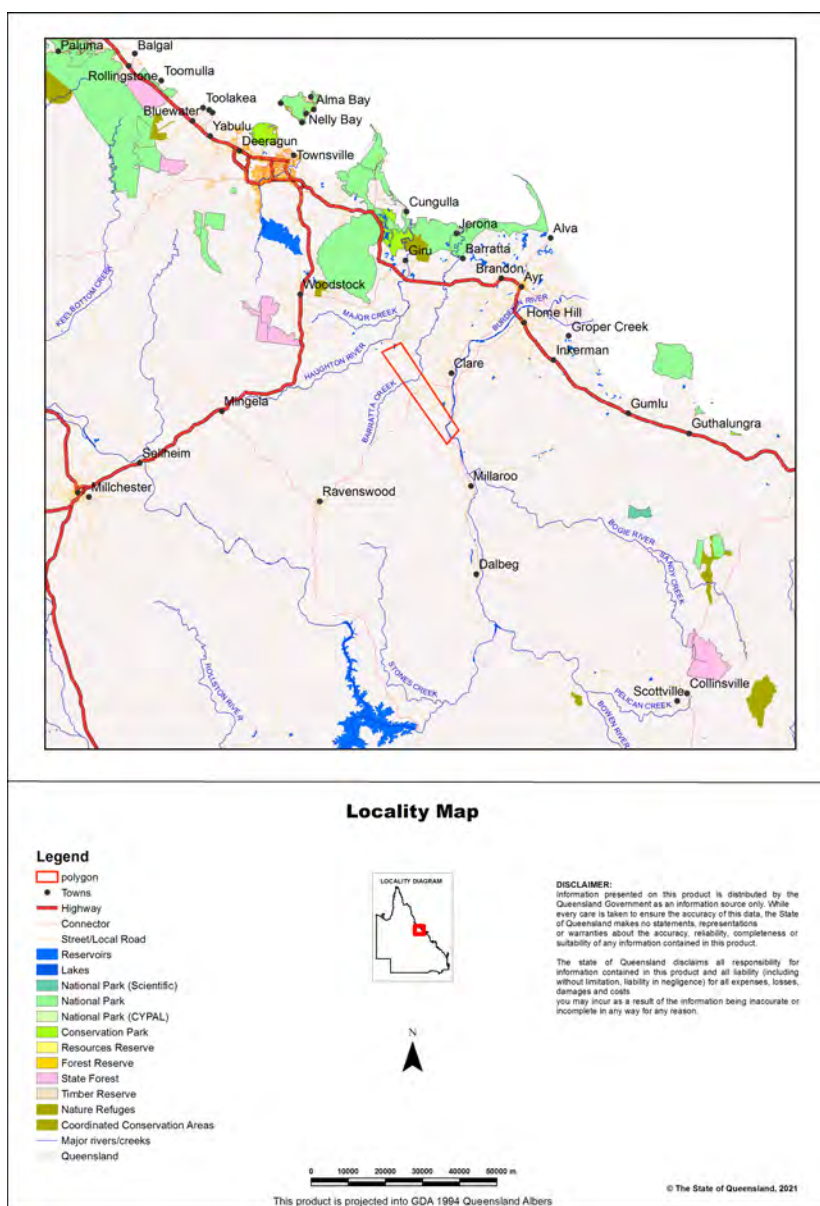
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Assessment Area Details

The following table provides an overview of the area of interest (AOI) with respect to selected topographic and environmental values.

Table 1: Summary table, details for AOI

Size (ha)	15,299.31
Local Government(s)	Burdekin Shire
Bioregion(s)	Brigalow Belt
Subregion(s)	Bogie River Hills, Townsville Plains
Catchment(s)	Burdekin, Haughton



Matters of State Environmental Significance (MSES)

MSES Categories

Queensland's State Planning Policy (SPP) includes a biodiversity State interest that states:

'The sustainable, long-term conservation of biodiversity is supported. Significant impacts on matters of national or state environmental significance are avoided, or where this cannot be reasonably achieved; impacts are minimised and residual impacts offset.'

The MSES mapping product is a guide to assist planning and development assessment decision-making. Its primary purpose is to support implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations. Similarly, the SPP biodiversity policy does not override or replace specific requirements of other Acts or regulations.

The SPP defines matters of state environmental significance as:

- Protected areas (including all classes of protected area except coordinated conservation areas) under the *Nature Conservation Act 1992* ;
- Marine parks and land within a 'marine national park', 'conservation park', 'scientific research', 'preservation' or 'buffer' zone under the *Marine Parks Act 2004* ;
- Areas within declared fish habitat areas that are management A areas or management B areas under the Fisheries Regulation 2008;
- Threatened wildlife under the *Nature Conservation Act 1992* and special least concern animals under the Nature Conservation (Wildlife) Regulation 2006;
- Regulated vegetation under the *Vegetation Management Act 1999* that is:
 - Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems;
 - Category C areas on the regulated vegetation management map that are 'endangered' or 'of concern' regional ecosystems;
 - Category R areas on the regulated vegetation management map;
 - Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse and drainage feature map;
 - Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map;
- Strategic Environmental Areas under the *Regional Planning Interests Act 2014* ;
- Wetlands in a wetland protection area of wetlands of high ecological significance shown on the Map of Queensland Wetland Environmental Values under the Environment Protection Regulation 2019;
- Wetlands and watercourses in high ecological value waters defined in the Environmental Protection (Water) Policy 2009, schedule 2;
- Legally secured offset areas.

MSES Values Present

The MSES values that are present in the area of interest are summarised in the table below:

Table 2: Summary of MSES present within the AOI

1a Protected Areas- estates	0.0 ha	0.0 %
1b Protected Areas- nature refuges	0.0 ha	0.0 %
1c Protected Areas- special wildlife reserves	0.0 ha	0.0 %
2 State Marine Parks- highly protected zones	0.0 ha	0.0 %
3 Fish habitat areas (A and B areas)	0.0 ha	0.0 %
4 Strategic Environmental Areas (SEA)	0.0 ha	0.0 %
5 High Ecological Significance wetlands on the map of Referable Wetlands	6.05 ha	0.0%
6a High Ecological Value (HEV) wetlands	0.0 ha	0.0 %
6b High Ecological Value (HEV) waterways **	0.0 km	Not applicable
7a Threatened (endangered or vulnerable) wildlife	377.76 ha	2.5%
7b Special least concern animals	0.0 ha	0.0 %
7c i Koala habitat area - core (SEQ)	0.0 ha	0.0 %
7c ii Koala habitat area - locally refined (SEQ)	0.0 ha	0.0 %
8a Regulated Vegetation - Endangered/Of concern in Category B (remnant)	346.25 ha	2.3%
8b Regulated Vegetation - Endangered/Of concern in Category C (regrowth)	5.65 ha	0.0%
8c Regulated Vegetation - Category R (GBR riverine regrowth)	75.9 ha	0.5%
8d Regulated Vegetation - Essential habitat	378.44 ha	2.5%
8e Regulated Vegetation - intersecting a watercourse **	115.0 km	Not applicable
8f Regulated Vegetation - within 100m of a Vegetation Management Wetland	40.88 ha	0.3%
9a Legally secured offset areas- offset register areas	0.0 ha	0.0 %
9b Legally secured offset areas- vegetation offsets through a Property Map of Assessable Vegetation	0.0 ha	0.0 %

Additional Information with Respect to MSES Values Present

MSES - State Conservation Areas

1a. Protected Areas - estates

(no results)

1b. Protected Areas - nature refuges

(no results)

1c. Protected Areas - special wildlife reserves

(no results)

2. State Marine Parks - highly protected zones

(no results)

3. Fish habitat areas (A and B areas)

(no results)

Refer to **Map 1 - MSES - State Conservation Areas** for an overview of the relevant MSES.

MSES - Wetlands and Waterways

4. Strategic Environmental Areas (SEA)

(no results)

5. High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values

Natural wetlands that are 'High Ecological Significance' (HES) on the Map of Queensland Wetland Environmental Values are present.

6a. Wetlands in High Ecological Value (HEV) waters

(no results)

6b. Waterways in High Ecological Value (HEV) waters

(no results)

Refer to **Map 2 - MSES - Wetlands and Waterways** for an overview of the relevant MSES.

MSES - Species

7a. Threatened (endangered or vulnerable) wildlife

Values are present

7b. Special least concern animals

Not applicable

7c i. Koala habitat area - core (SEQ)

Not applicable

7c ii. Koala habitat area - locally refined (SEQ)

Not applicable

Threatened (endangered or vulnerable) wildlife habitat suitability models

Species	Common name	NCA status	Presence
<i>Boronia keysii</i>		V	None
<i>Calyptorhynchus lathamii</i>	Glossy black cockatoo	V	None
<i>Casuarus casuaris johnsonii</i>	Sthn population cassowary	E	None
<i>Crinia tinnula</i>	Wallum froglet	V	None
<i>Denisonia maculata</i>	Ornamental snake	V	None
<i>Litoria freycineti</i>	Wallum rocketfrog	V	None
<i>Litoria olongburensis</i>	Wallum sedgefrog	V	None
<i>Melaleuca irbyana</i>		E	None
<i>Petaurus gracilis</i>	Mahogany Glider	E	None
<i>Petrogale persephone</i>	Proserpine rock-wallaby	E	None
<i>Phascolarctos cinereus</i>	Koala - outside SEQ*	V	None
<i>Pezoporus wallicus wallicus</i>	Eastern ground parrot	V	None
<i>Taudactylus pleione</i>	Kroombit tinkerfrog	E	None
<i>Xeromys myoides</i>	Water Mouse	V	None

*For koala model, this includes areas outside SEQ. Check 7c SEQ koala habitat for presence/absence.

Threatened (endangered or vulnerable) wildlife species records

Scientific name	Common name	NCA status	EPBC status	Migratory status
<i>Phascolarctos cinereus</i>	koala	V	V	
<i>Crocodylus porosus</i>	estuarine crocodile	V		M-B/E
<i>Saccolaimus saccolaimus nudicluniatus</i>	bare-rumped sheath-tail bat	E	V	

Special least concern animal species records

(no results)

*Nature Conservation Act 1992 (NCA) Status- Endangered (E), Vulnerable (V) or Special Least Concern Animal (SL).
Environment Protection and Biodiversity Conservation Act 1999 (EPBC) status: Critically Endangered (CE) Endangered (E), Vulnerable (V)

Migratory status (M) - China and Australia Migratory Bird Agreement (C), Japan and Australia Migratory Bird Agreement (J), Republic of Korea and Australia Migratory Bird Agreement (R), Bonn Migratory Convention (B), Eastern Flyway (E)

To request a species list for an area, or search for a species profile, access Wildlife Online at:

<https://www.qld.gov.au/environment/plants-animals/species-list/>

Refer to **Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals** and **Map 3b - MSES - Species - Koala habitat area (SEQ)** for an overview of the relevant MSES.

MSES - Regulated Vegetation

For further information relating to regional ecosystems in general, go to:

<https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/>

For a more detailed description of a particular regional ecosystem, access the regional ecosystem search page at:

<https://environment.ehp.qld.gov.au/regional-ecosystems/>

8a. Regulated Vegetation - Endangered/Of concern in Category B (remnant)

Regional ecosystem	Vegetation management polygon	Vegetation management status
11.12.1/11.12.9/11.3.34/11.3.25	O-subdom	rem_oc
11.3.4	O-dom	rem_oc
11.3.4/11.3.25/11.3.13/11.3.25b	O-dom	rem_oc

8b. Regulated Vegetation - Endangered/Of concern in Category C (regrowth)

Regional ecosystem	Vegetation management polygon	Vegetation management status
11.3.4	O-dom	hvr_oc
11.3.4/11.3.25/11.3.13/11.3.25b	O-dom	hvr_oc

8c. Regulated Vegetation - Category R (GBR riverine regrowth)

Regulated vegetation map category	Map number	RVM rule
R	8358	None

8d. Regulated Vegetation - Essential habitat

Values are present

8e. Regulated Vegetation - intersecting a watercourse**

A vegetation management watercourse is mapped as present

8f. Regulated Vegetation - within 100m of a Vegetation Management wetland

Regulated vegetation map category	Map number	RVM rule
B	8358	None

Refer to **Map 4 - MSES - Regulated Vegetation** for an overview of the relevant MSES.

MSES - Offsets

9a. Legally secured offset areas - offset register areas

(no results)

9b. Legally secured offset areas - vegetation offsets through a Property Map of Assessable Vegetation

(no results)

Refer to **Map 5 - MSES - Offset Areas** for an overview of the relevant MSES.

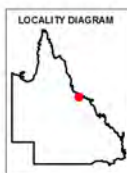
Map 1 - MSES - State Conservation Areas



MSES - State Conservation Areas

Area of Interest

- polygon
- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Protected area (estates, nature refuges, special wildlife reserves)
- Declared fish habitat area (A and B areas)
- Marine park (highly protected)



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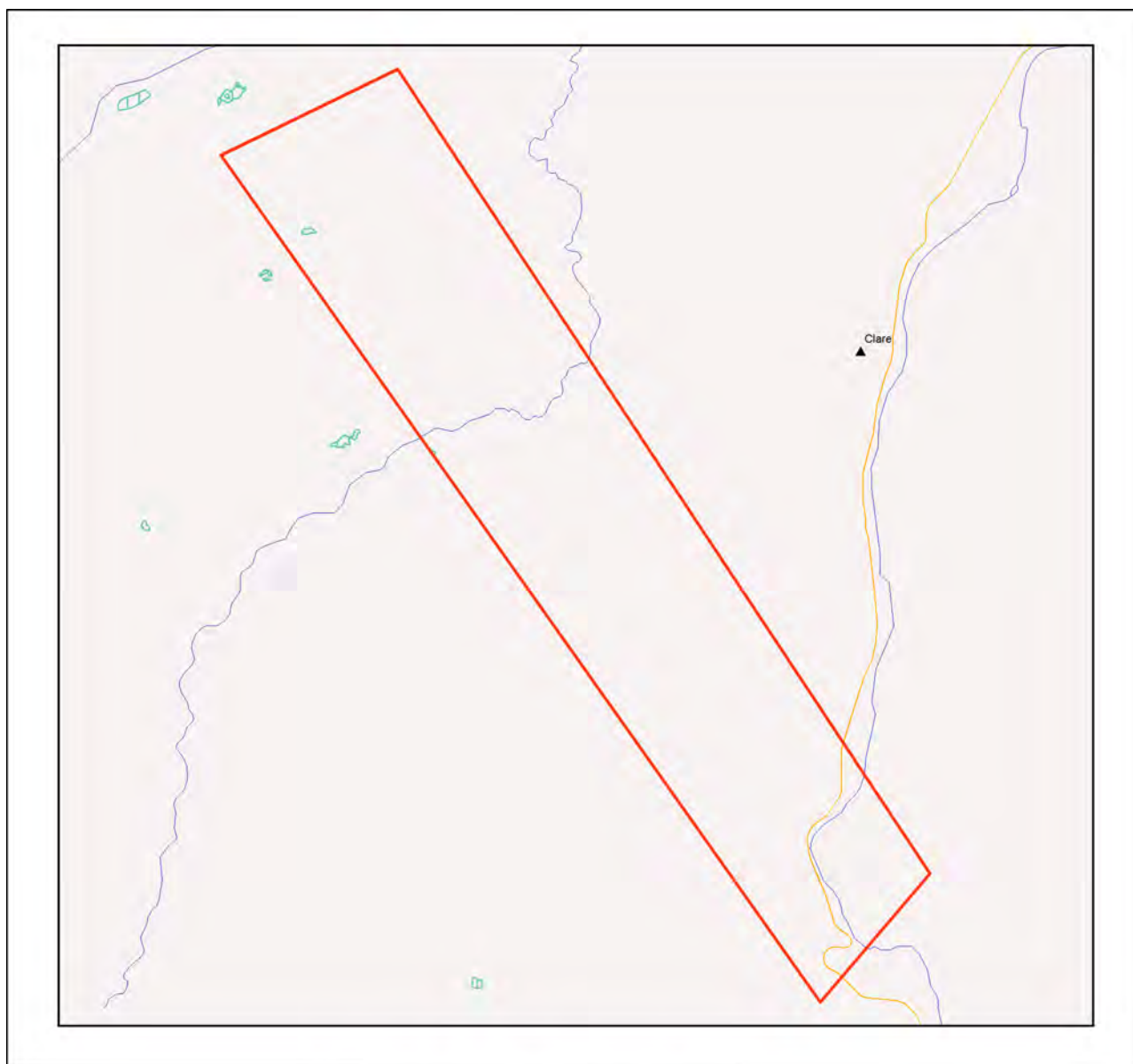
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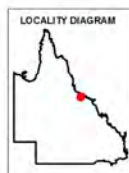
Map 2 - MSES - Wetlands and Waterways



MSES - Wetlands and Waterways

Area of Interest

- polygon
- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Declared high ecological value waters (watercourse)
- Strategic environmental area (designated precinct)
- Declared high ecological value waters (wetland)
- High ecological significance wetlands



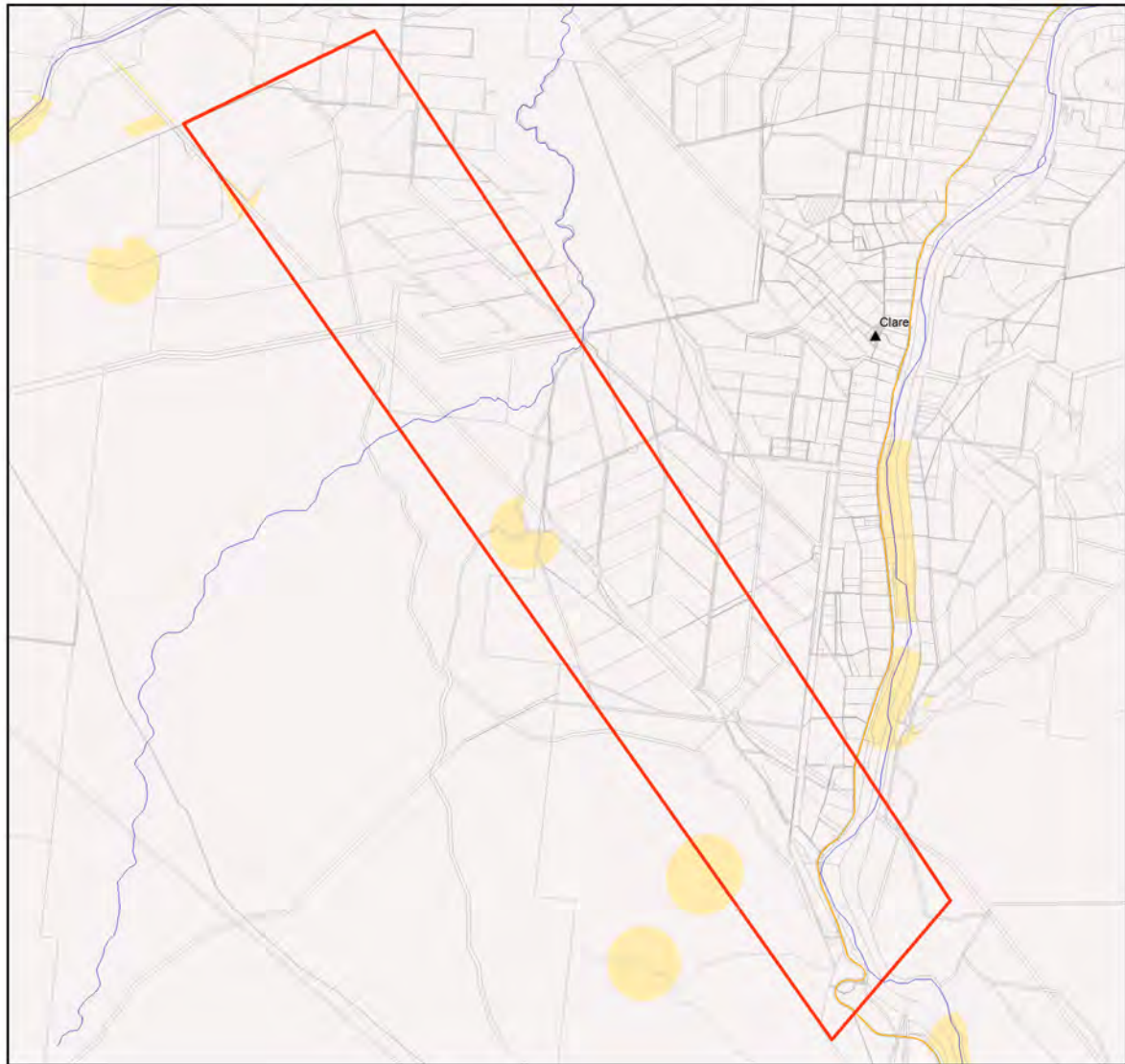
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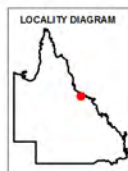
Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals



MSES - Species Threatened (endangered or vulnerable) wildlife and special least concern animals

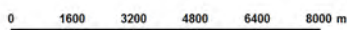
Area of Interest

- polygon
- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Wildlife habitat (special least concern)
- Wildlife habitat (endangered or vulnerable)



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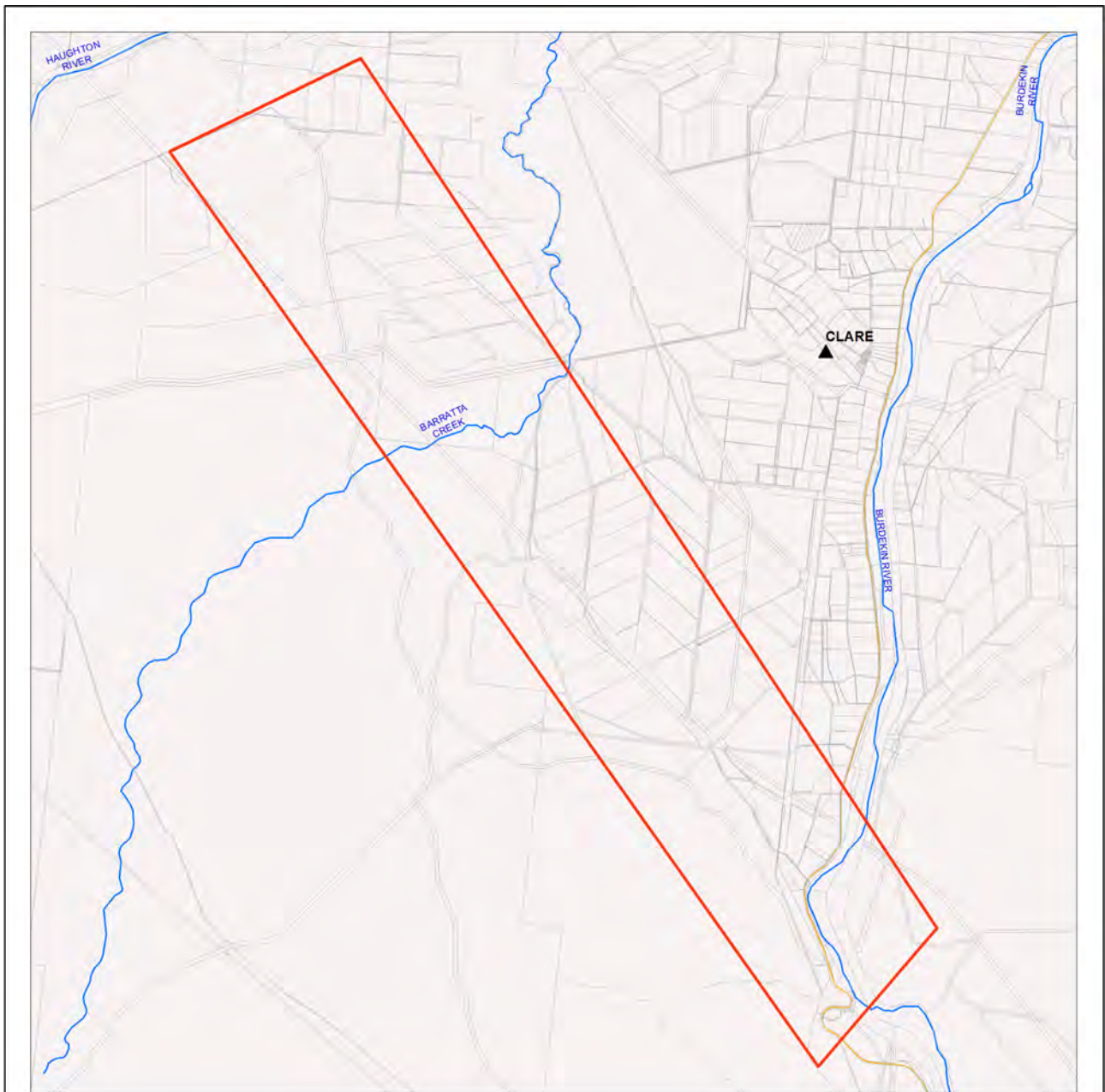
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Map 3b - MSES - Species - Koala habitat area (SEQ)



MSES - Species Koala habitat area (SEQ)

Area of Interest

- polygon
- Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Koala habitat area (core)
- Koala habitat area (locally refined)



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The represented layers for SEQ 'koala habitat area-core' and 'koala habitat area- locally refined' in MSES are sourced directly from the regulatory mapping under the Nature Conservation (Koala) Conservation Plan 2017. Whilst every effort is made to ensure the information remains current, there may be delays between updating versions. Please refer to the original mapping for the most recent version. See <https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping>

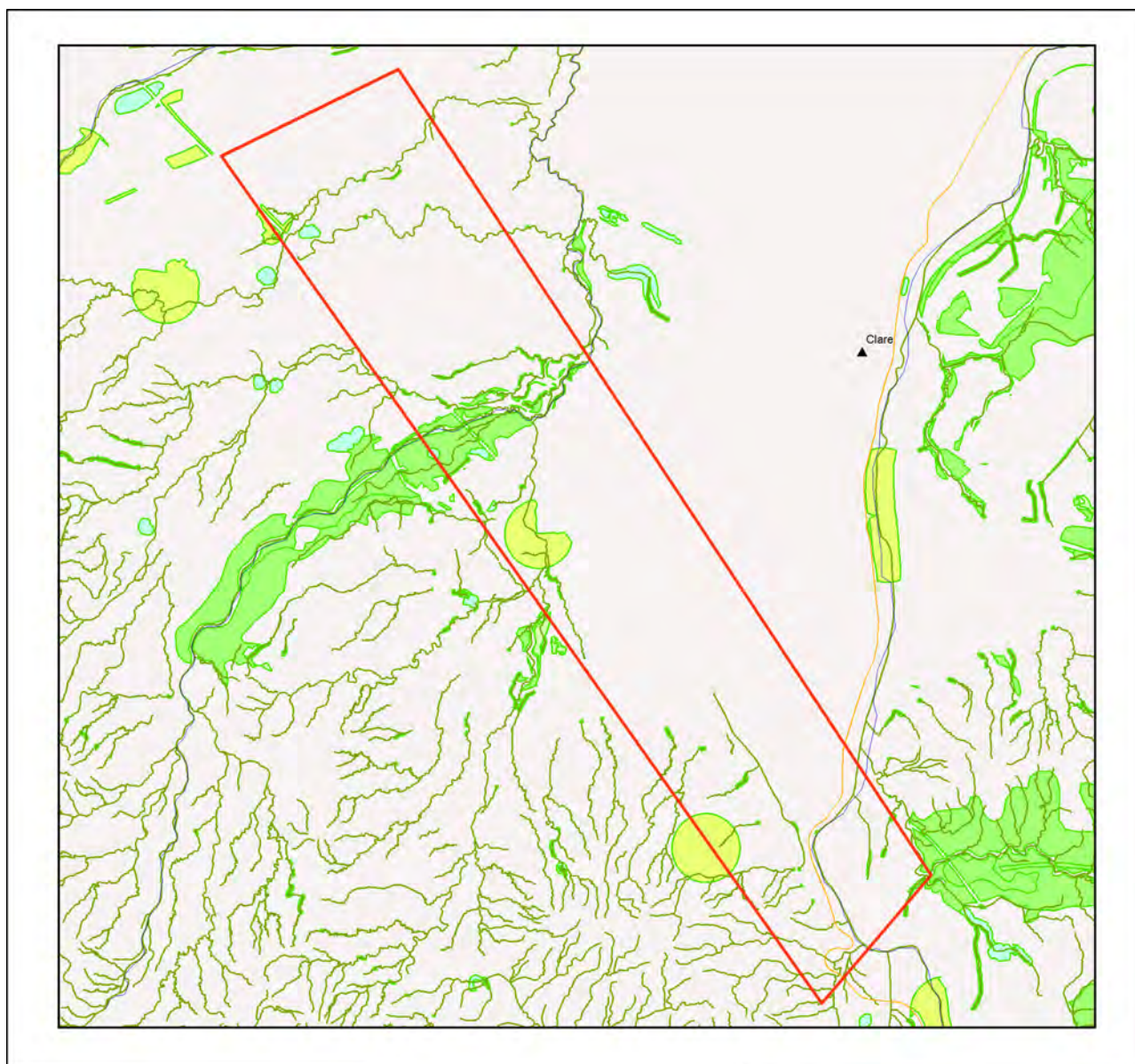
The koala habitat mapping within South East Queensland uses regional ecosystem linework compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.



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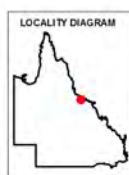
Map 4 - MSES - Regulated Vegetation



MSES - Regulated Vegetation

Area of Interest

- ▭ polygon
- ▲ Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Regulated vegetation (intersecting a watercourse)
- Regulated vegetation (100m from wetland)
- Regulated vegetation (category B - endangered or of concern)
- Regulated vegetation (category C - endangered or of concern)
- Regulated vegetation (category R - GBR riverine)
- Regulated vegetation (essential habitat)



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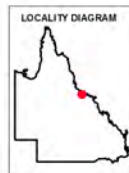
Map 5 - MSES - Offset Areas



MSES - Offsets

Area of Interest

-  polygon
-  Towns
-  Freeways/Highways
-  Secondary roads
-  Major rivers/creeks
-  Legally secured offset area (offset register)
-  Legally secured offset area (vegetation offsets)



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Appendices

Appendix 1 - Matters of State Environmental Significance (MSES) methodology

MSES mapping is a regional-scale representation of the definition for MSES under the State Planning Policy (SPP). The compiled MSES mapping product is a guide to assist planning and development assessment decision-making. Its primary purpose is to support implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations. Similarly, the SPP biodiversity policy does not override or replace specific requirements of other Acts or regulations.

The Queensland Government's "Method for mapping - matters of state environmental significance for use in land use planning and development assessment" can be downloaded from:

<http://www.ehp.qld.gov.au/land/natural-resource/method-mapping-mses.html> .

Appendix 2 - Source Data

The datasets listed below are available on request from:

<http://qldspatial.information.qld.gov.au/catalogue/custom/index.page>

- Matters of State environmental significance

Note: MSES mapping is not based on new or unique data. The primary mapping product draws data from a number of underlying environment databases and geo-referenced information sources. MSES mapping is a versioned product that is updated generally on a twice-yearly basis to incorporate the changes to underlying data sources. Several components of MSES mapping made for the current version may differ from the current underlying data sources. To ensure accuracy, or proper representation of MSES values, it is strongly recommended that users refer to the underlying data sources and review the current definition of MSES in the State Planning Policy, before applying the MSES mapping.

Individual MSES layers can be attributed to the following source data available at QSpatial:

MSES layers	current QSpatial data (http://qspatial.information.qld.gov.au)
Protected Areas-Estates, Nature Refuges, Special Wildlife Reserves	- Protected areas of Queensland - Nature Refuges - Queensland - Special Wildlife Reserves- Queensland
Marine Park-Highly Protected Zones	Moreton Bay marine park zoning 2008
Fish Habitat Areas	Queensland fish habitat areas
Strategic Environmental Areas-designated	Regional Planning Interests Act - Strategic Environmental Areas
HES wetlands	Map of Queensland Wetland Environmental Values
Wetlands in HEV waters	HEV waters: - EPP Water intent for waters Source Wetlands: - Queensland Wetland Mapping (Current version 5) Source Watercourses: - Vegetation management watercourse and drainage feature map (1:100000 and 1:250000)
Wildlife habitat (threatened and special least concern)	-WildNet database species records - habitat suitability models (various) - SEQ koala habitat areas under the Koala Conservation Plan 2019
VMA regulated regional ecosystems	Vegetation management regional ecosystem and remnant map
VMA Essential Habitat	Vegetation management - essential habitat map
VMA Wetlands	Vegetation management wetlands map
Legally secured offsets	Vegetation Management Act property maps of assessable vegetation. For offset register data-contact DES
Regulated Vegetation Map	Vegetation management - regulated vegetation management map

Appendix 3 - Acronyms and Abbreviations

AOI	- Area of Interest
DES	- Department of Environment and Science
EP Act	- <i>Environmental Protection Act 1994</i>
EPP	- Environmental Protection Policy
GDA94	- Geocentric Datum of Australia 1994
GEM	- General Environmental Matters
GIS	- Geographic Information System
MSES	- Matters of State Environmental Significance
NCA	- <i>Nature Conservation Act 1992</i>
RE	- Regional Ecosystem
SPP	- State Planning Policy
VMA	- <i>Vegetation Management Act 1999</i>



EPBC Act Protected Matters Report

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

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

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 22/11/21 13:08:58

[Summary](#)

[Details](#)

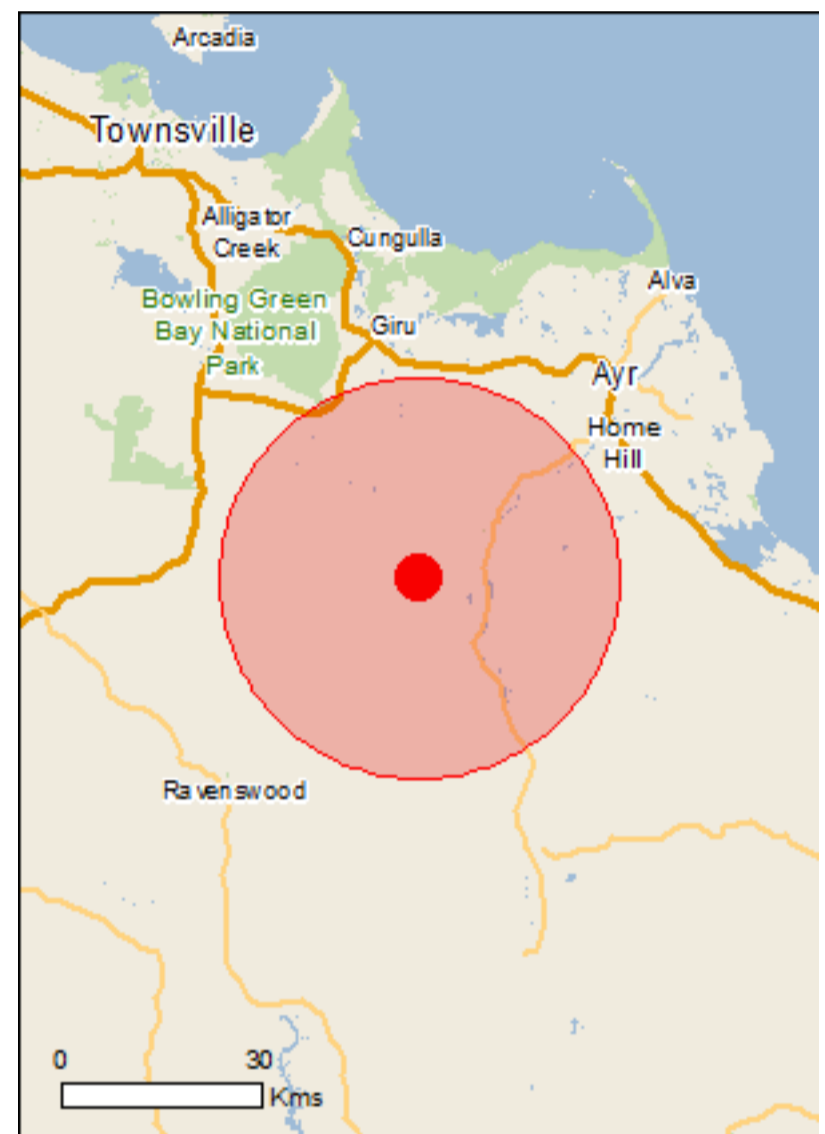
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

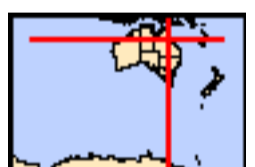
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

[Coordinates](#)

Buffer: 30.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	27
Listed Migratory Species:	18

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	22
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	32
Nationally Important Wetlands:	5
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)

[\[Resource Information \]](#)

Name	Proximity
Bowling green bay	Within 10km of Ramsar

Listed Threatened Ecological Communities

[\[Resource Information \]](#)

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

Name	Status	Type of Presence
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community may occur within area
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Community likely to occur within area

Listed Threatened Species

[\[Resource Information \]](#)

Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Poephila cincta cincta Southern Black-throated Finch [64447]	Endangered	Species or species habitat known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Turnix olivii Buff-breasted Button-quail [59293]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species

Name	Status	Type of Presence
Mammals		
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Hipposideros semoni Semon's Leaf-nosed Bat, Greater Wart-nosed Horseshoe-bat [180]	Vulnerable	Species or species habitat may occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat likely to occur within area
Rhinolophus robertsi Large-eared Horseshoe Bat, Greater Large-eared Horseshoe Bat [87639]	Vulnerable	Species or species habitat may occur within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheath-tail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Bulbophyllum globuliforme Miniature Moss-orchid, Hoop Pine Orchid [6649]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus raveretiana Black Ironbox [16344]	Vulnerable	Species or species habitat likely to occur within area
Marsdenia brevifolia [64585]	Vulnerable	Species or species habitat may occur within area
Omphalea celata [64586]	Vulnerable	Species or species habitat likely to occur within area
Tephrosia leveillei [16946]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Denisonia maculata Ornamental Snake [1193]	Vulnerable	Species or species habitat may occur within area
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat likely to occur within area
Lerista vittata Mount Cooper Striped Skink, Mount Cooper Striped Lerista [1308]	Vulnerable	Species or species habitat may occur within area
Sharks		
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence
[60756]		within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Marine Species		
Crocodylus porosus		
Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Species or species habitat likely to occur within area
Monarcha trivirgatus		
Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [\[Resource Information \]](#)

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Reptiles		
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Bowling Green Bay	QLD

Invasive Species

[[Resource Information](#)]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area

Plants

Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat may occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Vachellia nilotica Prickly Acacia, Blackthorn, Prickly Mimosa, Black Piquant, Babul [84351]		Species or species habitat likely to occur within area

Reptiles

Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area
--	--	--

Nationally Important Wetlands

Name	State
Barrattas Channels Aggregation	QLD

[[Resource Information](#)]

Name	State
Burdekin - Townsville Coastal Aggregation	QLD
Haughton Balancing Storage Aggregation	QLD
Jerona Aggregation	QLD
Junction of the Bogie River and Kirknie Creek Aggregation	QLD

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-19.83293 147.13819

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

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Please feel free to provide feedback via the [Contact Us](#) page.

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Queensland Government

Department of Environment and Science

Environmental Reports

Regional Ecosystems

Biodiversity Status

For the selected area of interest

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or area of interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "central coordinates" option, the resulting assessment area encompasses an area extending for a 2km radius from the input coordinates.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no matters of interest have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Important Note to User

Information presented in this report is based upon the Queensland Herbarium's Regional Ecosystem framework. The Biodiversity Status has been used to depict the extent of "Endangered", "Of Concern" and "No Concern at Present" regional ecosystems in all cases, rather than the classes used for the purposes of the *Vegetation Management Act 1999* (VMA). Mapping and figures presented in this document reflect the Queensland Herbarium's Remnant and Pre-clearing Regional Ecosystem Datasets, and not the certified mapping used for the purpose of the VMA.

For matters relevant to vegetation management under the VMA, please refer to the Department of Resources website <https://www.dnrme.qld.gov.au/>

Please direct queries about these reports to: Queensland.Herbarium@qld.gov.au

Disclaimer

Whilst every care is taken to ensure the accuracy of the information provided in this report, the Queensland Government makes no representations or warranties about its accuracy, reliability, completeness, or suitability, for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which the user may incur as a consequence of the information being inaccurate or incomplete in any way and for any reason.



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Summary Information

The following table provides an overview of the AOI with respect to selected topographic and environmental themes. Refer to **Map 1** for locality information.

Table 1: Area of interest details:

Size (ha)	15,299.31
Local Government(s)	Burdekin Shire
Bioregion(s)	Brigalow Belt
Subregion(s)	Bogie River Hills, Townsville Plains
Catchment(s)	Burdekin, Haughton

The table below summarizes the extent of remnant vegetation classed as "Endangered", "Of concern" and "No concern at present" regional ecosystems classified by Biodiversity Status within the area of interest (AOI).

Table 2: Summary table, biodiversity status of regional ecosystems within the AOI

Biodiversity Status	Area (Ha)	% of AOI
Endangered	16.96	0.11
Of concern	3,655.10	23.89
No concern at present	4,098.81	26.79
Total remnant vegetation	7,770.86	50.79

Refer to **Map 2** for further information.

Regional Ecosystems

1. Introduction

Regional ecosystems are vegetation communities in a bioregion that are consistently associated with particular combinations of geology, landform and soil (Sattler and Williams 1999). Descriptions of Queensland's Regional ecosystems are available online from the Regional Ecosystem Description Database (REDD). Descriptions are compiled from a broad range of information sources including vegetation, land system and geology survey and mapping and detailed vegetation site data. The regional ecosystem classification and descriptions are reviewed as new information becomes available. A number of vegetation communities may form a single regional ecosystem and are usually distinguished by differences in dominant species, frequently in the shrub or ground layers and are denoted by a letter following the regional ecosystem code (e.g. a, b, c). Vegetation communities and regional ecosystems are amalgamated into a higher level classification of broad vegetation groups (BVGs).

A published methodology for survey and mapping of regional ecosystems across Queensland (Neldner et al 2020) provides further details on regional ecosystem concepts and terminology.

This report provides information on the type, status, and extent of vegetation communities, regional ecosystems and broad vegetation groups present within a user specified area of interest. Please note, for the purpose of this report, the Biodiversity Status is used. This report has not been developed for application of the *Vegetation Management Act 1999* (VMA). Additionally, information generated in this report has been derived from the Queensland Herbarium's Regional Ecosystem Mapping, and not the regulated mapping certified for the purposes of the VMA. If your interest/matter relates to regional ecosystems and the VMA, users should refer to the Department of Resources website.

<https://www.dnrme.qld.gov.au/>

With respect to the Queensland Biodiversity Status,

"Endangered" regional ecosystems are described as those where:

- remnant vegetation is less than 10 per cent of its pre-clearing extent across the bioregion; or 10-30% of its pre-clearing extent remains and the remnant vegetation is less than 10,000 hectares, or
- less than 10 per cent of its pre-clearing extent remains unaffected by severe degradation and/or biodiversity loss*, or
- 10-30 per cent of its pre-clearing extent remains unaffected by severe degradation and/or biodiversity loss and the remnant vegetation is less than 10,000 hectares; or
- it is a rare** regional ecosystem subject to a threatening process.***

"Of concern" regional ecosystems are described as those where:

- the degradation criteria listed above for 'Endangered' regional ecosystems are not met and,
- remnant vegetation is 10-30 per cent of its pre-clearing extent across the bioregion; or more than 20 per cent of its pre-clearing extent remains and the remnant extent is less than 10,000 hectares, or
- 10-30 percent of its pre-clearing extent remains unaffected by moderate degradation and/or biodiversity loss.****

and "No concern at present" regional ecosystems are described as those where:

- remnant vegetation is over 30 per cent of its pre-clearing extent across the bioregion, and the remnant area is greater than 10,000 hectares, and
- the degradation criteria listed above for 'Endangered' or 'Of concern' regional ecosystems are not met.

**Severe degradation and/or biodiversity loss is defined as: floristic and/or faunal diversity is greatly reduced but unlikely to recover within the next 50 years even with the removal of threatening processes; or soil surface is severely degraded, for example, by loss of A horizon, surface expression of salinity; surface compaction, loss of organic matter or sheet erosion.*

***Rare regional ecosystem: pre-clearing extent (1000 ha); or patch size (100 ha and of limited total extent across its range).*

****Threatening processes are those that are reducing or will reduce the biodiversity and ecological integrity of a regional ecosystem. For example, clearing, weed invasion, fragmentation, inappropriate fire regime or grazing pressure, or infrastructure development.*

****Moderate degradation and/or biodiversity loss is defined as: floristic and/or faunal diversity is greatly reduced but unlikely to recover within the next 20 years even with the removal of threatening processes; or soil surface is moderately degraded.

2. Remnant Regional Ecosystems

The following table identifies the remnant regional ecosystems and vegetation communities mapped within the AOI and provides their short descriptions, Biodiversity Status, and remnant extent within the selected AOI. Please note, where heterogeneous vegetated patches (mixed patches of remnant vegetation mapped as containing multiple regional ecosystems) occur within the AOI, they have been split and listed as individual regional ecosystems (or vegetation communities where present) for the purposes of the table below. In such instances, associated area figures have been generated based upon the estimated proportion of each regional ecosystem (or vegetation community) predicted to be present within the larger mixed patch.

Table 3: Remnant regional ecosystems, description and status within the AOI

Regional Ecosystem	Short Description	BD Status	Area (Ha)	% of AOI
11.12.1	Eucalyptus crebra woodland on igneous rocks	No concern at present	554.37	3.62
11.12.9	Eucalyptus platyphylla woodland on igneous rocks	No concern at present	1.25	0.01
11.3.10	Eucalyptus brownii woodland on alluvial plains	No concern at present	13.04	0.09
11.3.12	Melaleuca viridiflora, M. argentea +/- M. dealbata woodland on alluvial plains	No concern at present	30.94	0.2
11.3.13	Grevillea striata open woodland on coastal alluvial plains	Endangered	16.96	0.11
11.3.25	Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines	Of concern	145.56	0.95
11.3.25b	Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines	Of concern	534.95	3.5
11.3.25f	Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines	Of concern	320.29	2.09
11.3.30	Eucalyptus crebra, Corymbia dallachiana woodland on alluvial plains	No concern at present	599.45	3.92
11.3.31	Ophiuros exaltatus, Dichanthium spp. grassland on alluvial plains	Of concern	3.32	0.02
11.3.34	Acacia tephрина woodland on alluvial plains	Of concern	0.5	less than 0.01
11.3.35	Eucalyptus platyphylla, Corymbia clarksoniana woodland on alluvial plains	No concern at present	1,602.87	10.48
11.3.35a	Eucalyptus platyphylla, Corymbia clarksoniana woodland on alluvial plains	No concern at present	34.92	0.23
11.3.4	Eucalyptus tereticornis and/or Eucalyptus spp. woodland on alluvial plains	Of concern	205.58	1.34
11.3.7	Corymbia spp. open woodland on alluvial plains	Of concern	2,444.90	15.98
11.3.9	Eucalyptus platyphylla, Corymbia spp. woodland on alluvial plains	No concern at present	1,261.96	8.25
non-remnant	None	None	7,520.65	49.16
water	None	None	4.74	0.03

Refer to **Map 2** for further information. **Map 3** also provides a visual estimate of the distribution of regional ecosystems present before clearing.

Table 4 provides further information in regards to the remnant regional ecosystems present within the AOI. Specifically, the extent of remnant vegetation remaining within the bioregion, the 1:1,000,000 broad vegetation group (BVG) classification, whether the regional ecosystem is identified as a wetland, and extent of representation in Queensland's Protected Area Estate. For a description of the vegetation communities within the AOI and classified according to the 1:1,000,000 BVG, refer to **Table 6**.

Table 4: Remnant regional ecosystems within the AOI, additional information

Regional Ecosystem	Remnant Extent	BVG (1 Million)	Wetland	Representation in protected estate
11.12.1	Pre-clearing 1421000 ha; Remnant 2019 854000 ha	13c	None	Low
11.12.9	Pre-clearing 113000 ha; Remnant 2019 97000 ha	9b	None	Medium
11.3.10	Pre-clearing 260000 ha; Remnant 2019 165000 ha	17a	None	Low
11.3.12	Pre-clearing 46000 ha; Remnant 2019 28000 ha	21a	Contains palustrine wetland (e.g. in swales).	Low
11.3.13	Pre-clearing 8000 ha; Remnant 2019 3000 ha	27c	None	Medium
11.3.25	Pre-clearing 797000 ha; Remnant 2019 514000 ha	16a	Riverine wetland or fringing riverine wetland.	Low
11.3.25b	Pre-clearing 797000 ha; Remnant 2019 514000 ha	22c	Riverine wetland or fringing riverine wetland.	Low
11.3.25f	Pre-clearing 797000 ha; Remnant 2019 514000 ha	16d	Riverine wetland or fringing riverine wetland.	Low
11.3.30	Pre-clearing 105000 ha; Remnant 2019 70000 ha	18b	None	Low
11.3.31	Pre-clearing 43000 ha; Remnant 2019 17000 ha	32a	Floodplain (other than floodplain wetlands).	Low
11.3.34	Pre-clearing 16000 ha; Remnant 2019 9000 ha	27a	None	No representation
11.3.35	Pre-clearing 183000 ha; Remnant 2019 108000 ha	9e	None	Low
11.3.35a	Pre-clearing 183000 ha; Remnant 2019 108000 ha	9e	None	Low
11.3.4	Pre-clearing 684000 ha; Remnant 2019 180000 ha	16c	Floodplain (other than floodplain wetlands).	Low
11.3.7	Pre-clearing 139000 ha; Remnant 2019 61000 ha	9e	None	Low
11.3.9	Pre-clearing 144000 ha; Remnant 2019 63000 ha	9e	Floodplain (other than floodplain wetlands).	Low
non-remnant	None	None	None	None
water	None	None	None	None

Representation in Protected Area Estate: High greater than 10% of pre-clearing extent is represented; Medium 4 - 10% is represented; Low less than 4% is represented, No representation.

The distribution of mapped wetland systems within the area of interest is displayed in **Map 6**.

The following table lists known special values associated with a regional ecosystem type.

Table 5: Remnant regional ecosystems within the AOI, special values

Regional Ecosystem	Special Values
11.12.1	Potential habitat for NCA listed species: <i>Acacia islana</i> , <i>Capparis humistrata</i> , <i>Corymbia petalophylla</i> , <i>Cycas megacarpa</i> , <i>Cycas ophiolitica</i> , <i>Macrozamia crassifolia</i> , <i>Sannantha brachypoda</i> , <i>Solanum graniticum</i>
11.12.9	Potential habitat for NCA listed species: <i>Bertya sharpeana</i> , <i>Sannantha papillosa</i>
11.3.10	Potential habitat for NCA listed species: <i>Acacia armitii</i>
11.3.12	None
11.3.13	None
11.3.25	Shown to be associated with a high fauna species richness in the Taroom area (Venz et al. 2002). Within parts of the Fitzroy catchment, this RE is known habitat for the threatened freshwater turtle <i>Rheodytes leukops</i> . Known to be important habitat for other riparian freshwater turtle species. This ecosystem is also known to provide suitable habitat for koalas (<i>Phascolarctos cinereus</i>).
11.3.25b	Shown to be associated with a high fauna species richness in the Taroom area (Venz et al. 2002). Within parts of the Fitzroy catchment, this RE is known habitat for the threatened freshwater turtle <i>Rheodytes leukops</i> . Known to be important habitat for other riparian freshwater turtle species. This ecosystem is also known to provide suitable habitat for koalas (<i>Phascolarctos cinereus</i>).
11.3.25f	Shown to be associated with a high fauna species richness in the Taroom area (Venz et al. 2002). Within parts of the Fitzroy catchment, this RE is known habitat for the threatened freshwater turtle <i>Rheodytes leukops</i> . Known to be important habitat for other riparian freshwater turtle species. This ecosystem is also known to provide suitable habitat for koalas (<i>Phascolarctos cinereus</i>).
11.3.30	Potential habitat for NCA listed species: <i>Eucalyptus paedoglauca</i>
11.3.31	None
11.3.34	None
11.3.35	None
11.3.35a	None
11.3.4	Potential habitat for NCA listed species: <i>Acacia pedleyi</i> , <i>Callicarpa thozetii</i> , <i>Cycas megacarpa</i> , <i>Cycas ophiolitica</i> , <i>Digitaria porrecta</i> , <i>Eriocaulon carsonii</i> subsp. <i>orientale</i> , <i>Livistona nitida</i> , <i>Rhaponticum australe</i> , <i>Samadera bidwillii</i> , <i>Sannantha brachypoda</i> . This ecosystem is also known to provide suitable habitat for koalas (<i>Phascolarctos cinereus</i>).
11.3.7	Habitat of the endangered northern hairy-nosed wombat, <i>Lasiorhinus krefftii</i> .
11.3.9	Potential habitat for NCA listed species: <i>Macrozamia serpentina</i>
non-remnant	None
water	None

3. Remnant Regional Ecosystems by Broad Vegetation Group

BVGs are a higher-level grouping of vegetation communities. Queensland encompasses a wide variety of landscapes across temperate, wet and dry tropics and semi-arid climatic zones. BVGs provide an overview of vegetation communities across the state or a bioregion and allow comparison with other states. There are three levels of BVGs which reflect the approximate scale at which they are designed to be used: the 1:5,000,000 (national), 1:2,000,000 (state) and 1:1,000,000 (regional)

scales.

A comprehensive description of BVGs is available at:

<https://publications.qld.gov.au/dataset/redd/resource/>

The following table provides a description of the 1:1,000,000 BVGs present and their associated extent within the AOI.

Table 6: Broad vegetation groups (1 million) within the AOI

BVG (1 Million)	Description	Area (Ha)	% of AOI
None	None	7,525.39	49.19
13c	Woodlands of <i>Eucalyptus crebra</i> (sens. lat.) (narrow-leaved red ironbark), <i>E. drepanophylla</i> (grey ironbark), <i>E. fibrosa</i> (dusky-leaved ironbark), <i>E. shirleyi</i> (shirley's silver-leaved ironbark) on granitic and metamorphic ranges (land zones 12, 11, 9, [5]) (BRB, EIU, SEQ, NET, CQC)	554.37	3.62
16a	Open forest and woodlands dominated by <i>Eucalyptus camaldulensis</i> (river red gum) (or <i>E. tereticornis</i> (blue gum)) and/or <i>E. coolabah</i> (coolabah) (or <i>E. microtheca</i> (coolabah)) fringing drainage lines. Associated species may include <i>Melaleuca</i> spp., <i>Corymbia tessellaris</i> (carbeen), <i>Angophora</i> spp., <i>Casuarina cunninghamiana</i> (riveroak). Does not include alluvial areas dominated by herb and grasslands or alluvial plains that are not flooded. (land zone 3) (MGD, BRB, GUP, CHC, MUL, DEU, EIU, NWH, SEQ, [NET, WET]) (All bioregions except CYP and CQC)	145.56	0.95
16c	Woodlands and open woodlands dominated by <i>Eucalyptus coolabah</i> (coolabah) or <i>E. microtheca</i> (coolabah) or <i>E. largiflorens</i> (black box) or <i>E. tereticornis</i> (blue gum) or <i>E. chlorophylla</i> on floodplains. Does not include alluvial areas dominated by herb and grasslands or alluvial plains that are not flooded. (land zone 3) (All bioregions except WET, principally GUP, BRB, MUL).	205.58	1.34
16d	River beds, open water or sand, or rock, frequently unvegetated. (land zone 3) (GUP, EIU, BRB, CYP, DEU, [CQC, MUL])	320.29	2.09
17a	Woodlands dominated by <i>Eucalyptus populnea</i> (poplar box) (or <i>E. brownii</i> (Reid River box)) on alluvium, sand plains and footslopes of hills and ranges. (land zones 3, 5, 10, 9, 4, 11, 12, [8]) (BRB, MUL, DEU, MUL, EIU)	13.04	0.09
18b	Woodlands dominated <i>Eucalyptus crebra</i> (sens. lat.) (narrow-leaved red ironbark) frequently with <i>Corymbia</i> spp. or <i>Callitris</i> spp. on flat to undulating plains. (land zones 5, 3) (BRB, DEU, EIU, GUP, CYP)	599.45	3.92
21a	Low woodlands and low open woodlands dominated by <i>Melaleuca viridiflora</i> (coarse-leaved paperbark) on depositional plains. (land zones 3, 5, 11, [10]) (GUP, CYP, BRB, CQC, EIU, WET, SEQ)	30.94	0.2
22c	Open forests dominated by <i>Melaleuca</i> spp. (<i>M. argentea</i> (silver tea-tree), <i>M. leucadendra</i> (broad-leaved tea-tree), <i>M. dealbata</i> (swamp tea-tree) or <i>M. fluviatilis</i>), fringing major streams with <i>Melaleuca saligna</i> or <i>M. bracteata</i> (black tea-tree) in minor streams. (land zone 3) (CYP, GUP, EIU, BRB, CQC, DEU, NWH, WET, [SEQ])	534.95	3.5
27a	Low open woodlands dominated by a variety of species including <i>Acacia tephрина</i> (boree), <i>Atalaya hemiglauca</i> (whitewood), <i>Ventilago viminalis</i> (supplejack) and <i>Lysiphyllum</i> spp. (land zones 9, 3, 4, [5]) (MGD, GUP, BRB, NWH, DEU, [CYP, EIU])	0.5	less than 0.01

BVG (1 Million)	Description	Area (Ha)	% of AOI
27c	Low open woodlands dominated by a variety of species including <i>Grevillea striata</i> (beefwood), <i>Acacia</i> spp., <i>Terminalia</i> spp. or <i>Cochlospermum</i> spp. (land zones 9, 12, 3, 11, 5) (NWH, EIU, DEU, GUP, [BRB])	16.96	0.11
32a	Closed tussock grasslands dominated by <i>Themeda arguens</i> , <i>Dichanthium sericeum</i> (Queensland bluegrass) or <i>Panicum</i> spp., <i>Eriachne</i> spp., <i>Fimbristylis</i> spp., <i>Aristida</i> spp. or <i>Imperata cylindrica</i> (blady grass) on marine and alluvial plains. (land zones 3, [5]) (GUP, CYP, [BRB,EIU, WET, CQC])	3.32	0.02
9b	Moist to dry woodlands dominated by <i>Eucalyptus platyphylla</i> (poplar gum) and/or <i>E. leptophleba</i> (Molloy red box). Other frequent tree species include <i>Corymbia clarksoniana</i> (grey bloodwood), <i>E. drepanophylla</i> (grey ironbark) and occasionally <i>E. chlorophylla</i> . (land zones 12, 11, 3, 10, 5). (CYP, CQC, BRB, WET, EIU)	1.25	0.01
9e	Open forests, woodlands and open woodlands dominated by <i>Corymbia clarksoniana</i> (grey bloodwood) (or <i>C. novoguineensis</i> or <i>C. intermedia</i> (pink bloodwood) or <i>C. polycarpa</i> (long-fruited bloodwood)) frequently with <i>Erythrophleum chlorostachys</i> (red ironwood) or <i>Eucalyptus platyphylla</i> (poplar gum) predominantly on coastal sandplains and alluvia. (land zones 3, 5, 2) (CYP, BRB, CQC, WET, EIU)	5,344.66	34.93

Refer to **Map 4** for further information. **Map 5** also provides a representation of the distribution of vegetation communities as per the 1:5,000,000 BVG believed to be present prior to European settlement.

4. Technical and BioCondition Benchmark Descriptions

Technical descriptions provide a detailed description of the full range in structure and floristic composition of regional ecosystems (e.g. 11.3.1) and their component vegetation communities (e.g. 11.3.1a, 11.3.1b). See:

<http://www.qld.gov.au/environment/plants-animals/plants/ecosystems/technical-descriptions/>

The descriptions are compiled using site survey data from the Queensland Herbarium's CORVEG database. Distribution maps, representative images (if available) and the pre-clearing and remnant extent (hectares) of each vegetation community derived from the regional ecosystem mapping data are included. The technical descriptions should be used in conjunction with the fields from the regional ecosystem description database (REDD) for a full description of the regional ecosystem.

Technical descriptions include data on canopy height, canopy cover and native plant species composition of the predominant layer, which are attributes relevant to assessment of the remnant status of vegetation under the *Vegetation Management Act 1999*. However, as technical descriptions reflect the full range in structure and floristic composition across the climatic, natural disturbance and geographic range of the regional ecosystem, local reference sites should be used for remnant assessment where possible (Neldner et al. 2020 (PDF)* section 3.3 of:

<https://publications.qld.gov.au/dataset/redd/resource/>

The technical descriptions are subject to review and are updated as additional data becomes available.

When conducting a BioCondition assessment, these technical descriptions should be used in conjunction with BioCondition benchmarks for the specific regional ecosystem, or component vegetation community.

<http://www.qld.gov.au/environment/plants-animals/biodiversity/benchmarks/>

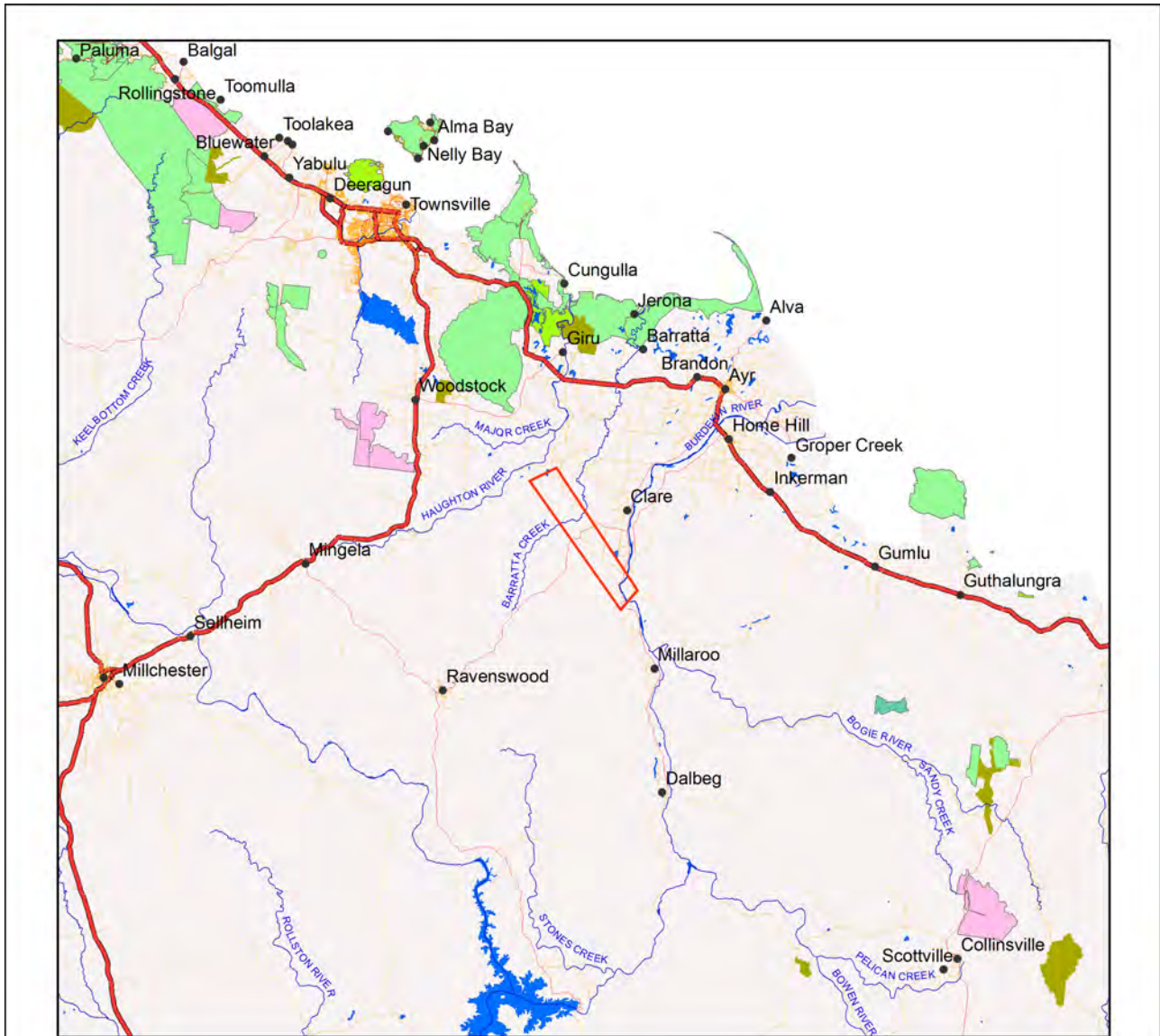
Benchmarks are based on a combination of quantitative and qualitative information and should be used as a guide only. Benchmarks are specific to one regional ecosystem vegetation community, however, the natural variability in structure and floristic composition under a range of climatic and natural disturbance regimes has been considered throughout the geographic extent of the regional ecosystem. Local reference sites should be used for this spatial and temporal (seasonal and annual) variability.

Table 7: List of remnant regional ecosystems within the AOI for which technical and biocondition benchmark descriptions are available

Regional ecosystems mapped as within the AOI	Technical Descriptions	Biocondition Benchmarks
11.12.1	Available	Available
11.12.9	Available	Available
11.3.10	Available	Available
11.3.12	Not currently available	Not currently available
11.3.13	Available	Not currently available
11.3.25	Available	Available
11.3.25b	Available	Available
11.3.25f	Not currently available	Not currently available
11.3.30	Available	Available
11.3.31	Available	Not currently available
11.3.34	Available	Not currently available
11.3.35	Available	Available
11.3.35a	Available	Available
11.3.4	Available	Available
11.3.7	Available	Available
11.3.9	Available	Available
non-remnant	Not currently available	Not currently available
water	Not currently available	Not currently available

Maps

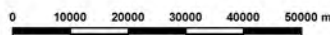
Map 1 - Location



Locality Map

Legend

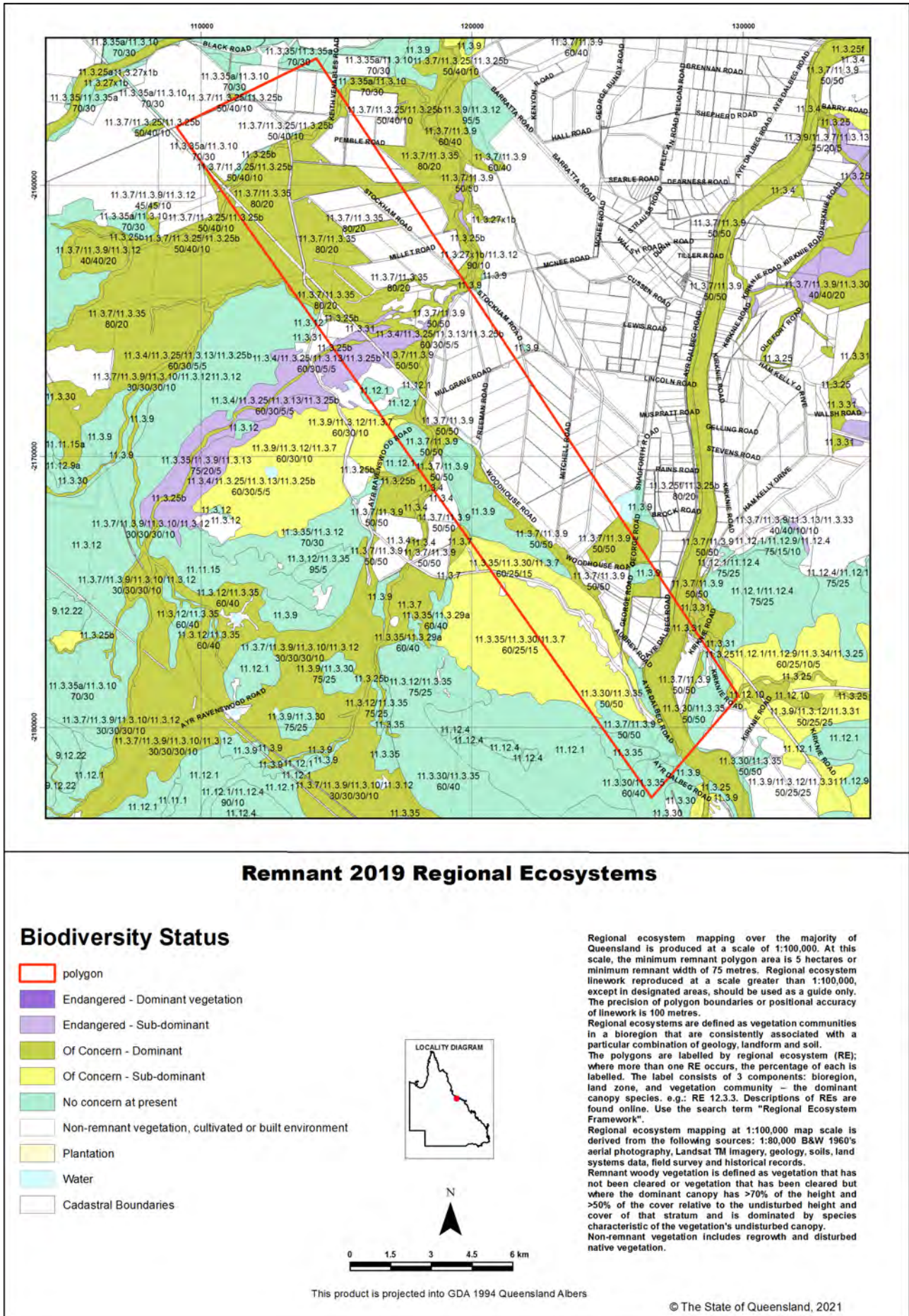
- polygon
- Towns
- Highway
- Connector
- Street/Local Road
- Reservoirs
- Lakes
- National Park (Scientific)
- National Park
- National Park (CYPAL)
- Conservation Park
- Resources Reserve
- Forest Reserve
- State Forest
- Timber Reserve
- Nature Refuges
- Coordinated Conservation Areas
- Major rivers/creeks
- Queensland



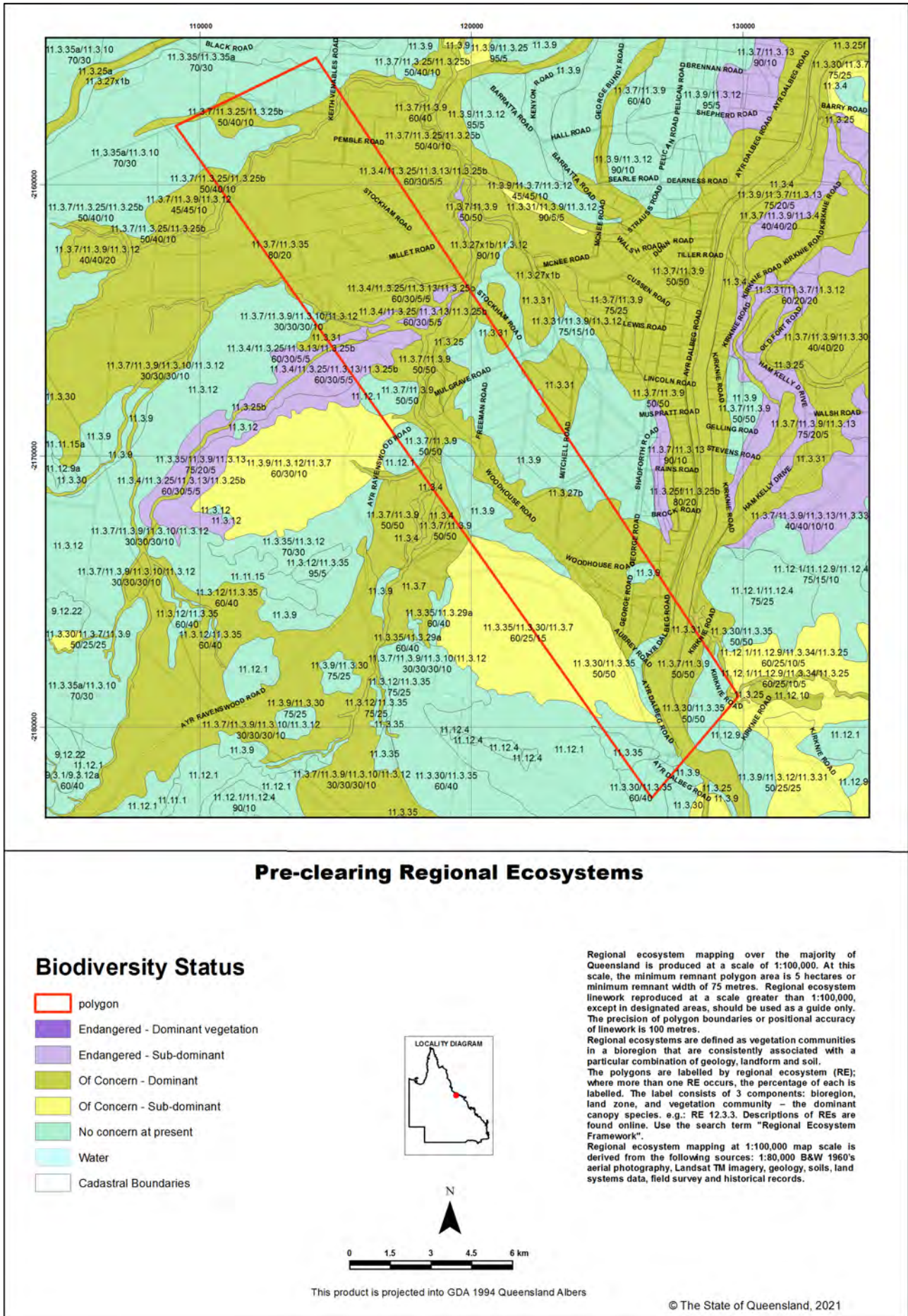
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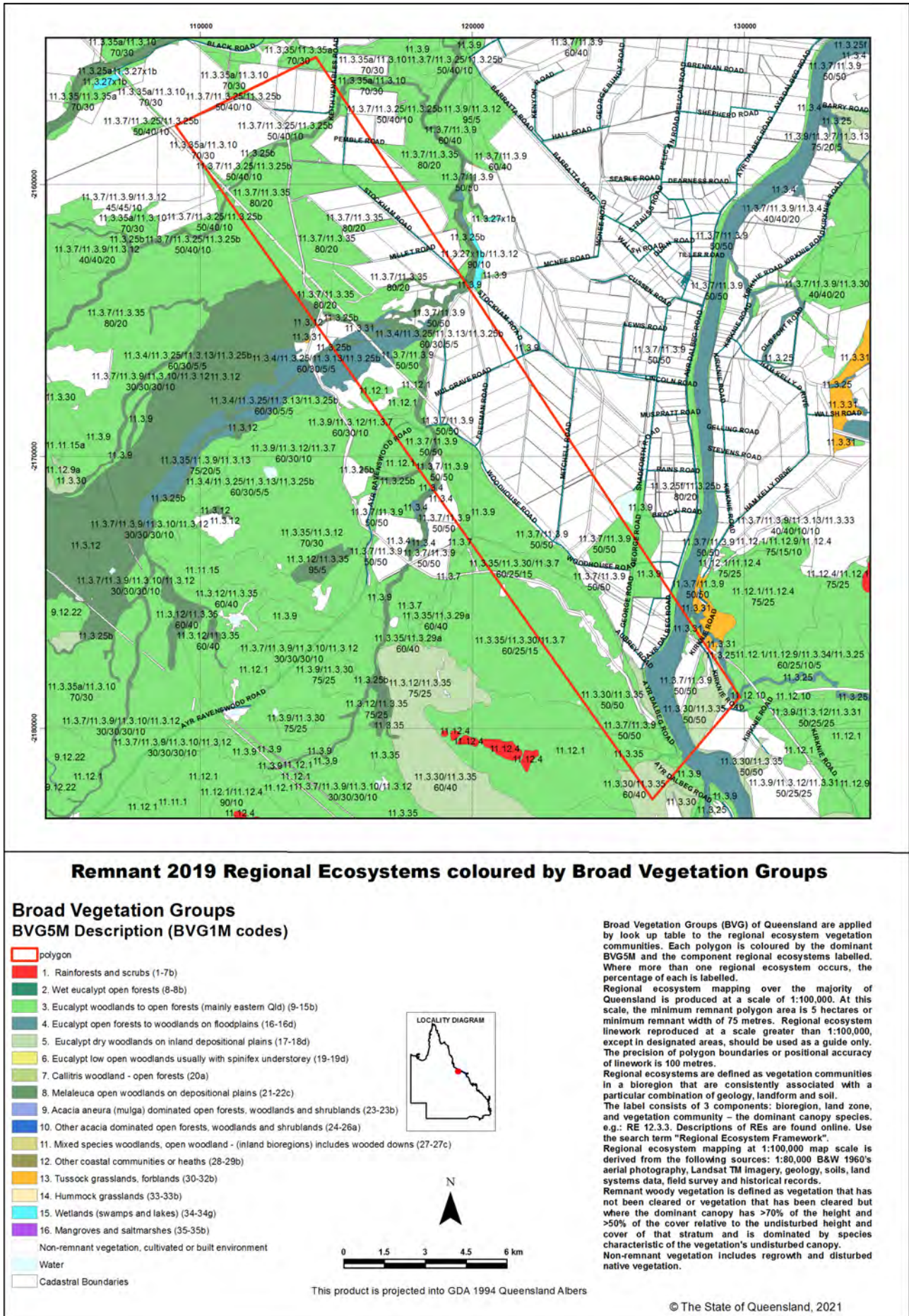
Map 2 - Remnant 2019 regional ecosystems



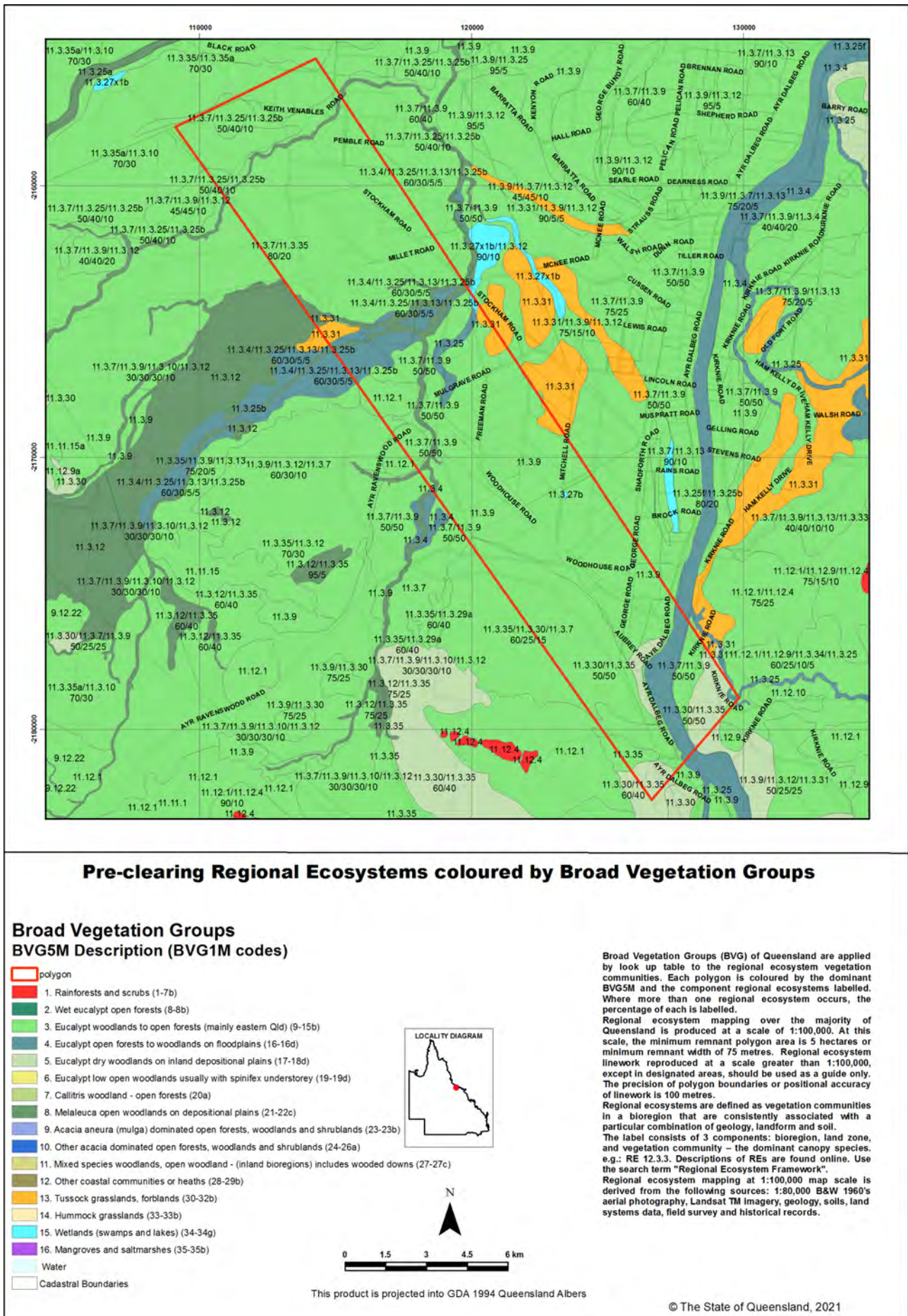
Map 3 - Pre-clearing regional ecosystems



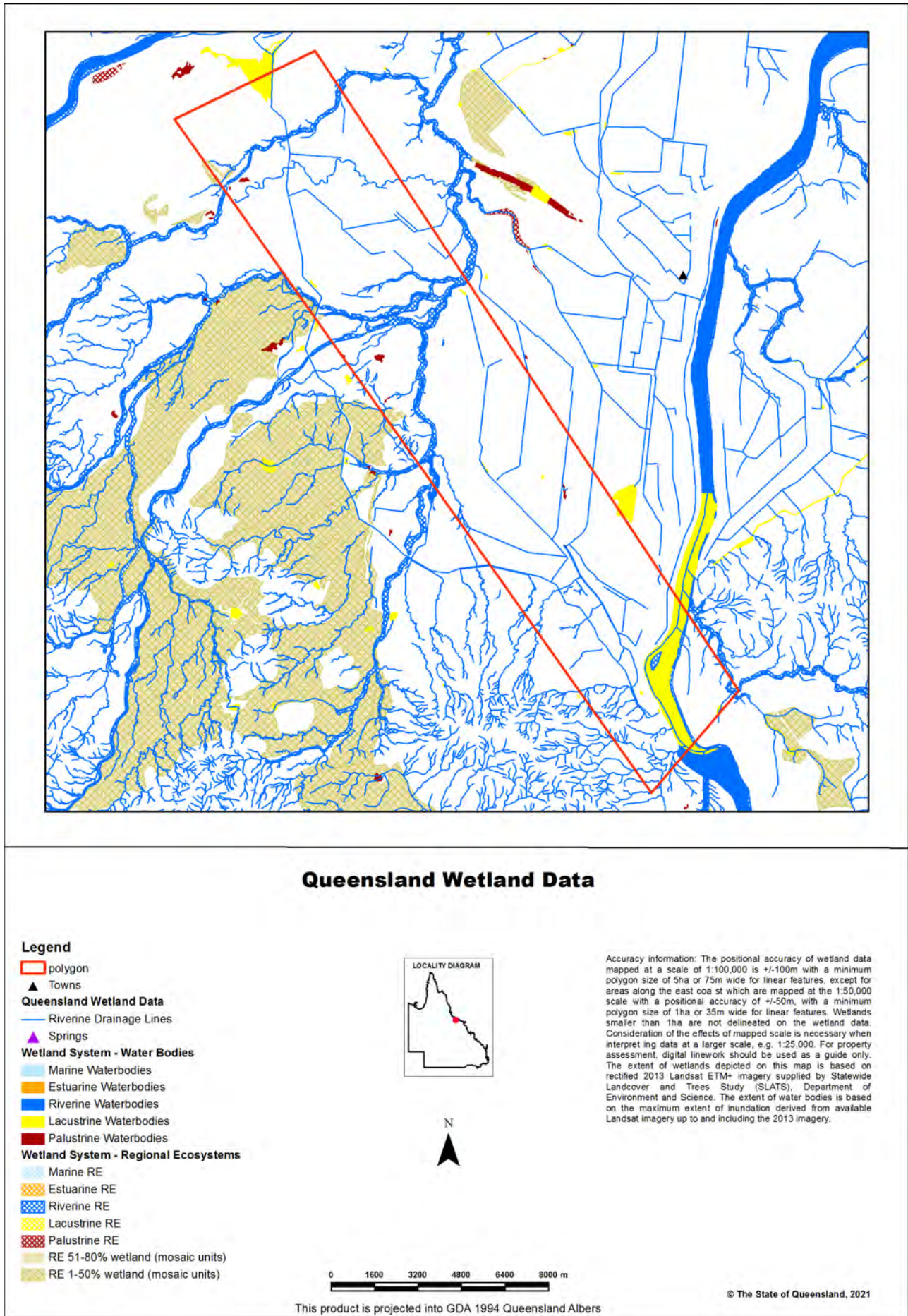
Map 4 - Remnant 2019 regional ecosystems by BVG (5M)



Map 5 - Pre-clearing regional ecosystems by BVG (5M)



Map 6 - Wetlands and waterways



Links and Other Information Sources

The Department of Environment and Science's Website -

<http://www.qld.gov.au/environment/plants-animals/plants/ecosystems/>

provides further information on the regional ecosystem framework, including access to links to the Regional Ecosystem Database, Broad Vegetation Group Definitions, Regional Ecosystem and Land zone descriptions.

Descriptions of the broad vegetation groups of Queensland can be downloaded from:

<https://publications.qld.gov.au/dataset/redd/resource/>

The methodology for mapping regional ecosystems can be downloaded from:

<https://publications.qld.gov.au/dataset/redd/resource/>

Technical descriptions for regional ecosystems can be obtained from:

<http://www.qld.gov.au/environment/plants-animals/plants/ecosystems/technical-descriptions/>

Benchmarks can be obtained from:

<http://www.qld.gov.au/environment/plants-animals/biodiversity/benchmarks/>

For further information associated with the remnant regional ecosystem dataset used by this report, refer to the metadata associated with the Biodiversity status of pre-clearing and Remnant Regional Ecosystems of Queensland dataset (version listed in **Appendix 1**) which is available through the Queensland Government Information System portal,

<http://dds.information.qld.gov.au/dds/>

The Queensland Globe is a mapping and data application. As an interactive online tool, Queensland Globe allows you to view and explore Queensland maps, imagery (including up-to-date satellite images) and other spatial data, including regional ecosystem mapping. To further view and explore regional ecosystems over an area of interest, access the Biota Globe (a component of the Queensland Globe). The Queensland Globe can be accessed via the following link:

<http://www.dnrm.qld.gov.au/mapping-data/queensland-globe>

References

Neldner, V.J., Niehus, R.E., Wilson, B.A., McDonald, W.J.F., Ford, A.J. and Accad, A. (2019). The Vegetation of Queensland. Descriptions of Broad Vegetation Groups. Version 4.0. Queensland Herbarium, Department of Environment and Science.

<https://publications.qld.gov.au/dataset/redd/resource/78209e74-c7f2-4589-90c1-c33188359086>

Neldner, V.J., Wilson, B.A., Dillewaard, H.A., Ryan, T.S., Butler, D.W., McDonald, W.J.F., Addicott, E.P. and Appelman, C.N. (2020). Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland. Version 5.1. Updated March 2020. Queensland Herbarium, Queensland Department of Environment and Science, Brisbane.

<https://publications.qld.gov.au/dataset/redd/resource/6dee78ab-c12c-4692-9842-b7257c2511e4>

Sattler, P.S. and Williams, R.D. (eds) (1999). *The Conservation Status of Queensland's Bioregional Ecosystems*. Environmental Protection Agency, Brisbane.

Appendices

Appendix 1 - Source Data

The dataset listed below is available for download from:

<http://www.qld.gov.au/environment/plants-animals/plants/ecosystems/download/>

- Regional Ecosystem Description Database

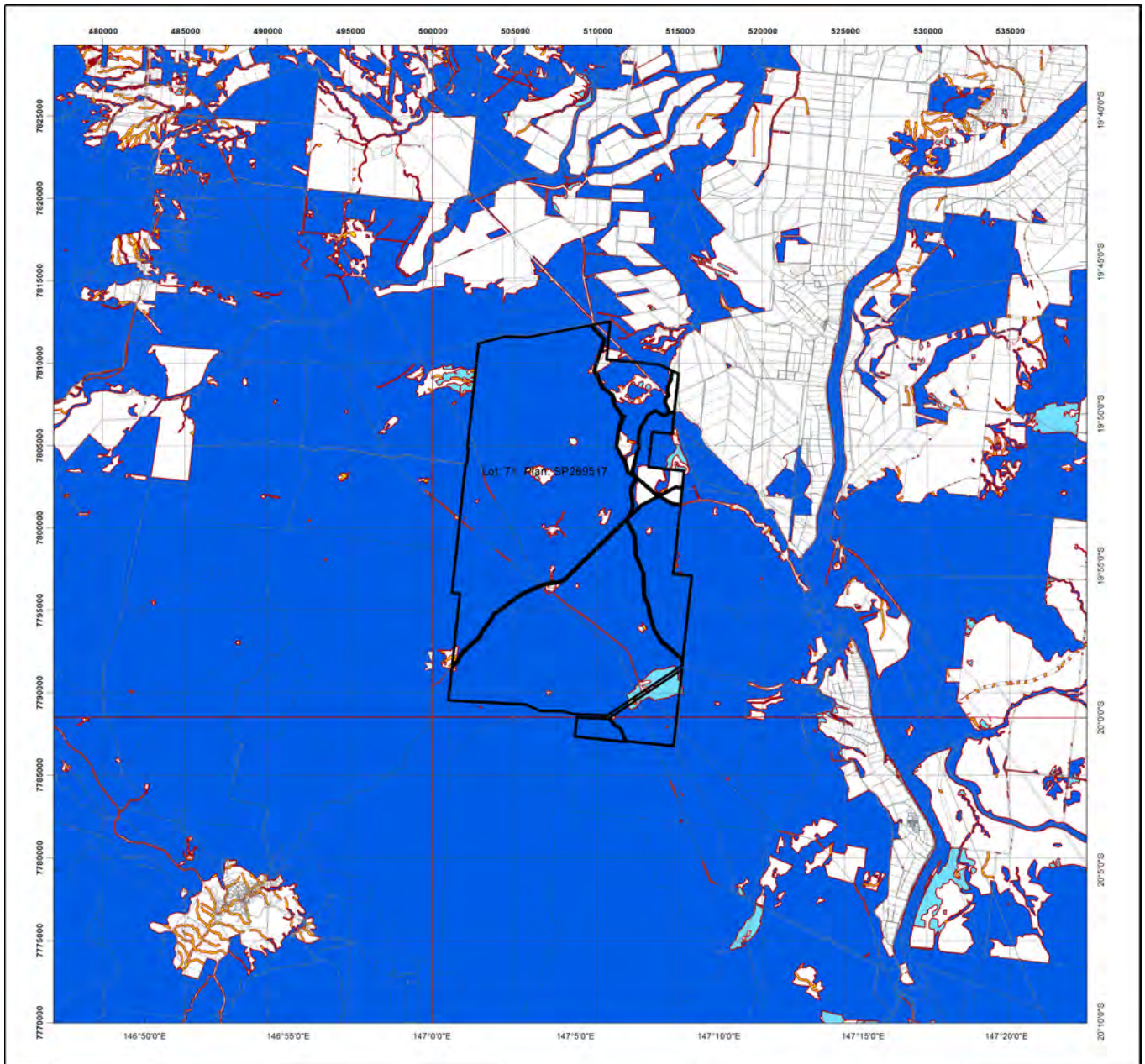
The datasets listed below are available for download from:

<http://dds.information.qld.gov.au/dds/>

- Biodiversity status of pre-clearing and 2019 remnant regional ecosystems of Queensland
- Pre-clearing Vegetation Communities and Regional Ecosystems of Queensland
- Queensland Wetland Data Version - Wetland lines
- Queensland Wetland Data Version - Wetland points
- Queensland Wetland Data Version - Wetland areas

Appendix 2 - Acronyms and Abbreviations

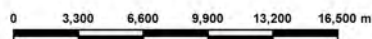
AOI	- Area of Interest
GDA94	- Geocentric Datum of Australia 1994
GIS	- Geographic Information System
RE	- Regional Ecosystem
REDD	- Regional Ecosystem Description Database
VMA	- <i>Vegetation Management Act 1999</i>



Regulated Vegetation Management Map

Legend

- Selected Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt clearing work on Freehold, Indigenous and Leasehold land)
- Water
- Area not categorised
- Other land parcel boundaries



This product is projected into:
 GDA 1994 MGA Zone 55

Disclaimer:

While every care is taken to ensure the accuracy of this product, the Department of Resources makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

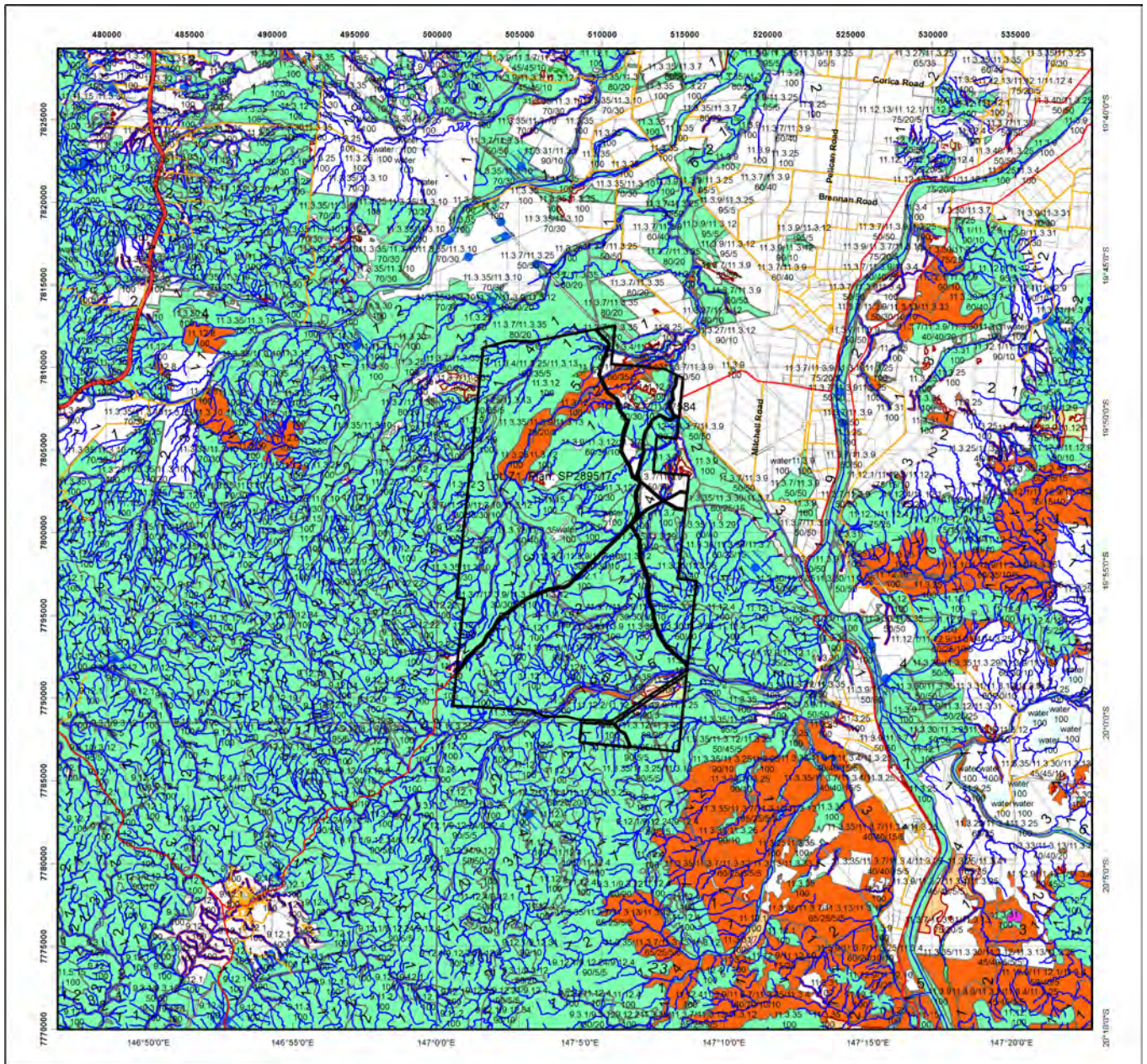
Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at <http://www.information.qld.gov.au/>

Land parcel boundaries are provided as locational aid only.

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

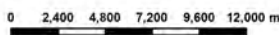
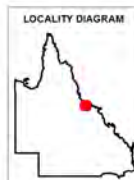




Vegetation Management Supporting Map

Legend

- Selected Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C or R area containing endangered regional ecosystems
- Category C or R area containing of concern regional ecosystems
- Category C or R area that is a least concern regional ecosystem
- Category X area
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourses and drainage features on the vegetation management watercourse and drainage features map (Stream order shown as black number against stream where available)
- Highway
- Connector
- Street/Local Road
- National Parks, State Forest and other reserves
- Other land parcel boundaries



This product is projected into:
 GDA 1994 MGA Zone 55

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

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Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at <http://www.information.qld.gov.au/>

Land parcel boundaries are provided as locational aid only.



Vegetation Management Act 1999 - Extract from the essential habitat database

Essential habitat is required for assessment under the:

- State Development Assessment Provisions - State Code 16: Native vegetation clearing which sets out the matters of interest to the state for development assessment under the *Planning Act 2016*, and
- Accepted development vegetation clearing codes made under the *Vegetation Management Act 1999*

Essential habitat for one or more of the following species is found on and within 1.1 km of the identified subject lot/s on the accompanying essential habitat map.

This report identifies essential habitat in Category A, B and Category C areas.

The numeric labels on the essential habitat map can be cross referenced with the database below to determine which essential habitat factors might exist for a particular species.

Essential habitat is compiled from a combination of species habitat models and buffered species records.

The Department of Resources website (<http://www.dnrme.qld.gov.au>) has more information on how the layer is applied under the State Development Assessment Provisions - State Code 16: Native vegetation clearing and the *Vegetation Management Act 1999*.

Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated.

Essential habitat, for protected wildlife, means a category A area, a category B area or category C area shown on the regulated vegetation management map-

- 1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database; or
- 2) in which the protected wildlife, at any stage of its life cycle, is located.

Protected wildlife includes critically endangered, endangered, vulnerable or near-threatened native wildlife prescribed under the *Nature Conservation Act 1992*.

Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
584	<i>Crocodylus porosus</i>	estuarine crocodile	V	Estuaries and major rivers, billabongs and swamps in dry season; freshwater swamps in wet season, occasionally found in open sea; also in dune swale swamps and dams; mostly within 40-50km of coastline (some breeding populations up to 100km from sea). Nest sites vegetated areas (preference for Melaleuca swamp forest with Thoracostachyum or Scleria sedgeswamp &/or Stenoclaena fern) near permanent freshwater (<100-200m), often on north-west banks, prime areas associated with productive deepwater estuaries; will also use marginal sites, e.g. grassy areas (Imperata, Ischaemum, Themeda, Sorghum) near forest edge or with sparse eucalypt, riverbank/fringe forest (Melaleuca, Corypha, Acacia), mangrove fringe, salt meadow behind mangrove, and sparse short (<40cm) sedgeland/swamp.	Sea level to 100m.	None	Near and in waterbodies.

Label	Regional Ecosystem (mandatory unless otherwise specified)
584	All regional ecosystems within the stream/wetland buffer as determined by VMA code.



Vegetation management report

For Lot: 71 Plan: SP289517

29/09/2021

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Recent changes

Updated mapping

Updated vegetation mapping was released on 8 September 2021 and includes the most recent Queensland Herbarium scientific updates to the Regulated Vegetation Management Map, regional ecosystems, wetland, high-value regrowth and essential habitat mapping.

The Department of Environment and Science have also updated their protected plant and koala protection mapping to align with the Queensland Herbarium scientific updates.

Overview

Based on the lot on plan details you have supplied, this report provides the following detailed information:

Property details - information about the specified Lot on Plan, lot size, local government area, bioregion(s), subregion(s) and catchment(s);

Vegetation management framework - an explanation of the application of the framework and contact details for the Department of Resources who administer the framework;

Vegetation management framework details for the specified Lot on Plan including:

- the vegetation management categories on the property;
- the vegetation management regional ecosystems on the property;
- vegetation management watercourses or drainage features on the property;
- vegetation management wetlands on the property;
- vegetation management essential habitat on the property;
- whether any area management plans are associated with the property;
- whether the property is coastal or non-coastal; and
- whether the property is mapped as Agricultural Land Class A or B;

Protected plant framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework, including:

- high risk areas on the protected plant flora survey trigger map for the property;

Koala protection framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework; and

Koala protection framework details for the specified Lot on Plan including:

- the koala district the property is located in;
- koala priority areas on the property;
- core and locally refined koala habitat areas on the property;
- whether the lot is located in an identified koala broad-hectare area; and
- koala habitat regional ecosystems on the property for core koala habitat areas.

This information will assist you to determine your options for managing vegetation under:

- the vegetation management framework, which may include:

- exempt clearing work;
- accepted development vegetation clearing code;
- an area management plan;
- a development approval;

- the protected plant framework, which may include:

- the need to undertake a flora survey;
- exempt clearing;
- a protected plant clearing permit;

- the koala protection framework, which may include:

- exempted development;
- a development approval;
- the need to undertake clearing sequentially and in the presence of a koala spotter.

Other laws

The clearing of native vegetation is regulated by both Queensland and Australian legislation, and some local governments also regulate native vegetation clearing. You may need to obtain an approval or permit under another Act, such as the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Section 8 of this guide provides contact details of other agencies you should confirm requirements with, before commencing vegetation clearing.

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1. Property details

1.1 Tenure and title area

All of the lot, plan, tenure and title area information associated with property Lot: 71 Plan: SP289517, are listed in Table 1.

Table 1: Lot, plan, tenure and title area information for the property

Lot	Plan	Tenure	Property title area (sq metres)
71	SP289517	Lands Lease	295,000,000
A	GS681	Easement	66,490
B	GS681	Easement	291,880
H	GS684	Easement	0.0
BB	SP289517	Easement	3,709
GA	SP175281	Easement	0.0
H	SP175282	Easement	171,500
D	SP144889	Easement	0.0
A	SP145194	Easement	403,400
C	GS682	Easement	105,120
E	SP144889	Easement	626,500
AA	SP289517	Easement	6,787
FA	SP175281	Easement	269,100
A	AP11662	Lands Lease	2,683
A	GS680	Easement	217,010
G	GS684	Easement	5,086
EA	SP175281	Easement	79,420
F	SP144889	Easement	204,900

The tenure of the land may affect whether clearing is considered exempt clearing work or may be carried out under an accepted development vegetation clearing code.

1.2 Property location

Table 2 provides a summary of the locations for property Lot: 71 Plan: SP289517, in relation to natural and administrative boundaries.

Table 2: Property location details

Local Government(s)
Burdekin Shire

Bioregion(s)	Subregion(s)
Brigalow Belt	Townsville Plains
Einasleigh Uplands	Broken River

Catchment(s)
Burdekin
Haughton

2. Vegetation management framework (administered by the Department of Resources)

The *Vegetation Management Act 1999* (VMA), the *Vegetation Management Regulation 2012*, the *Planning Act 2016* and the *Planning Regulation 2017*, in conjunction with associated policies and codes, form the Vegetation Management Framework.

The VMA does not apply to all land tenures or vegetation types. State forests, national parks, forest reserves and some tenures under the *Forestry Act 1959* and *Nature Conservation Act 1992* are not regulated by the VMA. Managing or clearing vegetation on these tenures may require approvals under these laws.

The following native vegetation is not regulated under the VMA but may require permit(s) under other laws:

- grass or non-woody herbage;
- a plant within a grassland regional ecosystem prescribed under Schedule 5 of the *Vegetation Management Regulation 2012*; and
- a mangrove.

2.1 Exempt clearing work

Exempt clearing work is an activity for which you do not need to notify the Department of Resources or obtain an approval under the vegetation management framework. Exempt clearing work was previously known as exemptions.

In areas that are mapped as Category X (white in colour) on the regulated vegetation management map (see section 4.1), and where the land tenure is freehold, indigenous land and leasehold land for agriculture and grazing purposes, the clearing of vegetation is considered exempt clearing work and does not require notification or development approval under the vegetation management framework. For all other land tenures, contact the Department of Resources before commencing clearing to ensure that the proposed activity is exempt clearing work.

A range of routine property management activities are considered exempt clearing work. A list of exempt clearing work is available at

<https://www.qld.gov.au/environment/land/vegetation/exemptions/>.

Exempt clearing work may be affected if the proposed clearing area is subject to development approval conditions, a covenant, an environmental offset, an exchange area, a restoration notice, or an area mapped as Category A. Exempt clearing work may require approval under other Commonwealth, State or Local Government laws, or local government planning schemes. Contact the Department of Resources prior to clearing in any of these areas.

2.2 Accepted development vegetation clearing codes

Some clearing activities can be undertaken under an accepted development vegetation clearing code. The codes can be downloaded at

<https://www.qld.gov.au/environment/land/vegetation/codes/>

If you intend to clear vegetation under an accepted development vegetation clearing code, you must notify the Department of Resources before commencing. The information in this report will assist you to complete the online notification form.

You can complete the online form at

<https://apps.dnrm.qld.gov.au/vegetation/>

2.3 Area management plans

Area Management Plans (AMP) provide an alternative approval system for vegetation clearing under the vegetation management framework. They list the purposes and clearing conditions that have been approved for the areas covered by the plan. It is not necessary to use an AMP, even when an AMP applies to your property.

On 8 March 2020, AMPs ended for fodder harvesting, managing thickened vegetation and managing encroachment. New notifications cannot be made for these AMPs. You will need to consider options for fodder harvesting, managing thickened vegetation or encroachment under a relevant accepted development vegetation clearing code or apply for a development approval.

New notifications can be made for all other AMPs. These will continue to apply until their nominated end date.

If an Area Management Plan applies to your property for which you can make a new notification, it will be listed in Section 3.6 of this report. Before clearing under one of these AMPs, you must first notify the Department of Resources and then follow the conditions and requirements listed in the AMP.

<https://www.qld.gov.au/environment/land/vegetation/area-plans/>

2.4 Development approvals

If under the vegetation management framework your proposed clearing is not exempt clearing work, or is not permitted under an accepted development vegetation clearing code, or an AMP, you may be able to apply for a development approval.

Information on how to apply for a development approval is available at

<https://www.qld.gov.au/environment/land/management/vegetation/development>

2.5. Contact information for the Department of Resources

For further information on the vegetation management framework:

Phone 135VEG (135 834)

Email vegetation@resources.qld.gov.au

Visit <https://www.dnrme.qld.gov.au/?contact=vegetation> to submit an online enquiry.

3. Vegetation management framework for Lot: 71 Plan: SP289517

3.1 Vegetation categories

The vegetation categories on your property are shown on the regulated vegetation management map in section 4.1 of this report. A summary of vegetation categories on the subject lot are listed in Table 3. Descriptions for these categories are shown in Table 4.

Table 3: Vegetation categories for subject property. Total area: 29464.05ha

Vegetation category	Area (ha)
Category B	27549.8
Category C	420.4
Category R	77.3
Category Water	77.5
Category X	1339.1

Table 4: Description of vegetation categories

Category	Colour on Map	Description	Requirements / options under the vegetation management framework
A	red	Compliance areas, environmental offset areas and voluntary declaration areas	Special conditions apply to Category A areas. Before clearing, contact the Department of Resources to confirm any requirements in a Category A area.
B	dark blue	Remnant vegetation areas	Exempt clearing work, or notification and compliance with accepted development vegetation clearing codes, area management plans or development approval.
C	light blue	High-value regrowth areas	Exempt clearing work, or notification and compliance with managing Category C regrowth vegetation accepted development vegetation clearing code.
R	yellow	Regrowth within 50m of a watercourse or drainage feature in the Great Barrier Reef catchment areas	Exempt clearing work, or notification and compliance with managing Category R regrowth accepted development vegetation clearing code or area management plans.
X	white	Clearing on freehold land, indigenous land and leasehold land for agriculture and grazing purposes is considered exempt clearing work under the vegetation management framework. Contact the Department of Resources to clarify whether a development approval is required for other State land tenures.	No permit or notification required on freehold land, indigenous land and leasehold land for agriculture and grazing. A development approval may be required for some State land tenures.

Property Map of Assessable Vegetation (PMAV)

There is no Property Map of Assessable Vegetation (PMAV) present on this property.

3.2 Regional ecosystems

The endangered, of concern and least concern regional ecosystems on your property are shown on the vegetation management supporting map in section 4.2 and are listed in Table 5.

A description of regional ecosystems can be accessed online at

<https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/descriptions/>

Table 5: Regional ecosystems present on subject property

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
11.11.1	Least concern	B	44.03	Eucalyptus crebra +/- Acacia rhodoxylon woodland on old sedimentary rocks with varying degrees of metamorphism and folding	Sparse
11.11.15	Least concern	B	792.99	Eucalyptus crebra woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics	Sparse
11.11.15	Least concern	C	3.12	Eucalyptus crebra woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics	Sparse
11.11.15	Least concern	R	0.28	Eucalyptus crebra woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics	Sparse
11.12.1	Least concern	B	4,872.08	Eucalyptus crebra woodland on igneous rocks	Sparse
11.12.1	Least concern	C	27.48	Eucalyptus crebra woodland on igneous rocks	Sparse
11.12.1	Least concern	R	13.43	Eucalyptus crebra woodland on igneous rocks	Sparse
11.12.2	Least concern	B	655.20	Eucalyptus melanophloia woodland on igneous rocks	Sparse
11.12.2	Least concern	C	12.42	Eucalyptus melanophloia woodland on igneous rocks	Sparse
11.12.2	Least concern	R	1.01	Eucalyptus melanophloia woodland on igneous rocks	Sparse
11.12.4	Least concern	B	184.46	Semi-evergreen vine thicket and microphyll vine forest on igneous rocks	Dense
11.12.9	Least concern	B	262.08	Eucalyptus platyphylla woodland on igneous rocks	Sparse
11.12.9	Least concern	C	4.97	Eucalyptus platyphylla woodland on igneous rocks	Sparse
11.12.9	Least concern	R	0.41	Eucalyptus platyphylla woodland on igneous rocks	Sparse
11.3.10	Least concern	B	1,947.93	Eucalyptus brownii woodland on alluvial plains	Sparse
11.3.10	Least concern	C	0.37	Eucalyptus brownii woodland on alluvial plains	Sparse
11.3.10	Least concern	R	4.78	Eucalyptus brownii woodland on alluvial plains	Sparse
11.3.12	Least concern	B	4,945.56	Melaleuca viridiflora, M. argentea +/- M. dealbata woodland on alluvial plains	Sparse
11.3.12	Least concern	C	0.12	Melaleuca viridiflora, M. argentea +/- M. dealbata woodland on alluvial plains	Sparse

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
11.3.12	Least concern	R	7.89	Melaleuca viridiflora, M. argentea +/- M. dealbata woodland on alluvial plains	Sparse
11.3.13	Of concern	B	79.83	Grevillea striata open woodland on coastal alluvial plains	Very sparse
11.3.13	Of concern	C	0.50	Grevillea striata open woodland on coastal alluvial plains	Very sparse
11.3.13	Of concern	R	0.71	Grevillea striata open woodland on coastal alluvial plains	Very sparse
11.3.25	Least concern	B	1,547.02	Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines	Sparse
11.3.25	Least concern	C	19.87	Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines	Sparse
11.3.25	Least concern	R	6.92	Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines	Sparse
11.3.29	Least concern	B	48.96	Eucalyptus crebra, E. exserta, Melaleuca spp. woodland on alluvial plains	Sparse
11.3.30	Least concern	B	776.76	Eucalyptus crebra, Corymbia dallachiana woodland on alluvial plains	Sparse
11.3.30	Least concern	R	0.51	Eucalyptus crebra, Corymbia dallachiana woodland on alluvial plains	Sparse
11.3.31	Least concern	B	9.79	Ophiuros exaltatus, Dichanthium spp. grassland on alluvial plains	Grassland Sch 4
11.3.31	Least concern	C	1.34	Ophiuros exaltatus, Dichanthium spp. grassland on alluvial plains	Grassland Sch 4
11.3.31	Least concern	R	0.42	Ophiuros exaltatus, Dichanthium spp. grassland on alluvial plains	Grassland Sch 4
11.3.35	Least concern	B	3,059.64	Eucalyptus platyphylla, Corymbia clarksoniana woodland on alluvial plains	Sparse
11.3.35	Least concern	C	249.02	Eucalyptus platyphylla, Corymbia clarksoniana woodland on alluvial plains	Sparse
11.3.35	Least concern	R	9.06	Eucalyptus platyphylla, Corymbia clarksoniana woodland on alluvial plains	Sparse
11.3.4	Of concern	B	734.34	Eucalyptus tereticornis and/or Eucalyptus spp. woodland on alluvial plains	Sparse
11.3.4	Of concern	C	39.15	Eucalyptus tereticornis and/or Eucalyptus spp. woodland on alluvial plains	Sparse
11.3.4	Of concern	R	6.02	Eucalyptus tereticornis and/or Eucalyptus spp. woodland on alluvial plains	Sparse
11.3.7	Least concern	B	3,202.42	Corymbia spp. open woodland on alluvial plains	Very sparse
11.3.7	Least concern	C	29.56	Corymbia spp. open woodland on alluvial plains	Very sparse
11.3.7	Least concern	R	11.56	Corymbia spp. open woodland on alluvial plains	Very sparse
11.3.9	Least concern	B	4,313.90	Eucalyptus platyphylla, Corymbia spp. woodland on alluvial plains	Sparse
11.3.9	Least concern	C	32.42	Eucalyptus platyphylla, Corymbia spp. woodland on alluvial plains	Sparse
11.3.9	Least concern	R	14.32	Eucalyptus platyphylla, Corymbia spp. woodland on alluvial plains	Sparse

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
9.12.1	Least concern	B	49.69	Eucalyptus crebra and/or E. xanthoclada and/or E. drepanophylla low open woodland on igneous rocks	Very sparse
9.12.22	Least concern	B	17.58	Eucalyptus drepanophylla, Corymbia clarksoniana or C. intermedia and C. dallachiana woodland on steep rugged igneous ranges	Sparse
9.12.24	Least concern	B	2.76	Eucalyptus drepanophylla or E. crebra and/or E. xanthoclada and Corymbia peltata woodland on igneous rocks	Sparse
9.12.4	Least concern	B	2.76	Eucalyptus shirleyi and/or E. melanophloia and/or Corymbia peltata and/or Callitris intratropica low open woodland on igneous rocks	Very sparse
non-rem	None	X	1,339.10	None	None
water	None	Water	77.49	None	None

Please note:

1. All area and area derived figures included in this table have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.
2. If Table 5 contains a Category 'plant', please be aware that this refers to 'plantations' such as forestry, and these areas are considered non-remnant under the VMA.

The VMA status of the regional ecosystem (whether it is endangered, of concern or least concern) also determines if any of the following are applicable:

- exempt clearing work;
- accepted development vegetation clearing codes;
- performance outcomes in State Code 16 of the State Development Assessment Provisions (SDAP).

3.3 Watercourses

Vegetation management watercourses and drainage features for this property are shown on the vegetation management supporting map in section 4.2.

3.4 Wetlands

Vegetation management wetlands are present on this property and are shown on the vegetation management supporting map in section 4.2 of this report.

3.5 Essential habitat

Under the VMA, essential habitat for protected wildlife is native wildlife prescribed under the *Nature Conservation Act 1992* (NCA) as critically endangered, endangered, vulnerable or near-threatened wildlife.

Essential habitat for protected wildlife includes suitable habitat on the lot, or where a species has been known to occur up to 1.1 kilometres from a lot on which there is assessable vegetation. These important habitat areas are protected under the VMA.

Any essential habitat on this property will be shown as blue hatching on the vegetation supporting map in section 4.2.

If essential habitat is identified on the lot, information about the protected wildlife species is provided in Table 6 below. The numeric labels on the vegetation management supporting map can be cross referenced with Table 6 to outline the essential habitat factors for that particular species. There may be essential habitat for more than one species on each lot, and areas of Category A, Category B and Category C can be mapped as Essential Habitat.

Essential habitat is compiled from a combination of species habitat models and buffered species records. Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated. Essential habitat, for protected wildlife, means an area of vegetation shown on the Regulated Vegetation Management Map -

- 1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database. Essential habitat factors are comprised of - regional ecosystem (mandatory for most species), vegetation community, altitude, soils, position in landscape; or
- 2) in which the protected wildlife, at any stage of its life cycle, is located.

If there is no essential habitat mapping shown on the vegetation management supporting map for this lot, and there is no table in the sections below, it confirms that there is no essential habitat on the lot.

Category A and/or Category B and/or Category C

Table 6: Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
584	<i>Crocodylus porosus</i>	estuarine crocodile	V	Estuaries and major rivers, billabongs and swamps in dry season; freshwater swamps in wet season, occasionally found in open sea; also in dune swale swamps and dams; mostly within 40-50km of coastline (some breeding populations up to 100km from sea). Nest sites vegetated areas (preference for Melaleuca swamp forest with <i>Thoracostachyum</i> or <i>Scleria</i> sedgeswamp &/or <i>Stenoclaena</i> fern) near permanent freshwater (<100-200m), often on north-west banks, prime areas associated with productive deepwater estuaries; will also use marginal sites, e.g. grassy areas (<i>Imperata</i> , <i>Ischaemum</i> , <i>Themeda</i> , <i>Sorghum</i>) near forest edge or with sparse eucalypt, riverbank/fringe forest (<i>Melaleuca</i> , <i>Corypha</i> , <i>Acacia</i>), mangrove fringe, salt meadow behind mangrove, and sparse short (<40cm) sedgeland/swamp.	Sea level to 100m.	None	Near and in waterbodies.

Label	Regional Ecosystem (mandatory unless otherwise specified)
584	All regional ecosystems within the stream/wetland buffer as determined by VMA code.

3.6 Area Management Plan(s)

Area Management Plan for the control of pest plants in the Dry Tropics region

3.7 Coastal or non-coastal

For the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP), this property is regarded as*

Coastal

Non Coastal

*See also Map 4.3

3.8 Agricultural Land Class A or B

The following can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code:

Does this lot contain land that is mapped as Agricultural Land Class A or B in the State Planning Interactive Mapping System?

Class A (with urban areas masked as per SPP): 6282.58ha

Class B (with urban areas masked as per SPP): 16642.8ha

Note - This confirms Agricultural Land Classes as per the State Planning Interactive Mapping System only. This response does not include Agricultural Land Classes identified under local government planning schemes. For further information, check the Planning Scheme for your local government area.

See Map 4.4 to identify the location and extent of Class A and/or Class B Agricultural land on Lot: 71 Plan: SP289517.

4. Vegetation management framework maps

Vegetation management maps included in this report may also be requested individually at:

<https://www.dnrme.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form>

Regulated vegetation management map

The regulated vegetation management map shows vegetation categories needed to determine clearing requirements. These maps are updated monthly to show new [property maps of assessable vegetation \(PMAV\)](#).

Vegetation management supporting map

The vegetation management supporting map provides information on regional ecosystems, wetlands, watercourses and essential habitat.

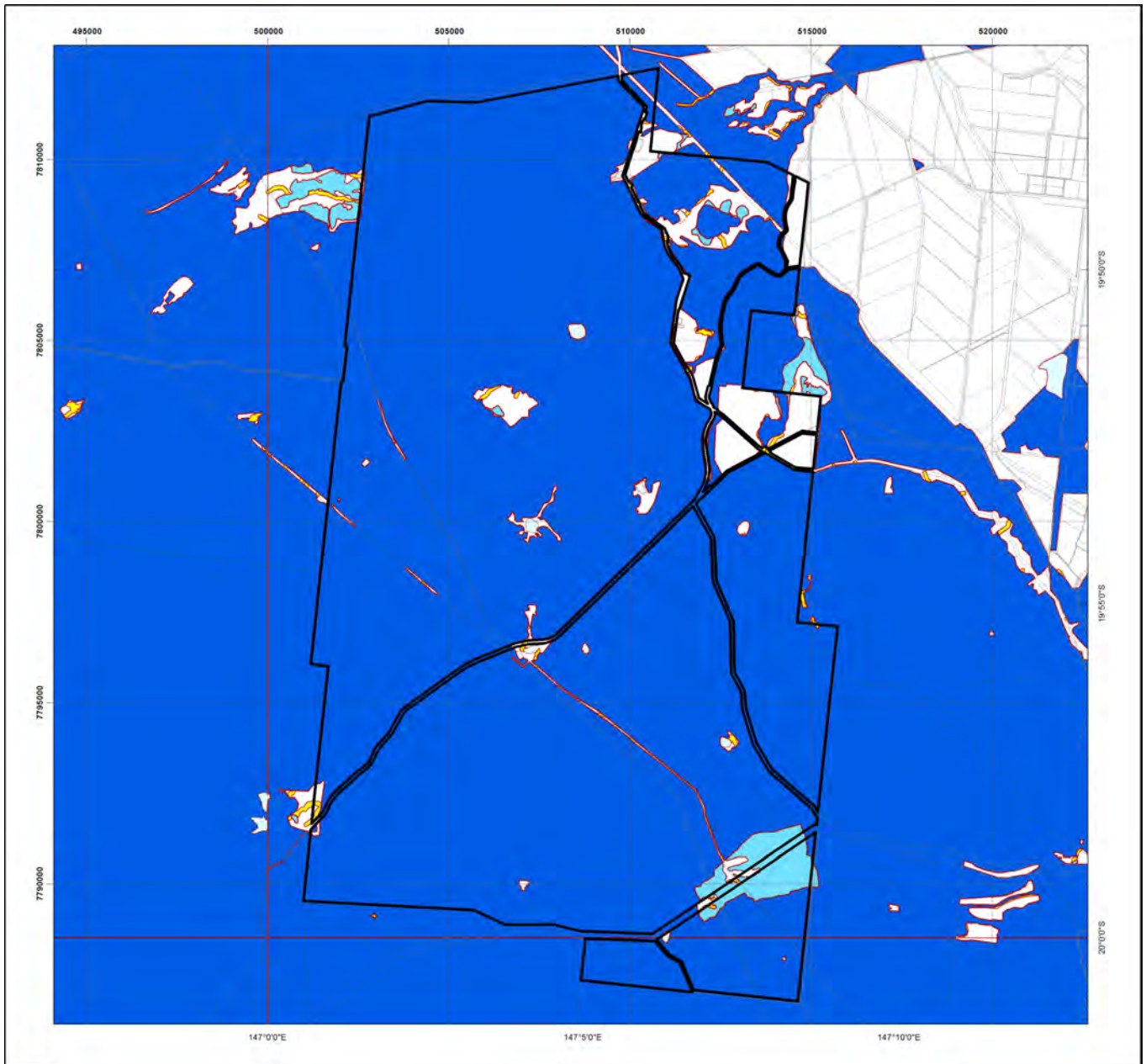
Coastal/non-coastal map

The coastal/non-coastal map confirms whether the lot, or which parts of the lot, are considered coastal or non-coastal for the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP).

Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture




The Agricultural Land Class map confirms the location and extent of land mapped as Agricultural Land Classes A or B as identified on the State Planning Interactive Mapping System. Please note that this map does not include areas identified as Agricultural Land Class A or B in local government planning schemes. This map can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code.

4.1 Regulated vegetation management map



Regulated Vegetation Management Map

Legend

-  Selected Lot and Plan
-  Category A area (Vegetation offsets/compliance notices/VDecs)
-  Category B area (Remnant vegetation)
-  Category C area (High-value regrowth vegetation)
-  Category R area (Reef regrowth watercourse vegetation)
-  Category X area (Exempt clearing work on Freehold, Indigenous and Leasehold land)
-  Water
-  Area not categorised
-  Other land parcel boundaries



This product is projected into:
GDA 1994 MGA Zone 55

Disclaimer:

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Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

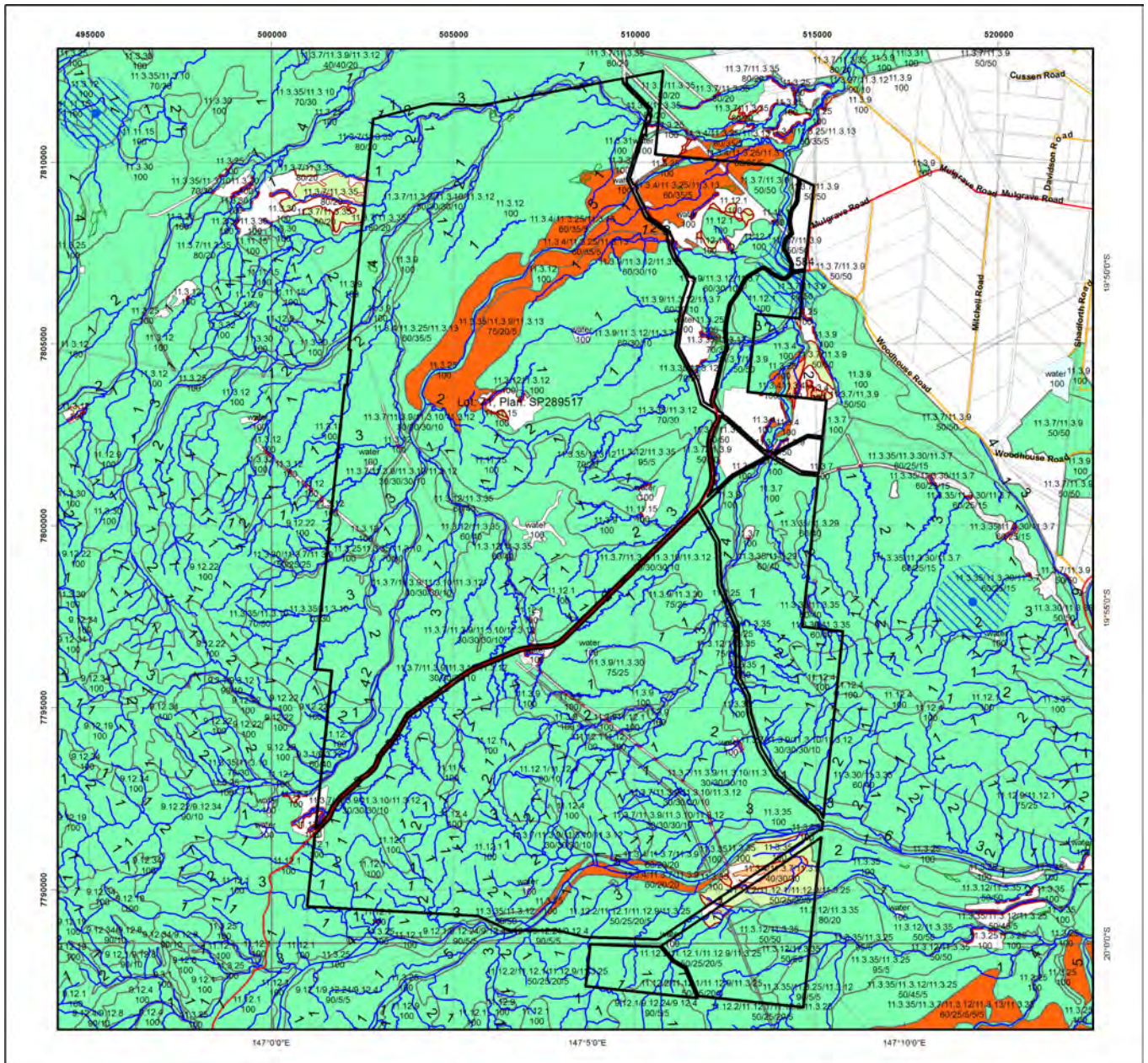
Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at <http://www.information.qld.gov.au/>

Land parcel boundaries are provided as locational aid only.

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.




4.2 Vegetation management supporting map



Vegetation Management Supporting Map


Legend

- Selected Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C or R area containing endangered regional ecosystems
- Category C or R area containing of concern regional ecosystems
- Category C or R area that is a least concern regional ecosystem
- Category X area
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- ~ Watercourses and drainage features on the vegetation management watercourse and drainage features map (Stream order shown as black number against stream where available)
- Highway
- Connector
- Street/Local Road
- National Parks, State Forest and other reserves
- Other land parcel boundaries




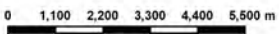
Queensland Government

LOCALITY DIAGRAM



N





0 1,100 2,200 3,300 4,400 5,500 m

This product is projected into:
GDA 1994 MGA Zone 55

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

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Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at <http://www.information.qld.gov.au/>

Land parcel boundaries are provided as locational aid only.

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4.3 Coastal/non-coastal map



Coastal/Non Coastal Map

Legend

- Selected Lot and Plan
- Coastal
- Non Coastal
- Other land parcel boundaries



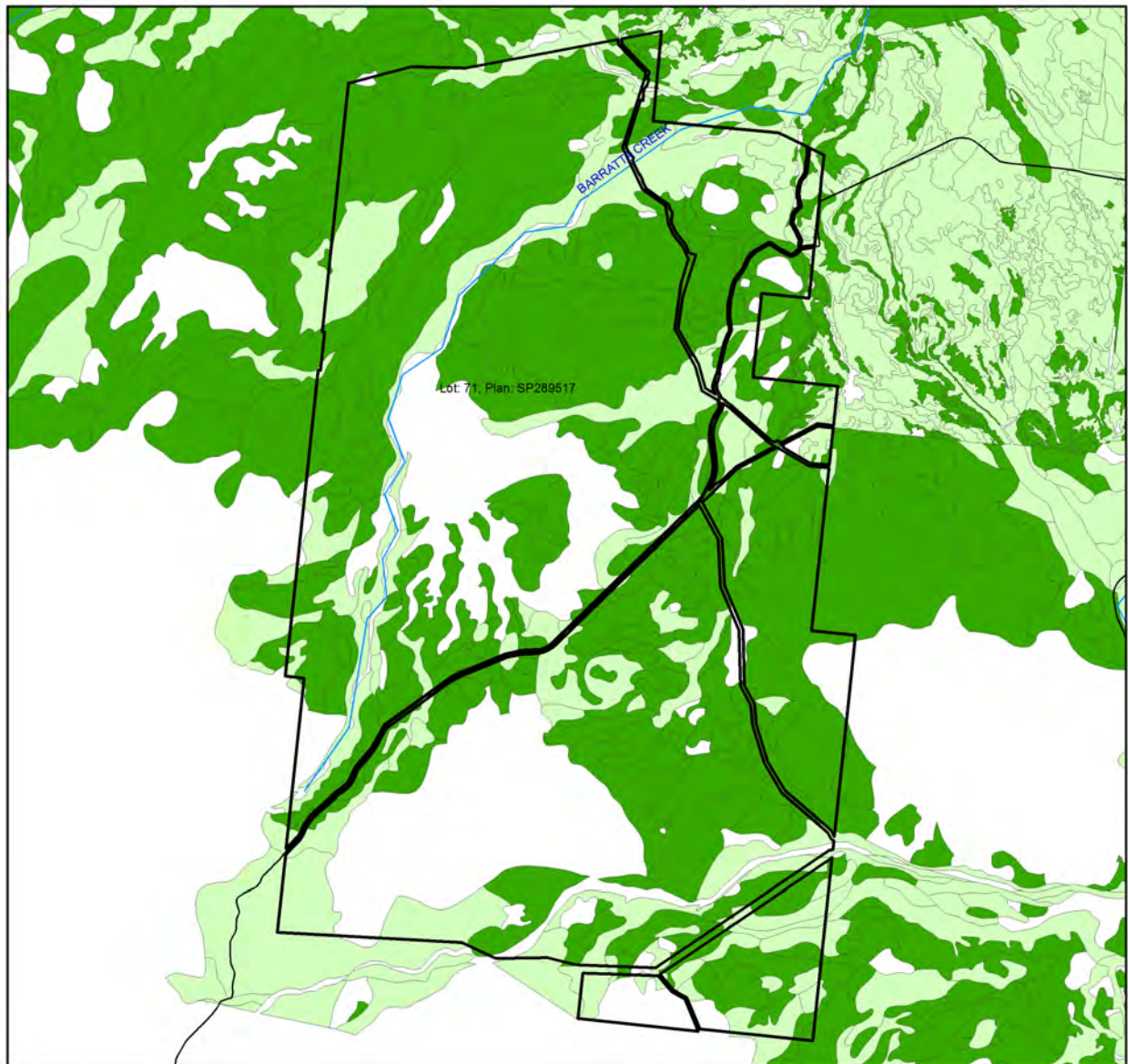
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







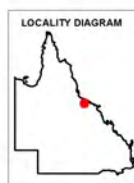
4.4 Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture



Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture

Legend

-  Selected Lot and Plan
-  Towns
-  Rivers and creeks
-  Freeways / motorways; Highways
-  Secondary roads; Streets
- Agricultural land class A or B
-  A
-  B
-  Not class A or B



0 1500 3000 4500 6000 7500 m

This product is projected into GDA 1994 MGA Zone 55

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5. Protected plants framework (administered by the Department of Environment and Science (DES))

In Queensland, all plants that are native to Australia are protected plants under the [Nature Conservation Act 1992](#) (NCA). The NCA regulates the clearing of protected plants 'in the wild' (see [Operational policy: When a protected plant in Queensland is considered to be 'in the wild'](#)) that are listed as critically endangered, endangered, vulnerable or near threatened under the Act.

Please note that the protected plant clearing framework applies irrespective of the classification of the vegetation under the *Vegetation Management Act 1999* and any approval or exemptions given under another Act, for example, the *Vegetation Management Act 1999* or *Planning Regulation 2017*.

5.1 Clearing in high risk areas on the flora survey trigger map

The flora survey trigger map identifies high-risk areas for endangered, vulnerable or near threatened (EVNT) plants. These are areas where EVNT plants are known to exist or are likely to exist based on the habitat present. The flora survey trigger map for this property is provided in section 5.5.

If you are proposing to clear an area shown as high risk on the flora survey trigger map, a flora survey of the clearing impact area must be undertaken by a suitably qualified person in accordance with the [Flora survey guidelines](#). The main objective of a flora survey is to locate any EVNT plants that may be present in the clearing impact area.

If the flora survey identifies that EVNT plants are not present within the clearing impact area or clearing within 100m of EVNT plants can be avoided, the clearing activity is exempt from a permit. An [exempt clearing notification form](#) must be submitted to the Department of Environment and Science, with a copy of the flora survey report, at least one week prior to clearing.

If the flora survey identifies that EVNT plants are present in, or within 100m of, the area to be cleared, a clearing permit is required before any clearing is undertaken. The flora survey report, as well as an impact management report, must be submitted with the [clearing permit application form](#).

5.2 Clearing outside high risk areas on the flora survey trigger map

In an area other than a high risk area, a clearing permit is only required where a person is, or becomes aware that EVNT plants are present in, or within 100m of, the area to be cleared. You must keep a copy of the flora survey trigger map for the area subject to clearing for five years from the day the clearing starts. If you do not clear within the 12 month period that the flora survey trigger map was printed, you need to print and check a new flora survey trigger map.

5.3 Exemptions

Many activities are 'exempt' under the protected plant clearing framework, which means that clearing of native plants that are in the wild can be undertaken for these activities with no need for a flora survey or a protected plant clearing permit. The Information sheet - General exemptions for the take of protected plants provides some of these exemptions.

Some exemptions under the NCA are the same as exempt clearing work (formerly known as exemptions) under the *Vegetation Management Act 1999* (i.e. listed in Schedule 21 of the Planning Regulations 2017) while some are different.

5.4 Contact information for DES

For further information on the protected plants framework:

Phone 1300 130 372 (and select option four)

Email palm@des.qld.gov.au

Visit <https://www.qld.gov.au/environment/plants-animals/plants/protected-plants>

5.5 Protected plants flora survey trigger map

This map included may also be requested individually at: <https://apps.des.qld.gov.au/map-request/flora-survey-trigger/>.

Updates to the data informing the flora survey trigger map

The flora survey trigger map will be reviewed, and updated if necessary, at least every 12 months to ensure the map reflects the most up-to-date and accurate data available.






Species information

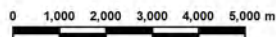
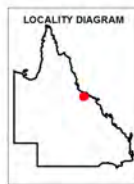
Please note that flora survey trigger maps do not identify species associated with 'high risk areas'. While some species information may be publicly available, for example via the [Queensland Spatial Catalogue](#), the Department of Environment and Science does not provide species information on request. Regardless of whether species information is available for a particular high risk area, clearing plants in a high risk area may require a flora survey and/or clearing permit. Please see the Department of Environment and Science webpage on the [clearing of protected plants](#) for more information.



Protected Plants Flora Survey Trigger Map

Legend

-  Selected Lot and Plan
-  High risk area
-  Other land parcel boundaries
-  Freeways / motorways / highways
-  Secondary roads / streets



This product is projected into:
GDA 1994 MGA Zone 55

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

Land parcel boundaries are provided as locational aid only.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Science at palm@des.qld.gov.au

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6. Koala protection framework (administered by the Department of Environment and Science (DES))

The koala (*Phascolarctos cinereus*) is listed in Queensland as vulnerable by the Queensland Government under *Nature Conservation Act 1992* and by the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Queensland Government's koala protection framework is comprised of the *Nature Conservation Act 1992*, the Nature Conservation (Animals) Regulation 2020, the Nature Conservation (Koala) Conservation Plan 2017, the *Planning Act 2016* and the Planning Regulation 2017.

6.1 Koala mapping

6.1.1 Koala districts

The parts of Queensland where koalas are known to occur has been divided into three koala districts - koala district A, koala district B and koala district C. Each koala district is made up of areas with comparable koala populations (e.g. density, extent and significance of threatening processes affecting the population) which require similar management regimes.

Section 7.1 identifies which koala district your property is located in.

6.1.2 Koala habitat areas

Koala habitat areas are areas of vegetation that have been determined to contain koala habitat that is essential for the conservation of a viable koala population in the wild based on the combination of habitat suitability and biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water). In order to protect this important koala habitat, clearing controls have been introduced into the Planning Regulation 2017 for development in koala habitat areas.

Please note that koala habitat areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley, Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

There are two different categories of koala habitat area (core koala habitat area and locally refined koala habitat), which have been determined using two different methodologies. These methodologies are described in the document [Spatial modelling in South East Queensland](#).

Section 7.2 shows any koala habitat area that exists on your property.

Under the Nature Conservation (Koala) Conservation Plan 2017, an owner of land (or a person acting on the owner's behalf with written consent) can request to make, amend or revoke a koala habitat area determination if they believe, on reasonable grounds, that the existing determination for all or part of their property is incorrect.

More information on requests to make, amend or revoke a koala habitat area determination can be found in the document [Guideline - Requests to make, amend or revoke a koala habitat area determination](#).

The koala habitat area map will be updated at least annually to include any koala habitat areas that have been made, amended or revoked.

Changes to the koala habitat area map which occur between annual updates because of a request to make, amend or revoke a koala habitat area determination can be viewed on the register of approved requests to make, amend or revoke a koala habitat area available at: <https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/koalamaps>. The register includes the lot on plan for the change, the date the decision was made and the map issued to the landholder that shows areas determined to be koala habitat areas.

6.1.3 Koala priority areas

Koala priority areas are large, connected areas that have been determined to have the highest likelihood of achieving conservation outcomes for koalas based on the combination of habitat suitability, biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water) and a koala conservation cost benefit analysis.

Conservation efforts will be prioritised in these areas to ensure the conservation of viable koala populations in the wild including a focus on management (e.g. habitat protection, habitat restoration and threat mitigation) and monitoring. This includes a prohibition on clearing in koala habitat areas that are in koala priority areas under the Planning Regulation 2017 (subject to some exemptions).

Please note that koala priority areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley,

Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

Section 7.2 identifies if your property is in a koala priority area.

6.1.4 Identified koala broad-hectare areas

There are seven identified koala broad-hectare areas in SEQ. These are areas of koala habitat that are located in areas committed to meet development targets in the SEQ Regional Plan to accommodate SEQ's growing population including bring-forward Greenfield sites under the Queensland Housing Affordability Strategy and declared master planned areas under the repealed *Sustainable Planning Act 2009* and the repealed *Integrated Planning Act 1997*.

Specific assessment benchmarks apply to development applications for development proposed in identified koala broad-hectare areas to ensure koala conservation measures are incorporated into the proposed development.

Section 7.2 identifies if your property is in an identified koala broad-hectare area.

6.2 Koala habitat planning controls

On 7 February 2020, the Queensland Government introduced new planning controls to the Planning Regulation 2017 to strengthen the protection of koala habitat in South East Queensland (i.e. koala district A).

More information on these planning controls can be found here:

<https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy>.

As a high-level summary, the koala habitat planning controls make:

- development that involves interfering with koala habitat (defined below) in an area that is both a koala priority area and a koala habitat area, prohibited development (i.e. development for which a development application cannot be made);
- development that involves interfering with koala habitat (defined below) in an area that is a koala habitat area but is not a koala priority area, assessable development (i.e. development for which development approval is required); and
- development that is for extractive industries where the development involves interfering with koala habitat (defined below) in an area that is both a koala habitat area and a key resource area, assessable development (i.e. development for which development approval is required).

Interfering with koala habitat means:

- 1) Removing, cutting down, ringbarking, pushing over, poisoning or destroying in anyway, including by burning, flooding or draining native vegetation in a koala habitat area; but
- 2) Does not include destroying standing vegetation by stock or lopping a tree.

However, these planning controls do not apply if the development is exempted development as defined in Schedule 24 of the [Planning Regulation 2017](#). More information on exempted development can be found here:

<https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy>.

There are also assessment benchmarks that apply to development applications for:

- building works, operational works, material change of use or reconfiguration of a lot where:
 - the local government planning scheme makes the development assessable;
 - the premises includes an area that is both a koala priority area and a koala habitat area; and
 - the development does not involve interfering with koala habitat (defined above); and
- development in identified koala broad-hectare areas.

The [Guideline - Assessment Benchmarks in relation to Koala Habitat in South East Queensland assessment benchmarks](#) outlines these assessment benchmarks, the intent of these assessment benchmarks and advice on how proposed development may meet these assessment benchmarks.

6.3 Koala Conservation Plan clearing requirements

Section 10 and 11 of the [Nature Conservation \(Koala\) Conservation Plan 2017](#) prescribes requirements that must be met when clearing koala habitat in koala district A and koala district B.

These clearing requirements are independent to the koala habitat planning controls introduced into the Planning Regulation 2017, which means they must be complied with irrespective of any approvals or exemptions offered under other legislation.

Unlike the clearing controls prescribed in the Planning Regulation 2017 that are to protect koala habitat, the clearing requirements prescribed in the Nature Conservation (Koala) Conservation Plan 2017 are in place to prevent the injury or death of koalas when koala habitat is being cleared.

6.4 Contact information for DES

For further information on the koala protection framework:

Phone 13 QGOV (13 74 68)

Email koala.assessment@des.qld.gov.au

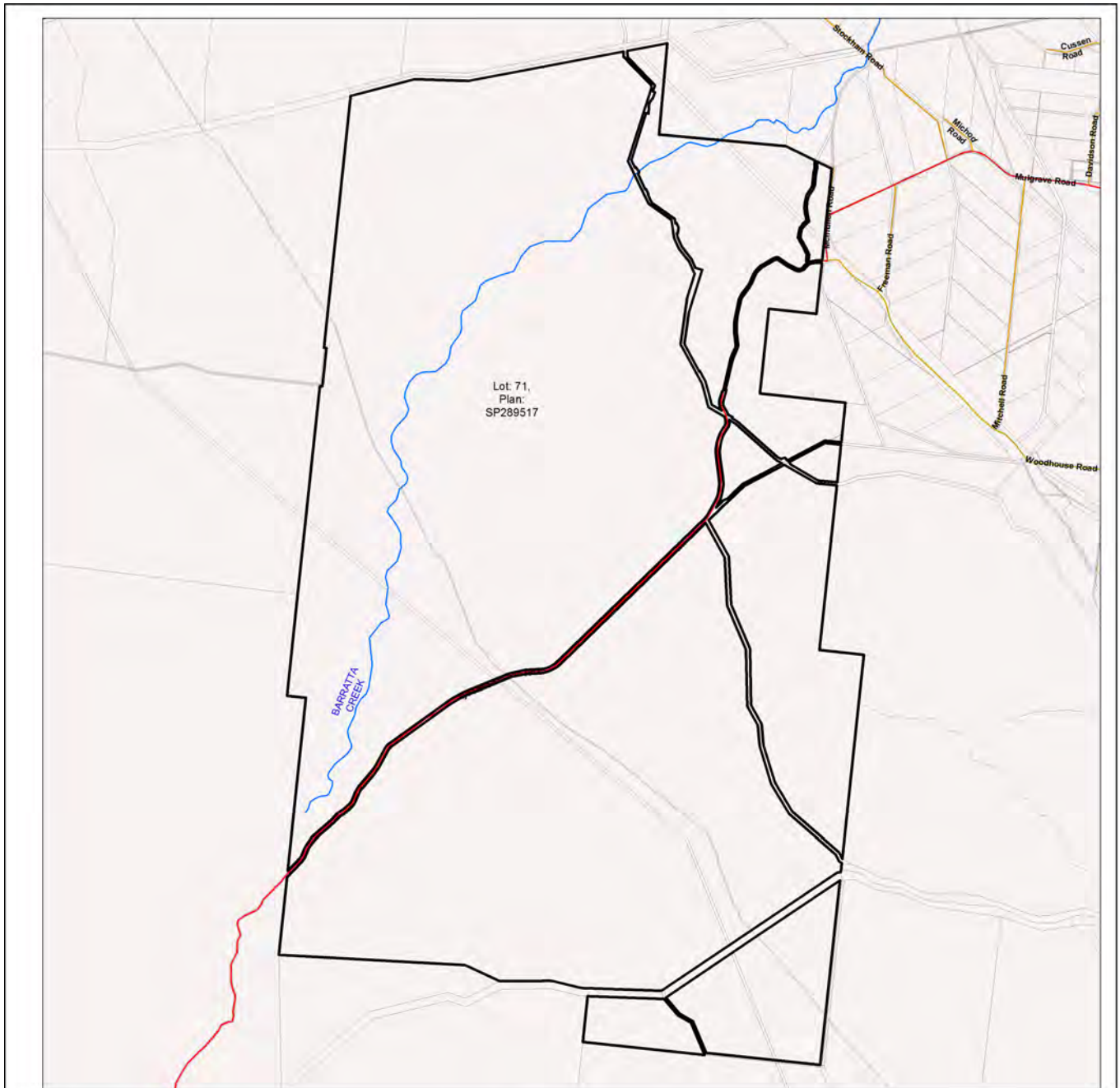
Visit <https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping>

7. Koala protection framework details for Lot: 71 Plan: SP289517

7.1 Koala districts

Koala District C

7.2 Koala priority area, koala habitat area and identified koala broad-hectare area map



Koala priority area, koala habitat area and identified koala broad-hectare area map

Legend

- Selected Lot and Plan
- Koala habitat area (core)
- Koala habitat area (locally refined)
- Koala priority area
- Identified koala broad-hectare area
- Cadastral Boundaries
- Towns
- Highway
- Connector
- Street/Local Road
- Major rivers/creeks
- Queensland

The koala habitat mapping within South East Queensland uses regional ecosystem line work compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.



0 1,300 2,600 3,900 5,200 6,500 m

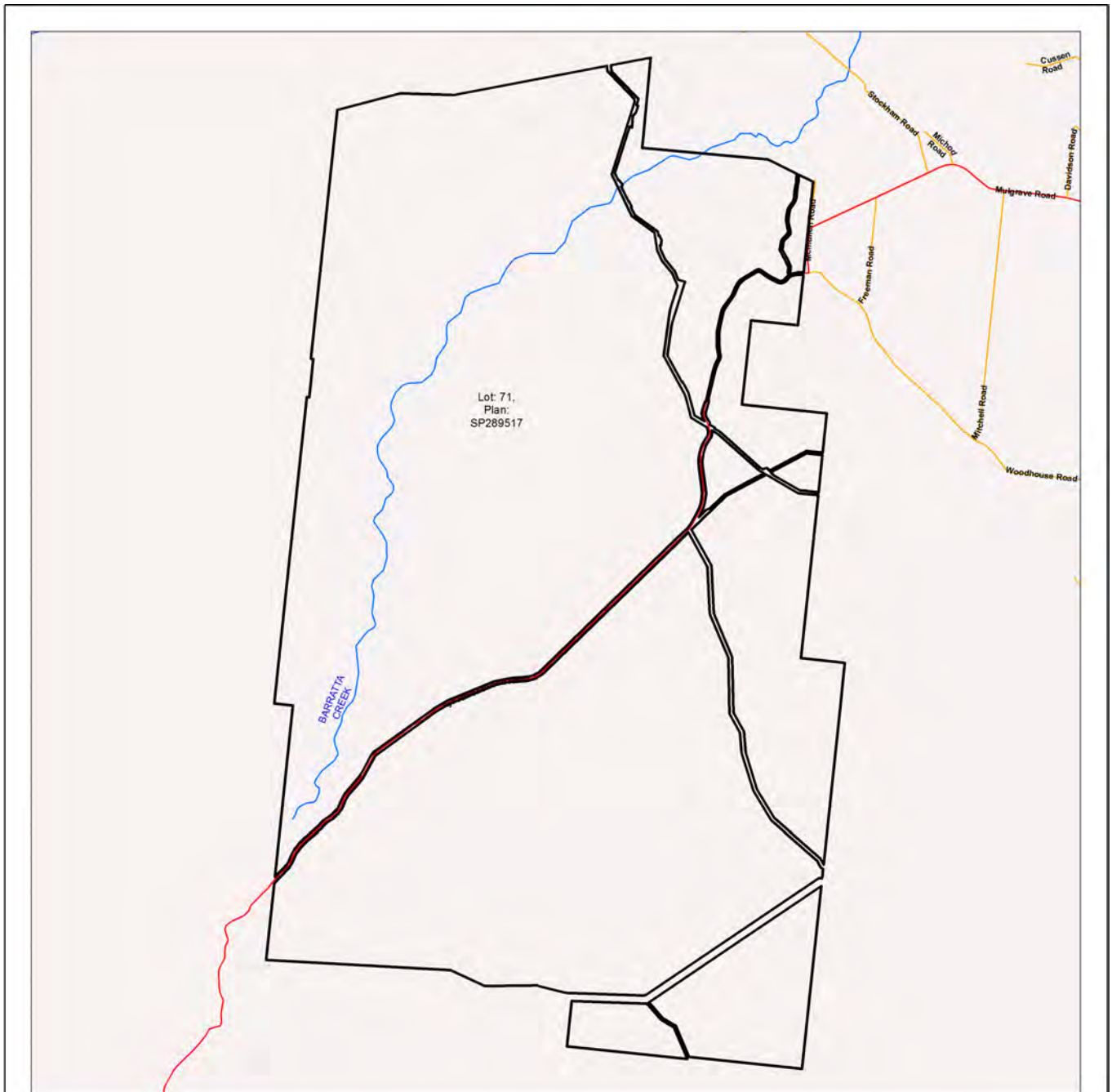
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The koala conservation plan maps will be updated at least annually to include any koala habitat areas that have been made, amended or revoked.

In order to ensure that the most recent map for an area of interest can be accessed, prior to the annual update, a register of changes made to koala habitat areas as a result of the map amendment process will be available at:
<https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/>.
 The register will include lot on plan for the change, the date the decision was made and the map issued to the landholder which shows areas determined to be koala habitat areas.

7.3 Koala habitat regional ecosystems for core koala habitat areas



Koala habitat regional ecosystems for core koala habitat areas

Legend

-  Selected Lot and Plan
-  Koala habitat area (core)
-  Towns
-  Highway
-  Connector
-  Street/Local Road
-  Major rivers/creeks
-  Queensland



N



The koala habitat mapping within South East Queensland uses regional ecosystem linework compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.

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8. Other relevant legislation contacts list

Activity	Legislation	Agency	Contact details
<ul style="list-style-type: none"> • Interference with overland flow • Earthworks, significant disturbance 	<i>Water Act 2000</i> <i>Soil Conservation Act 1986</i>	Department of Regional Development, Manufacturing and Water (Queensland Government) Department of Resources (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dnrme.qld.gov.au
<ul style="list-style-type: none"> • Indigenous Cultural Heritage 	<i>Aboriginal Cultural Heritage Act 2003</i> <i>Torres Strait Islander Cultural Heritage Act 2003</i>	Department of Seniors, Disability Services and Aboriginal and Torres Strait Islander Partnerships	Ph: 13 QGOV (13 74 68) www.datsip.qld.gov.au
<ul style="list-style-type: none"> • Mining and environmentally relevant activities • Infrastructure development (coastal) • Heritage issues 	<i>Environmental Protection Act 1994</i> <i>Coastal Protection and Management Act 1995</i> <i>Queensland Heritage Act 1992</i>	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) www.des.qld.gov.au
<ul style="list-style-type: none"> • Protected plants and protected areas 	<i>Nature Conservation Act 1992</i>	Department of Environment and Science (Queensland Government)	Ph: 1300 130 372 (option 4) palm@des.qld.gov.au www.des.qld.gov.au
<ul style="list-style-type: none"> • Koala mapping and regulations 	<i>Nature Conservation Act 1992</i>	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) Koala.assessment@des.qld.gov.au
<ul style="list-style-type: none"> • Interference with fish passage in a watercourse, mangroves • Forestry activities on State land tenures 	<i>Fisheries Act 1994</i> <i>Forestry Act 1959</i>	Department of Agriculture and Fisheries (Queensland Government)	Ph: 13 QGOV (13 74 68) www.daf.qld.gov.au
<ul style="list-style-type: none"> • Matters of National Environmental Significance including listed threatened species and ecological communities 	<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Department of Agriculture, Water and the Environment (Australian Government)	Ph: 1800 803 772 www.environment.gov.au
<ul style="list-style-type: none"> • Development and planning processes 	<i>Planning Act 2016</i> <i>State Development and Public Works Organisation Act 1971</i>	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dsdmip.qld.gov.au
<ul style="list-style-type: none"> • Local government requirements 	<i>Local Government Act 2009</i> <i>Planning Act 2016</i>	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) Your relevant local government office
<ul style="list-style-type: none"> • Harvesting timber in the Wet Tropics of Qld World Heritage area 	<i>Wet Tropics World Heritage Protection and Management Act 1993</i>	Wet Tropics Management Authority	Ph: (07) 4241 0500 www.wettropics.gov.au



Queensland Government

WildNet species list

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Queensland status: All
Records: All
Date: All
Latitude: -19.8329
Longitude: 147.1381
Distance: 30
Email: pascale.lin@ghd.com
Date submitted: Thursday 30 Sep 2021 12:31:34
Date extracted: Thursday 30 Sep 2021 12:40:02

The number of records retrieved = 677

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Information about your Species lists request is logged for quality assurance, user support and product enhancement purposes only.

The information provided should be appropriately acknowledged as being derived from WildNet database when it is used. As the WildNet Program is still in a process of collating and vetting data, it is possible the information given is not complete. Go to the WildNet database webpage (<https://www.qld.gov.au/environment/plants-animals/species-information/wildnet>) to find out more about WildNet and where to access other WildNet information products approved for publication. Feedback about WildNet species lists should be emailed to wildlife.online@des.qld.gov.au.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufo	<i>Rhinella marina</i>	cane toad	Y			12
animals	amphibians	Hylidae	<i>Litoria bicolor</i>	northern sedgefrog		C		1
animals	amphibians	Hylidae	<i>Litoria fallax</i>	eastern sedgefrog		C		1
animals	amphibians	Hylidae	<i>Litoria inermis</i>	bumpy rocketfrog		C		2
animals	amphibians	Hylidae	<i>Litoria latopalmata</i>	broad palmed rocketfrog		C		2
animals	amphibians	Hylidae	<i>Litoria rubella</i>	ruddy treefrog		C		1
animals	amphibians	Limnodynastidae	<i>Limnodynastes convexiusculus</i>	marbled frog		C		1
animals	birds	Acanthizidae	<i>Gerygone olivacea</i>	white-throated gerygone		C		17
animals	birds	Acanthizidae	<i>Gerygone palpebrosa</i>	fairy gerygone		C		3
animals	birds	Acanthizidae	<i>Smicromis brevirostris</i>	weebill		C		13
animals	birds	Accipitridae	<i>Accipiter fasciatus</i>	brown goshawk		C		7
animals	birds	Accipitridae	<i>Accipiter novaehollandiae</i>	grey goshawk		C		1
animals	birds	Accipitridae	<i>Aquila audax</i>	wedge-tailed eagle		C		11
animals	birds	Accipitridae	<i>Aviceda subcristata</i>	Pacific baza		C		8
animals	birds	Accipitridae	<i>Circus approximans</i>	swamp harrier		C		6
animals	birds	Accipitridae	<i>Circus assimilis</i>	spotted harrier		C		6
animals	birds	Accipitridae	<i>Elanus axillaris</i>	black-shouldered kite		C		7
animals	birds	Accipitridae	<i>Haliaeetus leucogaster</i>	white-bellied sea-eagle		C		19
animals	birds	Accipitridae	<i>Haliastur indus</i>	brahmny kite		C		3
animals	birds	Accipitridae	<i>Haliastur sphenurus</i>	whistling kite		C		45
animals	birds	Accipitridae	<i>Lophoictinia isura</i>	square-tailed kite		C		3
animals	birds	Accipitridae	<i>Milvus migrans</i>	black kite		C		61
animals	birds	Accipitridae	<i>Pandion cristatus</i>	eastern osprey		SL		1
animals	birds	Acrocephalidae	<i>Acrocephalus australis</i>	Australian reed-warbler		C		7
animals	birds	Aegothelidae	<i>Aegotheles cristatus</i>	Australian owl-nightjar		C		1
animals	birds	Alcedinidae	<i>Ceyx azureus</i>	azure kingfisher		C		4
animals	birds	Alcedinidae	<i>Ceyx pusillus</i>	little kingfisher		C		1
animals	birds	Anatidae	<i>Anas gracilis</i>	grey teal		C		8
animals	birds	Anatidae	<i>Anas superciliosa</i>	Pacific black duck		C		39
animals	birds	Anatidae	<i>Aythya australis</i>	hardhead		C		18
animals	birds	Anatidae	<i>Chenonetta jubata</i>	Australian wood duck		C		6
animals	birds	Anatidae	<i>Cygnus atratus</i>	black swan		C		19
animals	birds	Anatidae	<i>Dendrocygna arcuata</i>	wandering whistling-duck		C		18
animals	birds	Anatidae	<i>Dendrocygna eytoni</i>	plumed whistling-duck		C		17/3
animals	birds	Anatidae	<i>Nettapus coromandelianus</i>	cotton pygmy-goose		C		12
animals	birds	Anatidae	<i>Nettapus pulchellus</i>	green pygmy-goose		C		11
animals	birds	Anhingidae	<i>Anhinga novaehollandiae</i>	Australasian darter		C		45
animals	birds	Anseranatidae	<i>Anseranas semipalmata</i>	magpie goose		C		42
animals	birds	Apodidae	<i>Aerodramus terraereginae</i>	Australian swiftlet		C		2
animals	birds	Apodidae	<i>Apus pacificus</i>	fork-tailed swift		SL		2
animals	birds	Apodidae	<i>Hirundapus caudacutus</i>	white-throated needletail		V	V	1
animals	birds	Ardeidae	<i>Ardea alba modesta</i>	eastern great egret		C		36
animals	birds	Ardeidae	<i>Ardea intermedia</i>	intermediate egret		C		24
animals	birds	Ardeidae	<i>Ardea pacifica</i>	white-necked heron		C		14
animals	birds	Ardeidae	<i>Ardea sumatrana</i>	great-billed heron		C		2
animals	birds	Ardeidae	<i>Bubulcus ibis</i>	cattle egret		C		10

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Ardeidae	<i>Egretta garzetta</i>	little egret		C		9
animals	birds	Ardeidae	<i>Egretta novaehollandiae</i>	white-faced heron		C		27
animals	birds	Ardeidae	<i>Egretta picata</i>	piebald heron		C		1
animals	birds	Ardeidae	<i>Ixobrychus dubius</i>	Australian little bittern		C		1
animals	birds	Ardeidae	<i>Ixobrychus flavicollis</i>	black bittern		C		4
animals	birds	Ardeidae	<i>Nycticorax caledonicus</i>	nankeen night-heron		C		8
animals	birds	Artamidae	<i>Artamus cinereus</i>	black-faced woodswallow		C		15
animals	birds	Artamidae	<i>Artamus leucorhynchus</i>	white-breasted woodswallow		C		49
animals	birds	Artamidae	<i>Artamus minor</i>	little woodswallow		C		1
animals	birds	Artamidae	<i>Artamus personatus</i>	masked woodswallow		C		1
animals	birds	Artamidae	<i>Artamus superciliosus</i>	white-browed woodswallow		C		2
animals	birds	Artamidae	<i>Cracticus nigrogularis</i>	piebald butcherbird		C		45
animals	birds	Artamidae	<i>Cracticus torquatus</i>	grey butcherbird		C		6
animals	birds	Artamidae	<i>Gymnorhina tibicen</i>	Australian magpie		C		58
animals	birds	Artamidae	<i>Strepera graculina</i>	piebald currawong		C		13
animals	birds	Burhinidae	<i>Burhinus grallarius</i>	bush stone-curlew		C		7
animals	birds	Cacatuidae	<i>Cacatua galerita</i>	sulphur-crested cockatoo		C		31
animals	birds	Cacatuidae	<i>Calyptorhynchus banksii</i>	red-tailed black-cockatoo		C		51
animals	birds	Cacatuidae	<i>Eolophus roseicapilla</i>	galah		C		4
animals	birds	Cacatuidae	<i>Nymphicus hollandicus</i>	cockatiel		C		3
animals	birds	Campephagidae	<i>Coracina maxima</i>	ground cuckoo-shrike		C		1
animals	birds	Campephagidae	<i>Coracina novaehollandiae</i>	black-faced cuckoo-shrike		C		48
animals	birds	Campephagidae	<i>Coracina papuensis</i>	white-bellied cuckoo-shrike		C		70
animals	birds	Campephagidae	<i>Coracina tenuirostris</i>	cidabird		C		2
animals	birds	Campephagidae	<i>Lalage leucomela</i>	varied triller		C		6
animals	birds	Campephagidae	<i>Lalage tricolor</i>	white-winged triller		C		27
animals	birds	Caprimulgidae	<i>Caprimulgus macrurus</i>	large-tailed nightjar		C		1
animals	birds	Casuariidae	<i>Dromaius novaehollandiae</i>	emu		C		1
animals	birds	Charadriidae	<i>Charadrius ruficapillus</i>	red-capped plover		C		1
animals	birds	Charadriidae	<i>Elseya melanops</i>	black-fronted dotterel		C		5
animals	birds	Charadriidae	<i>Vanellus miles</i>	masked lapwing		C		35
animals	birds	Ciconiidae	<i>Ephippiorhynchus asiaticus</i>	black-necked stork		C		14
animals	birds	Cisticolidae	<i>Cisticola exilis</i>	golden-headed cisticola		C		10
animals	birds	Cisticolidae	<i>Cisticola juncidis laveryi</i>	zitting cisticola		C		2
animals	birds	Columbidae	<i>Columba livia</i>	rock dove	Y			5
animals	birds	Columbidae	<i>Ducula bicolor</i>	piebald imperial-pigeon		C		2
animals	birds	Columbidae	<i>Geopelia cuneata</i>	diamond dove		C		8
animals	birds	Columbidae	<i>Geopelia humeralis</i>	bar-shouldered dove		C		23
animals	birds	Columbidae	<i>Geopelia striata</i>	peaceful dove		C		88
animals	birds	Columbidae	<i>Geophaps scripta</i>	squatter pigeon		C		11
animals	birds	Columbidae	<i>Geophaps scripta scripta</i>	squatter pigeon (southern subspecies)		V	V	2
animals	birds	Columbidae	<i>Lopholaimus antarcticus</i>	topknot pigeon		C		4
animals	birds	Columbidae	<i>Macropygia amboinensis</i>	brown cuckoo-dove		C		2
animals	birds	Columbidae	<i>Ocyphaps lophotes</i>	crested pigeon		C		39
animals	birds	Columbidae	<i>Phaps chalcoptera</i>	common bronzewing		C		1
animals	birds	Columbidae	<i>Streptopelia chinensis</i>	spotted dove	Y			2

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Coraciidae	<i>Eurystomus orientalis</i>	dollarbird		C		21
animals	birds	Corcoracidae	<i>Corcorax melanorhamphos</i>	white-winged cough		C		5
animals	birds	Corcoracidae	<i>Struthidea cinerea</i>	apostlebird		C		17
animals	birds	Corvidae	<i>Corvus coronoides</i>	Australian raven		C		29
animals	birds	Corvidae	<i>Corvus orru</i>	Torresian crow		C		30
animals	birds	Cuculidae	<i>Cacomantis flabelliformis</i>	fan-tailed cuckoo		C		6
animals	birds	Cuculidae	<i>Cacomantis pallidus</i>	pallid cuckoo		C		20
animals	birds	Cuculidae	<i>Cacomantis variolosus</i>	brush cuckoo		C		34/1
animals	birds	Cuculidae	<i>Centropus phasianinus</i>	pheasant coucal		C		44
animals	birds	Cuculidae	<i>Chalcites basalis</i>	Horsfield's bronze-cuckoo		C		11
animals	birds	Cuculidae	<i>Chalcites lucidus</i>	shining bronze-cuckoo		C		2
animals	birds	Cuculidae	<i>Chalcites minutillus</i>	little bronze-cuckoo		C		11
animals	birds	Cuculidae	<i>Chalcites minutillus russatus</i>	Gould's bronze-cuckoo		C		4
animals	birds	Cuculidae	<i>Eudynamys orientalis</i>	eastern koel		C		12
animals	birds	Cuculidae	<i>Scythrops novaehollandiae</i>	channel-billed cuckoo		C		14
animals	birds	Dicruridae	<i>Dicrurus bracteatus</i>	spangled drongo		C		45
animals	birds	Estrildidae	<i>Lonchura castaneothorax</i>	chestnut-breasted mannikin		C		341
animals	birds	Estrildidae	<i>Lonchura punctulata</i>	nutmeg mannikin	Y			8
animals	birds	Estrildidae	<i>Neochmia modesta</i>	plum-headed finch		C		12
animals	birds	Estrildidae	<i>Neochmia phaeton</i>	crimson finch		C		10
animals	birds	Estrildidae	<i>Neochmia temporalis</i>	red-browed finch		C		12
animals	birds	Estrildidae	<i>Poephila cincta cincta</i>	black-throated finch (white-rumped subspecies)		E	E	15
animals	birds	Estrildidae	<i>Taeniopygia bichenovii</i>	double-barred finch		C		63
animals	birds	Estrildidae	<i>Taeniopygia guttata</i>	zebra finch		C		7
animals	birds	Eurostopodidae	<i>Eurostopodus argus</i>	spotted nightjar		C		1
animals	birds	Falconidae	<i>Falco berigora</i>	brown falcon		C		13
animals	birds	Falconidae	<i>Falco cenchroides</i>	nankeen kestrel		C		10
animals	birds	Falconidae	<i>Falco longipennis</i>	Australian hobby		C		7
animals	birds	Falconidae	<i>Falco peregrinus</i>	peregrine falcon		C		5
animals	birds	Falconidae	<i>Falco subniger</i>	black falcon		C		1
animals	birds	Gruidae	<i>Antigone rubicunda</i>	broilga		C		13
animals	birds	Halcyonidae	<i>Dacelo leachii</i>	blue-winged kookaburra		C		60
animals	birds	Halcyonidae	<i>Dacelo novaeguineae</i>	laughing kookaburra		C		33
animals	birds	Halcyonidae	<i>Todiramphus macleayii</i>	forest kingfisher		C		60
animals	birds	Halcyonidae	<i>Todiramphus pyrrhopygius</i>	red-backed kingfisher		C		3
animals	birds	Halcyonidae	<i>Todiramphus sanctus</i>	sacred kingfisher		C		31
animals	birds	Hirundinidae	<i>Hirundo neoxena</i>	welcome swallow		C		14
animals	birds	Hirundinidae	<i>Petrochelidon ariel</i>	fairy martin		C		22
animals	birds	Hirundinidae	<i>Petrochelidon nigricans</i>	tree martin		C		23
animals	birds	Jacanidae	<i>Irediparra gallinacea</i>	comb-crested jacana		C		26
animals	birds	Laridae	<i>Chlidonias hybrida</i>	whiskered tern		C		2
animals	birds	Laridae	<i>Gelochelidon nilotica</i>	gull-billed tern		SL		2
animals	birds	Laridae	<i>Hydroprogne caspia</i>	Caspian tern		SL		5
animals	birds	Maluridae	<i>Malurus melanocephalus</i>	red-backed fairy-wren		C		75
animals	birds	Megaluridae	<i>Cincloramphus mathewsi</i>	rufous songlark		C		21

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Megaluridae	<i>Megalurus timoriensis</i>	tawny grassbird		C		22
animals	birds	Megapodiidae	<i>Alectura lathami</i>	Australian brush-turkey		C		6
animals	birds	Meliphagidae	<i>Caligavis chrysops</i>	yellow-faced honeyeater		C		1
animals	birds	Meliphagidae	<i>Conopophila rufogularis</i>	rufous-throated honeyeater		C		14
animals	birds	Meliphagidae	<i>Entomyzon cyanotis</i>	blue-faced honeyeater		C		52/1
animals	birds	Meliphagidae	<i>Epthianura tricolor</i>	crimson chat		C		1
animals	birds	Meliphagidae	<i>Gavicalis virescens</i>	singing honeyeater		C		1
animals	birds	Meliphagidae	<i>Lichmera indistincta</i>	brown honeyeater		C		47
animals	birds	Meliphagidae	<i>Manorina flavigula</i>	yellow-throated miner		C		25
animals	birds	Meliphagidae	<i>Manorina melanocephala</i>	noisy miner		C		5
animals	birds	Meliphagidae	<i>Meliphaga lewinii</i>	Lewin's honeyeater		C		5
animals	birds	Meliphagidae	<i>Meliphaga notata</i>	yellow-spotted honeyeater		C		3
animals	birds	Meliphagidae	<i>Melithreptus albogularis</i>	white-throated honeyeater		C		56
animals	birds	Meliphagidae	<i>Melithreptus gularis</i>	black-chinned honeyeater		C		10
animals	birds	Meliphagidae	<i>Myzomela obscura</i>	dusky honeyeater		C		5
animals	birds	Meliphagidae	<i>Myzomela sanguinolenta</i>	scarlet honeyeater		C		5
animals	birds	Meliphagidae	<i>Philemon buceroides</i>	helmeted friarbird		C		7
animals	birds	Meliphagidae	<i>Philemon citreogularis</i>	little friarbird		C		60
animals	birds	Meliphagidae	<i>Philemon corniculatus</i>	noisy friarbird		C		23
animals	birds	Meliphagidae	<i>Ramsayornis fasciatus</i>	bar-breasted honeyeater		C		3
animals	birds	Meliphagidae	<i>Ramsayornis modestus</i>	brown-backed honeyeater		C		21
animals	birds	Meliphagidae	<i>Stomiopera flava</i>	yellow honeyeater		C		91
animals	birds	Meliphagidae	<i>Stomiopera unicolor</i>	white-gaped honeyeater		C		6
animals	birds	Meropidae	<i>Merops ornatus</i>	rainbow bee-eater		C		66
animals	birds	Monarchidae	<i>Grallina cyanoleuca</i>	magpie-lark		C		80
animals	birds	Monarchidae	<i>Monarcha melanopsis</i>	black-faced monarch		SL		3
animals	birds	Monarchidae	<i>Myiagra cyanoleuca</i>	satin flycatcher		SL		1
animals	birds	Monarchidae	<i>Myiagra inquieta</i>	restless flycatcher		C		12
animals	birds	Monarchidae	<i>Myiagra rubecula</i>	leaden flycatcher		C		64
animals	birds	Monarchidae	<i>Symposiachrus trivirgatus</i>	spectacled monarch		SL		3
animals	birds	Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian pipit		C		5
animals	birds	Nectariniidae	<i>Cinnyris jugularis</i>	olive-backed sunbird		C		32
animals	birds	Nectariniidae	<i>Dicaeum hirundinaceum</i>	mistletoebird		C		18
animals	birds	Neosittidae	<i>Daphoenositta chrysoptera</i>	varied sittella		C		2
animals	birds	Oriolidae	<i>Oriolus sagittatus</i>	olive-backed oriole		C		23
animals	birds	Oriolidae	<i>Sphecotheres vieillotii</i>	Australasian figbird		C		24
animals	birds	Otididae	<i>Ardeotis australis</i>	Australian bustard		C		10
animals	birds	Pachycephalidae	<i>Colluricincla harmonica</i>	grey shrike-thrush		C		1
animals	birds	Pachycephalidae	<i>Colluricincla megarhyncha</i>	little shrike-thrush		C		12
animals	birds	Pachycephalidae	<i>Pachycephala pectoralis</i>	golden whistler		C		1
animals	birds	Pachycephalidae	<i>Pachycephala rufiventris</i>	rufous whistler		C		89
animals	birds	Pardalotidae	<i>Pardalotus striatus</i>	striated pardalote		C		51
animals	birds	Passeridae	<i>Passer domesticus</i>	house sparrow	Y			6
animals	birds	Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian pelican		C		17
animals	birds	Petroicidae	<i>Melanodryas cucullata</i>	hooded robin		C		1
animals	birds	Petroicidae	<i>Microeca fascinans</i>	jacky winter		C		10

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animals	birds	Petroicidae	<i>Microeca flavigaster</i>	lemon-bellied flycatcher		C		49
animals	birds	Petroicidae	<i>Petroica goodenovii</i>	red-capped robin		C		2
animals	birds	Petroicidae	<i>Poecilodryas superciliosa</i>	white-browed robin		C		1
animals	birds	Phalacrocoracidae	<i>Microcarbo melanoleucos</i>	little pied cormorant		C		35
animals	birds	Phalacrocoracidae	<i>Phalacrocorax carbo</i>	great cormorant		C		12
animals	birds	Phalacrocoracidae	<i>Phalacrocorax sulcirostris</i>	little black cormorant		C		31
animals	birds	Phalacrocoracidae	<i>Phalacrocorax varius</i>	pied cormorant		C		3
animals	birds	Phasianidae	<i>Coturnix ypsilophora</i>	brown quail		C		11
animals	birds	Pittidae	<i>Pitta versicolor</i>	noisy pitta		C		1
animals	birds	Podargidae	<i>Podargus strigoides</i>	tawny frogmouth		C		5
animals	birds	Podicipedidae	<i>Podiceps cristatus</i>	great crested grebe		C		8
animals	birds	Podicipedidae	<i>Tachybaptus novaehollandiae</i>	Australasian grebe		C		20
animals	birds	Pomatostomidae	<i>Pomatostomus temporalis</i>	grey-crowned babbler		C		8
animals	birds	Psittacidae	<i>Aprosmictus erythropterus</i>	red-winged parrot		C		26
animals	birds	Psittacidae	<i>Melopsittacus undulatus</i>	budgerigar		C		2
animals	birds	Psittacidae	<i>Platycercus adscitus</i>	pale-headed rosella		C		58
animals	birds	Psittacidae	<i>Trichoglossus chlorolepidotus</i>	scaly-breasted lorikeet		C		25
animals	birds	Psittacidae	<i>Trichoglossus moluccanus</i>	rainbow lorikeet		C		43
animals	birds	Ptilonorhynchidae	<i>Ptilonorhynchus maculatus</i>	spotted bowerbird		C		1
animals	birds	Ptilonorhynchidae	<i>Ptilonorhynchus nuchalis</i>	great bowerbird		C		29
animals	birds	Rallidae	<i>Amaurornis cinerea</i>	white-browed crane		C		3
animals	birds	Rallidae	<i>Amaurornis moluccana</i>	pale-vented bush-hen		C		7
animals	birds	Rallidae	<i>Fulica atra</i>	Eurasian coot		C		5
animals	birds	Rallidae	<i>Gallinula tenebrosa</i>	dusky moorhen		C		5
animals	birds	Rallidae	<i>Gallirallus philippensis</i>	buff-banded rail		C		6
animals	birds	Rallidae	<i>Porphyrio melanotus</i>	purple swamphen		C		2
animals	birds	Rallidae	<i>Porzana fluminea</i>	Australian spotted crane		C		1
animals	birds	Rallidae	<i>Porzana pusilla</i>	Baillon's crane		C		1
animals	birds	Rallidae	<i>Porzana tabuensis</i>	spotless crane		C		1
animals	birds	Recurvirostridae	<i>Himantopus himantopus</i>	black-winged stilt		C		4
animals	birds	Recurvirostridae	<i>Recurvirostra novaehollandiae</i>	red-necked avocet		C		1
animals	birds	Rhipiduridae	<i>Rhipidura albiscapa</i>	grey fantail		C		72
animals	birds	Rhipiduridae	<i>Rhipidura leucophrys</i>	willie wagtail		C		76
animals	birds	Rhipiduridae	<i>Rhipidura rufifrons</i>	rufous fantail		SL		2
animals	birds	Rhipiduridae	<i>Rhipidura rufiventris</i>	northern fantail		C		1
animals	birds	Scelopacidae	<i>Gallinago hardwickii</i>	Latham's snipe		SL		1
animals	birds	Strigidae	<i>Ninox boobook</i>	southern boobook		C		1
animals	birds	Strigidae	<i>Ninox connivens</i>	barking owl		C		8
animals	birds	Strigidae	<i>Ninox rufa queenslandica</i>	rufous owl (southern subspecies)		C		1
animals	birds	Sturnidae	<i>Aplonis metallica</i>	metallic starling		C		1
animals	birds	Threskiornithidae	<i>Platalea flavipes</i>	yellow-billed spoonbill		C		18
animals	birds	Threskiornithidae	<i>Platalea regia</i>	royal spoonbill		C		17
animals	birds	Threskiornithidae	<i>Plegadis falcinellus</i>	glossy ibis		SL		4
animals	birds	Threskiornithidae	<i>Threskiornis molucca</i>	Australian white ibis		C		34
animals	birds	Threskiornithidae	<i>Threskiornis spinicollis</i>	straw-necked ibis		C		39
animals	birds	Timaliidae	<i>Zosterops lateralis</i>	silveryeye		C		2

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animals	birds	Turnicidae	<i>Turnix maculosus</i>	red-backed button-quail		C		4
animals	birds	Turnicidae	<i>Turnix pyrrhorthorax</i>	red-chested button-quail		C		2
animals	birds	Turnicidae	<i>Turnix varius</i>	painted button-quail		C		1
animals	birds	Tytonidae	<i>Tyto delicatula</i>	eastern barn owl		C		2
animals	mammals	Cervidae	<i>Axis axis</i>	chital	Y			1
animals	mammals	Dasyuridae	<i>Dasyurus hallucatus</i>	northern quoll		C	E	2
animals	mammals	Leporidae	<i>Lepus europaeus</i>	European brown hare	Y			1
animals	mammals	Macropodidae	<i>Macropus giganteus</i>	eastern grey kangaroo		C		2
animals	mammals	Macropodidae	<i>Notamacropus agilis</i>	agile wallaby		C		2
animals	mammals	Macropodidae	<i>Petrogale assimilis</i>	allied rock-wallaby		C		5/5
animals	mammals	Macropodidae	<i>Petrogale inornata</i>	unadorned rock-wallaby		C		3/3
animals	mammals	Miniopteridae	<i>Miniopterus australis</i>	little bent-wing bat		C		1
animals	mammals	Miniopteridae	<i>Miniopterus schreibersii oceanensis</i>	eastern bent-wing bat		C		1
animals	mammals	Peramelidae	<i>Isoodon macrourus</i>	northern brown bandicoot		C		2/2
animals	mammals	Phascolarctidae	<i>Phascolarctos cinereus</i>	koala		V	V	1
animals	mammals	Pteropodidae	<i>Pteropus alecto</i>	black flying-fox		C		2/1
animals	mammals	Pteropodidae	<i>Pteropus scapulatus</i>	little red flying-fox		C		1
animals	mammals	Suidae	<i>Sus scrofa</i>	pig	Y			6
animals	mammals	Vespertilionidae	<i>Myotis macropus</i>	large-footed myotis		C		1
animals	ray-finned fishes	Ambassidae	<i>Ambassis agassizii</i>	Agassiz's glassfish				1
animals	ray-finned fishes	Ambassidae	<i>Ambassis agrammus</i>	sailfin glassfish				11
animals	ray-finned fishes	Ambassidae	<i>Ambassis species</i>	northwest glassfish				2
animals	ray-finned fishes	Anguillidae	<i>Anguilla reinhardtii</i>	longfin eel				40
animals	ray-finned fishes	Apogonidae	<i>Glossamia aprion</i>	mouth almighty				45
animals	ray-finned fishes	Ariidae	<i>Neoarius graeffei</i>	blue catfish				7
animals	ray-finned fishes	Atherinidae	<i>Craterocephalus stercusmuscarum</i>	flyspecked hardyhead				400
animals	ray-finned fishes	Belonidae	<i>Strongylura krefftii</i>	freshwater longtom				47
animals	ray-finned fishes	Centropomidae	<i>Lates calcarifer</i>	barramundi				188
animals	ray-finned fishes	Cichlidae	<i>Oreochromis mossambica</i>	Mozambique mouthbrooder	Y			4
animals	ray-finned fishes	Clupeidae	<i>Nematalosa erebi</i>	bony bream				518
animals	ray-finned fishes	Eleotridae	<i>Hypseleotris compressa</i>	empire gudgeon				67
animals	ray-finned fishes	Eleotridae	<i>Oxyeleotris lineolata</i>	sleepy cod				218
animals	ray-finned fishes	Gobiidae	<i>Awaous acritosus</i>	roman-nose goby				1
animals	ray-finned fishes	Hemiramphidae	<i>Arrhamphus sclerolepis</i>	snubnose garfish				7
animals	ray-finned fishes	Megalopidae	<i>Megalops cyprinoides</i>	oxeye herring				36
animals	ray-finned fishes	Melanotaeniidae	<i>Melanotaenia splendida splendida</i>	eastern rainbowfish				84
animals	ray-finned fishes	Mugilidae	<i>Mugil cephalus</i>	sea mullet				1
animals	ray-finned fishes	Osteoglossidae	<i>Scleropages jardinii</i>	northern saratoga				1
animals	ray-finned fishes	Plotosidae	<i>Neosilurus ater</i>	black catfish				35
animals	ray-finned fishes	Plotosidae	<i>Neosilurus hyrtlii</i>	Hyrtl's catfish				1
animals	ray-finned fishes	Poeciliidae	<i>Gambusia holbrooki</i>	mosquitofish	Y			1
animals	ray-finned fishes	Scatophagidae	<i>Scatophagus argus</i>	spotted scat				2
animals	ray-finned fishes	Terapontidae	<i>Amniataba percoides</i>	barred grunter				36
animals	ray-finned fishes	Terapontidae	<i>Hephaestus fuliginosus</i>	sooty grunter				22
animals	ray-finned fishes	Terapontidae	<i>Leiopotherapon unicolor</i>	spangled perch				6
animals	ray-finned fishes	Terapontidae	<i>Scortum parviceps</i>	smallhead grunter				3

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animals	ray-finned fishes	Toxotidae	<i>Toxotes chatareus</i>	sevenspot archerfish				20
animals	reptiles	Agamidae	<i>Diporiphora australis</i>	tommy roundhead		C		2/1
animals	reptiles	Boidae	<i>Antaresia maculosa</i>	spotted python		C		1/1
animals	reptiles	Carphodactylidae	<i>Nephrurus asper</i>	spiny knob-tailed gecko		C		1
animals	reptiles	Chelidae	<i>Chelodina canni</i>	Cann's longneck turtle		C		1
animals	reptiles	Chelidae	<i>Elseya irwini</i>	Irwin's turtle		C		1
animals	reptiles	Chelidae	<i>Emydura macquarii krefftii</i>	Krefft's river turtle		C		1
animals	reptiles	Colubridae	<i>Dendrelaphis punctulatus</i>	green tree snake		C		2
animals	reptiles	Colubridae	<i>Tropidonophis mairii</i>	freshwater snake		C		1
animals	reptiles	Diplodactylidae	<i>Oedura castelnaui</i>	northern velvet gecko		C		1
animals	reptiles	Elapidae	<i>Antaioserpens albiceps</i>	north-eastern plain-nosed burrowing snake		C		1/1
animals	reptiles	Elapidae	<i>Demansia torquata</i>	collared whipsnake		C		1
animals	reptiles	Elapidae	<i>Furina diadema</i>	red-naped snake		C		1
animals	reptiles	Elapidae	<i>Pseudonaja textilis</i>	eastern brown snake		C		1
animals	reptiles	Elapidae	<i>Vermicella annulata</i>	bandy-bandy		C		1/1
animals	reptiles	Gekkonidae	<i>Gehyra dubia</i>	dubious dtella		C		2/1
animals	reptiles	Gekkonidae	<i>Heteronotia binoei</i>	Bynoe's gecko		C		4
animals	reptiles	Pygopodidae	<i>Delma tincta</i>	excitable delma		C		1/1
animals	reptiles	Pygopodidae	<i>Lialis burtonis</i>	Burton's legless lizard		C		2/2
animals	reptiles	Scincidae	<i>Carlia jarnoldae</i>	lined rainbow-skink		C		1
animals	reptiles	Scincidae	<i>Carlia rubigo</i>	orange-flanked rainbow skink		C		2
animals	reptiles	Scincidae	<i>Carlia schmeltzii</i>	robust rainbow-skink		C		1
animals	reptiles	Scincidae	<i>Cryptoblepharus adamsi</i>	Adams' snake-eyed skink		C		1
animals	reptiles	Scincidae	<i>Cryptoblepharus pulcher pulcher</i>	elegant snake-eyed skink		C		1
animals	reptiles	Scincidae	<i>Cryptoblepharus sp.</i>			C		1
animals	reptiles	Scincidae	<i>Ctenotus spaldingi</i>	straight-browed ctenotus		C		1
animals	reptiles	Scincidae	<i>Glaphyromorphus punctulatus</i>	fine-spotted mulch-skink		C		4/4
animals	reptiles	Scincidae	<i>Lampropholis delicata</i>	dark-flecked garden sunskink		C		3/3
animals	reptiles	Scincidae	<i>Morethia taeniopleura</i>	fire-tailed skink		C		2
animals	reptiles	Scincidae	<i>Pygmaeascincus timlowi</i>	dwarf litter-skink		C		1
animals	reptiles	Typhlopidae	<i>Anilius affinis</i>	small-headed blind snake		C		1
animals	reptiles	Varanidae	<i>Varanus storri</i>	Storr's monitor		C		2
plants	land plants	Acanthaceae	<i>Asystasia gangetica subsp. gangetica</i>		Y			1/1
plants	land plants	Acanthaceae	<i>Hygrophila angustifolia</i>			C		1/1
plants	land plants	Acanthaceae	<i>Hypoestes floribunda var. floribunda</i>			C		1/1
plants	land plants	Acanthaceae	<i>Nelsonia campestris</i>			C		1/1
plants	land plants	Acanthaceae	<i>Rostellularia adscendens subsp. adscendens</i>			C		1/1
plants	land plants	Acanthaceae	<i>Ruellia tuberosa</i>		Y			1/1
plants	land plants	Acanthaceae	<i>Thunbergia fragrans</i>		Y			4/4
plants	land plants	Acanthaceae	<i>Thunbergia grandiflora</i>	sky flower	Y			1/1
plants	land plants	Alismataceae	<i>Caldesia oligococca</i>			C		1/1
plants	land plants	Amaranthaceae	<i>Alternanthera angustifolia</i>			C		1/1
plants	land plants	Amaranthaceae	<i>Alternanthera denticulata var. micrantha</i>			C		4/4
plants	land plants	Amaranthaceae	<i>Alternanthera ficoidea</i>		Y			2/2
plants	land plants	Amaranthaceae	<i>Alternanthera nana</i>	hairy joyweed		C		1/1

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plants	land plants	Amaranthaceae	<i>Alternanthera nodiflora</i>	joyweed		C		1/1
plants	land plants	Amaranthaceae	<i>Amaranthus spinosus</i>	needle burr	Y			2/2
plants	land plants	Amaranthaceae	<i>Deeringia amaranthoides</i>	redberry		C		3/3
plants	land plants	Amaranthaceae	<i>Guilleminea densa</i>	small matweed	Y			1/1
plants	land plants	Anacardiaceae	<i>Pleiogynium timorense</i>	Burdekin plum		C		1/1
plants	land plants	Apocynaceae	<i>Alyxia spicata</i>			C		1/1
plants	land plants	Apocynaceae	<i>Catharanthus roseus</i>	pink periwinkle	Y			1/1
plants	land plants	Apocynaceae	<i>Cryptostegia grandiflora</i>	rubber vine	Y			7/2
plants	land plants	Apocynaceae	<i>Nerium oleander</i>	oleander	Y			1/1
plants	land plants	Apocynaceae	<i>Parsonsia lanceolata</i>	northern silkpod		C		1/1
plants	land plants	Apocynaceae	<i>Vincetoxicum erectum</i>			C		5/5
plants	land plants	Apocynaceae	<i>Wrightia saligna</i>			C		1/1
plants	land plants	Araceae	<i>Lemna aequinoctialis</i>	common duckweed		C		1/1
plants	land plants	Asteraceae	<i>Acanthospermum hispidum</i>	star burr	Y			1/1
plants	land plants	Asteraceae	<i>Acmella grandiflora</i> var. <i>brachyglossa</i>			C		1/1
plants	land plants	Asteraceae	<i>Blumea saxatilis</i>			C		1/1
plants	land plants	Asteraceae	<i>Camptacra barbata</i>			C		1/1
plants	land plants	Asteraceae	<i>Centipeda borealis</i>			C		2/2
plants	land plants	Asteraceae	<i>Chrysocephalum apiculatum</i>	yellow buttons		C		2/2
plants	land plants	Asteraceae	<i>Coronidium lanuginosum</i>			C		1/1
plants	land plants	Asteraceae	<i>Cyanthillium cinereum</i>			C		1/1
plants	land plants	Asteraceae	<i>Eclipta prostrata</i>	white eclipta	Y			3/3
plants	land plants	Asteraceae	<i>Gynura drymophila</i> var. <i>drymophila</i>			C		1/1
plants	land plants	Asteraceae	<i>Parthenium hysterophorus</i>	parthenium weed	Y			1/1
plants	land plants	Asteraceae	<i>Peripleura scabra</i>			C		2/2
plants	land plants	Asteraceae	<i>Pseudognaphalium luteoalbum</i>	Jersey cudweed		C		1/1
plants	land plants	Asteraceae	<i>Pterocaulon serrulatum</i> var. <i>serrulatum</i>			C		2/2
plants	land plants	Asteraceae	<i>Sphaeranthus indicus</i>			C		1/1
plants	land plants	Asteraceae	<i>Synedrella nodiflora</i>		Y			1/1
plants	land plants	Asteraceae	<i>Xanthium occidentale</i>		Y			1/1
plants	land plants	Asteraceae	<i>Xerochrysum bracteatum</i>	golden everlasting daisy		C		1/1
plants	land plants	Asteraceae	<i>Xerochrysum bracteatum</i> subsp. (<i>Mount Elliot A.R.Bean 3593</i>)			C		1/1
plants	land plants	Bignoniaceae	<i>Dolichandrone alternifolia</i>			C		1/1
plants	land plants	Bignoniaceae	<i>Pandorea pandorana</i>	wonga vine		C		1/1
plants	land plants	Bombacaceae	<i>Lagunaria queenslandica</i>			C		2/2
plants	land plants	Boraginaceae	<i>Cordia dichotoma</i>			C		1/1
plants	land plants	Boraginaceae	<i>Ehretia grahamii</i>			C		1/1
plants	land plants	Boraginaceae	<i>Ehretia membranifolia</i>	weeping koda		C		1/1
plants	land plants	Boraginaceae	<i>Heliotropium ovalifolium</i>			C		2/2
plants	land plants	Byttneriaceae	<i>Hannafordia shanesii</i>			C		1/1
plants	land plants	Caesalpiniaceae	<i>Chamaecrista absus</i> var. <i>absus</i>			C		2/2
plants	land plants	Caesalpiniaceae	<i>Lysiphyllum hookeri</i>	Queensland ebony		C		1/1
plants	land plants	Caesalpiniaceae	<i>Parkinsonia aculeata</i>	parkinsonia	Y			2/2
plants	land plants	Caesalpiniaceae	<i>Senna gaudichaudii</i>			C		1/1
plants	land plants	Campanulaceae	<i>Lobelia quadrangularis</i>			C		1/1

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plants	land plants	Campanulaceae	<i>Wahlenbergia caryophylloides</i>			C		1/1
plants	land plants	Capparaceae	<i>Capparis canescens</i>			C		1/1
plants	land plants	Caryophyllaceae	<i>Polycarpaea spirostylis subsp. spirostylis</i>			C		1/1
plants	land plants	Casuarinaceae	<i>Casuarina cunninghamiana subsp. cunninghamiana</i>			C		1/1
plants	land plants	Celastraceae	<i>Denhamia cunninghamii</i>			C		2/2
plants	land plants	Celastraceae	<i>Denhamia oleaster</i>			C		1/1
plants	land plants	Celastraceae	<i>Elaeodendron melanocarpum</i>			C		1/1
plants	land plants	Chenopodiaceae	<i>Chenopodium album</i>	fat-hen	Y			2/2
plants	land plants	Chenopodiaceae	<i>Dysphania glomulifera subsp. glomulifera</i>			C		1/1
plants	land plants	Cleomaceae	<i>Arivela viscosa</i>			C		1/1
plants	land plants	Cleomaceae	<i>Tarenaya aculeata</i>		Y			1/1
plants	land plants	Clusiaceae	<i>Hypericum gramineum</i>			C		1/1
plants	land plants	Cochlospermaceae	<i>Cochlospermum gillivraei</i>			C		2/2
plants	land plants	Combretaceae	<i>Terminalia sericocarpa</i>	damson		C		1/1
plants	land plants	Convolvulaceae	<i>Argyreia nervosa</i>		Y			2/2
plants	land plants	Convolvulaceae	<i>Distimake quinquefolius</i>		Y			2/2
plants	land plants	Convolvulaceae	<i>Evolvulus nummularius</i>		Y			1/1
plants	land plants	Convolvulaceae	<i>Ipomoea abrupta</i>			C		1/1
plants	land plants	Convolvulaceae	<i>Ipomoea aquatica</i>			C		1/1
plants	land plants	Convolvulaceae	<i>Ipomoea eriocarpa</i>			C		1/1
plants	land plants	Convolvulaceae	<i>Ipomoea funicularis</i>			C		1/1
plants	land plants	Convolvulaceae	<i>Jacquemontia paniculata</i>			C		1/1
plants	land plants	Convolvulaceae	<i>Operculina turpethum</i>			C		1/1
plants	land plants	Convolvulaceae	<i>Xenostegia tridentata</i>			C		1/1
plants	land plants	Cornaceae	<i>Alangium polyosmoides subsp. tomentosum</i>			C		1/1
plants	land plants	Cucurbitaceae	<i>Cucumis anguria var. anguria</i>	West Indian gherkin	Y			1/1
plants	land plants	Cucurbitaceae	<i>Diplocyclos palmatus subsp. affinis</i>			C		1/1
plants	land plants	Cucurbitaceae	<i>Luffa aegyptiaca</i>			C		1/1
plants	land plants	Cyperaceae	<i>Cyperus bulbosus</i>			C		1/1
plants	land plants	Cyperaceae	<i>Cyperus concinnus</i>			C		1/1
plants	land plants	Cyperaceae	<i>Cyperus distans</i>			C		1/1
plants	land plants	Cyperaceae	<i>Cyperus iria</i>			C		1/1
plants	land plants	Cyperaceae	<i>Cyperus nervulosus</i>			C		1/1
plants	land plants	Cyperaceae	<i>Cyperus perangustus</i>			C		1/1
plants	land plants	Cyperaceae	<i>Cyperus platystylis</i>			C		1/1
plants	land plants	Cyperaceae	<i>Cyperus procerus</i>			C		1/1
plants	land plants	Cyperaceae	<i>Cyperus scariosus</i>			C		1/1
plants	land plants	Cyperaceae	<i>Eleocharis geniculata</i>			C		1/1
plants	land plants	Cyperaceae	<i>Fimbristylis bisumbellata</i>			C		1/1
plants	land plants	Cyperaceae	<i>Fimbristylis dichotoma</i>	common fringe-rush		C		1/1
plants	land plants	Cyperaceae	<i>Fimbristylis littoralis</i>			C		1/1
plants	land plants	Cyperaceae	<i>Fimbristylis sieberiana</i>			C		1/1
plants	land plants	Cyperaceae	<i>Gahnia aspera</i>			C		1/1
plants	land plants	Cyperaceae	<i>Schoenus falcatus</i>			C		1/1
plants	land plants	Cyperaceae	<i>Scleria sphacelata</i>			C		2/2
plants	land plants	Droseraceae	<i>Drosera finlaysoniana</i>			C		1/1

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plants	land plants	Ebenaceae	<i>Diospyros geminata</i>	scaly ebony		C		1/1
plants	land plants	Ebenaceae	<i>Diospyros humilis</i>	small-leaved ebony		C		1/1
plants	land plants	Ebenaceae	<i>Diospyros laurina</i>			C		1/1
plants	land plants	Euphorbiaceae	<i>Acalypha eremorum</i>	soft acalypha		C		2/2
plants	land plants	Euphorbiaceae	<i>Claoxylon tenerifolium subsp. tenerifolium</i>			C		1/1
plants	land plants	Euphorbiaceae	<i>Croton</i>					1/1
plants	land plants	Euphorbiaceae	<i>Croton arnhemicus</i>			C		1/1
plants	land plants	Euphorbiaceae	<i>Croton pheballoides</i>	narrow-leaved croton		C		1/1
plants	land plants	Euphorbiaceae	<i>Euphorbia bifida</i>			C		1/1
plants	land plants	Euphorbiaceae	<i>Jatropha gossypifolia</i>	bellyache bush	Y			2/2
plants	land plants	Euphorbiaceae	<i>Mallotus philippensis</i>	red kamala		C		2/2
plants	land plants	Euphorbiaceae	<i>Ricinus communis</i>	castor oil bush	Y			5/1
plants	land plants	Fabaceae	<i>Abrus precatorius subsp. precatorius</i>			C		1/1
plants	land plants	Fabaceae	<i>Aeschynomene americana var. glandulosa</i>		Y			1/1
plants	land plants	Fabaceae	<i>Aeschynomene indica</i>	budda pea		C		1/1
plants	land plants	Fabaceae	<i>Aeschynomene villosa</i>		Y			1/1
plants	land plants	Fabaceae	<i>Alysicarpus bupleurifolius</i>	sweet alys	Y			1/1
plants	land plants	Fabaceae	<i>Alysicarpus ovalifolius</i>		Y			1/1
plants	land plants	Fabaceae	<i>Alysicarpus vaginalis</i>		Y			1/1
plants	land plants	Fabaceae	<i>Canavalia papuana</i>	wild jack bean		C		1/1
plants	land plants	Fabaceae	<i>Centrosema molle</i>		Y			1/1
plants	land plants	Fabaceae	<i>Crotalaria aridicola subsp. aridicola</i>			C		1/1
plants	land plants	Fabaceae	<i>Crotalaria gorensis</i>	gambia pea	Y			1/1
plants	land plants	Fabaceae	<i>Crotalaria laburnifolia</i>		Y			1/1
plants	land plants	Fabaceae	<i>Crotalaria medicaginea var. medicaginea</i>			C		1/1
plants	land plants	Fabaceae	<i>Crotalaria mitchellii subsp. mitchellii</i>			C		1/1
plants	land plants	Fabaceae	<i>Crotalaria montana var. exserta</i>			C		1/1
plants	land plants	Fabaceae	<i>Crotalaria pallida var. obovata</i>		Y			3/3
plants	land plants	Fabaceae	<i>Crotalaria quinquefolia</i>			C		1/1
plants	land plants	Fabaceae	<i>Crotalaria retusa var. retusa</i>		Y			1/1
plants	land plants	Fabaceae	<i>Crotalaria sessiliflora var. anthylloides</i>			C		1/1
plants	land plants	Fabaceae	<i>Crotalaria verrucosa</i>			C		1/1
plants	land plants	Fabaceae	<i>Cullen badocanum</i>			C		3/3
plants	land plants	Fabaceae	<i>Desmodium scorpiurus</i>		Y			1/1
plants	land plants	Fabaceae	<i>Flemingia lineata</i>			C		1/1
plants	land plants	Fabaceae	<i>Galactia</i>					1/1
plants	land plants	Fabaceae	<i>Galactia tenuiflora var. lucida</i>			C		2/2
plants	land plants	Fabaceae	<i>Glycine</i>					1/1
plants	land plants	Fabaceae	<i>Hovea longipes</i>	brush hovea		C		1/1
plants	land plants	Fabaceae	<i>Indigofera</i>					1/1
plants	land plants	Fabaceae	<i>Indigofera linifolia</i>			C		1/1
plants	land plants	Fabaceae	<i>Indigofera pratensis</i>			C		1/1
plants	land plants	Fabaceae	<i>Indigofera tryonii</i>			C		1/1
plants	land plants	Fabaceae	<i>Macroptilium lathyroides</i>		Y			1/1
plants	land plants	Fabaceae	<i>Millettia pinnata</i>			C		1/1
plants	land plants	Fabaceae	<i>Mucuna gigantea</i>	burny bean		C		1/1

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plants	land plants	Fabaceae	<i>Tephrosia</i>					1/1
plants	land plants	Fabaceae	<i>Tephrosia brachyodon</i> var. <i>longifolia</i>			C		2/2
plants	land plants	Fabaceae	<i>Tephrosia filipes</i> subsp. <i>filipes</i>			C		1/1
plants	land plants	Fabaceae	<i>Tephrosia macrostachya</i>			C		1/1
plants	land plants	Fabaceae	<i>Uraria lagopodioides</i>			C		1/1
plants	land plants	Fabaceae	<i>Vigna radiata</i> var. <i>sublobata</i>			C		1/1
plants	land plants	Fabaceae	<i>Vigna</i> sp. (Greta Creek R.J.Lawn+ AQ532201)			C		3/3
plants	land plants	Fabaceae	<i>Vigna</i> sp. (Station Creek R.J.Lawn CQ3284)			C		2/2
plants	land plants	Fabaceae	<i>Zornia muelleriana</i> subsp. <i>muelleriana</i>			C		1/1
plants	land plants	Fabaceae	<i>Zornia muriculata</i> subsp. <i>angustata</i>			C		3/3
plants	land plants	Goodeniaceae	<i>Goodenia pilosa</i>			C		1/1
plants	land plants	Goodeniaceae	<i>Goodenia rosulata</i>			C		1/1
plants	land plants	Haloragaceae	<i>Gonocarpus acanthocarpus</i>			C		1/1
plants	land plants	Haloragaceae	<i>Myriophyllum verrucosum</i>	water milfoil		C		1/1
plants	land plants	Helicteraceae	<i>Helicteres semiglabra</i>			C		1/1
plants	land plants	Hemerocallidaceae	<i>Dianella caerulea</i>			C		2/2
plants	land plants	Hydrocharitaceae	<i>Hydrilla verticillata</i>	hydrilla		C		1/1
plants	land plants	Hydrocharitaceae	<i>Hydrocharis dubia</i>	frogbit	Y			1/1
plants	land plants	Hydrocharitaceae	<i>Ottelia alismoides</i>			C		1/1
plants	land plants	Hydrocharitaceae	<i>Ottelia ovalifolia</i> subsp. <i>ovalifolia</i>			C		1/1
plants	land plants	Lamiaceae	<i>Basilicum polystachyon</i>			C		2/2
plants	land plants	Lamiaceae	<i>Clerodendrum floribundum</i>			C		5/5
plants	land plants	Lamiaceae	<i>Coleus graveolens</i>			C		1/1
plants	land plants	Lamiaceae	<i>Coleus scutellarioides</i>			C		1/1
plants	land plants	Lamiaceae	<i>Leucas decemdentata</i>			C		1/1
plants	land plants	Lamiaceae	<i>Leucas lavandulifolia</i>		Y			1/1
plants	land plants	Lamiaceae	<i>Mesosphaerum suaveolens</i>		Y			1/1
plants	land plants	Lamiaceae	<i>Ocimum americanum</i>		Y			2/2
plants	land plants	Lamiaceae	<i>Pityrodia salviiifolia</i>	pityrodia		C		1/1
plants	land plants	Lamiaceae	<i>Premna dallachyana</i>			C		1/1
plants	land plants	Lamiaceae	<i>Premna serratifolia</i>			C		1/1
plants	land plants	Lamiaceae	<i>Teucrium modestum</i>			C		2/2
plants	land plants	Lauraceae	<i>Cryptocarya triplinervis</i> var. <i>triplinervis</i>			C		2/2
plants	land plants	Lauraceae	<i>Litsea glutinosa</i>			C		2/2
plants	land plants	Laxmanniaceae	<i>Lomandra longifolia</i>			C		1/1
plants	land plants	Lentibulariaceae	<i>Utricularia aurea</i>	golden bladderwort		C		1/1
plants	land plants	Lentibulariaceae	<i>Utricularia stellaris</i>			C		1/1
plants	land plants	Loranthaceae	<i>Lysiana subfalcata</i>			C		1/1
plants	land plants	Lythraceae	<i>Ammannia multiflora</i>	jerry-jerry		C		1/1
plants	land plants	Malvaceae	<i>Abutilon auritum</i>	Chinese lantern		C		1/1
plants	land plants	Malvaceae	<i>Abutilon guineense</i>		Y			1/1
plants	land plants	Malvaceae	<i>Abutilon micropetalum</i>			C		1/1
plants	land plants	Malvaceae	<i>Hibiscus krichauffianus</i>			C		1/1
plants	land plants	Malvaceae	<i>Hibiscus panduriformis</i>			C		2/2
plants	land plants	Malvaceae	<i>Hibiscus vitifolius</i>			C		1/1
plants	land plants	Malvaceae	<i>Sida acuta</i>	spinyhead sida	Y			1/1

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plants	land plants	Malvaceae	<i>Sida hackettiana</i>			C		1/1
plants	land plants	Malvaceae	<i>Urena lobata</i>	urena weed	Y			1/1
plants	land plants	Marsileaceae	<i>Marsilea mutica</i>	shiny nardoo		C		1/1
plants	land plants	Martyniaceae	<i>Martynia annua</i>	small-fruited devil's claw	Y			2/2
plants	land plants	Menispermaceae	<i>Pachygone ovata</i>			C		1/1
plants	land plants	Mimosaceae	<i>Acacia hemsleyi</i>			C		1/1
plants	land plants	Mimosaceae	<i>Acacia jackesiana</i>			C		1/1
plants	land plants	Mimosaceae	<i>Acacia leptostachya</i>	Townsville wattle		C		1/1
plants	land plants	Mimosaceae	<i>Acacia tephrina</i>			C		2/2
plants	land plants	Mimosaceae	<i>Desmanthus leptophyllus</i>		Y			1/1
plants	land plants	Mimosaceae	<i>Leucaena leucocephala</i>		Y			3
plants	land plants	Mimosaceae	<i>Leucaena leucocephala subsp. leucocephala</i>		Y			1/1
plants	land plants	Mimosaceae	<i>Neptunia gracilis forma gracilis</i>			C		1/1
plants	land plants	Mimosaceae	<i>Neptunia major</i>			C		3/3
plants	land plants	Mimosaceae	<i>Neptunia monosperma</i>			C		1/1
plants	land plants	Mimosaceae	<i>Senegalia</i>					1/1
plants	land plants	Mimosaceae	<i>Vachellia farnesiana</i>		Y			1/1
plants	land plants	Molluginaceae	<i>Glinus lotoides</i>	hairy carpet weed		C		1/1
plants	land plants	Molluginaceae	<i>Glinus oppositifolius</i>			C		1/1
plants	land plants	Molluginaceae	<i>Mollugo verticillata</i>		Y			2/2
plants	land plants	Moraceae	<i>Ficus rubiginosa forma rubiginosa</i>			C		1/1
plants	land plants	Myrsinaceae	<i>Lysimachia ovalis</i>			C		2/2
plants	land plants	Myrtaceae	<i>Corymbia clarksoniana</i>			C		2/2
plants	land plants	Myrtaceae	<i>Corymbia dallachiana</i>			C		2/2
plants	land plants	Myrtaceae	<i>Corymbia lamprophylla</i>			C		1/1
plants	land plants	Myrtaceae	<i>Corymbia leichhardtii</i>	rustyjacket		C		1/1
plants	land plants	Myrtaceae	<i>Eucalyptus brownii</i>	Reid River box		C		1/1
plants	land plants	Myrtaceae	<i>Eucalyptus drepanophylla</i>			C		1/1
plants	land plants	Myrtaceae	<i>Eucalyptus persistens</i>			C		1/1
plants	land plants	Myrtaceae	<i>Eucalyptus platyphylla</i>	poplar gum		C		2/2
plants	land plants	Myrtaceae	<i>Eucalyptus raveretiana</i>	black ironbox		C	V	1/1
plants	land plants	Myrtaceae	<i>Eucalyptus shirleyi</i>			C		1/1
plants	land plants	Myrtaceae	<i>Eucalyptus xanthoclada</i>	yellow-branched ironbark		C		2/2
plants	land plants	Myrtaceae	<i>Gossia bidwillii</i>			C		4/4
plants	land plants	Myrtaceae	<i>Leptospermum anfractum</i>			C		1/1
plants	land plants	Myrtaceae	<i>Lophostemon grandiflorus subsp. riparius</i>			C		5/5
plants	land plants	Myrtaceae	<i>Melaleuca bracteata</i>			C		3/3
plants	land plants	Myrtaceae	<i>Melaleuca leucadendra</i>	broad-leaved tea-tree		C		1/1
plants	land plants	Myrtaceae	<i>Melaleuca nervosa</i>			C		4/4
plants	land plants	Myrtaceae	<i>Melaleuca viminalis</i>			C		1/1
plants	land plants	Myrtaceae	<i>Rhodomyrtus trineura subsp. trineura</i>			C		1/1
plants	land plants	Myrtaceae	<i>Syzygium cumini</i>		Y			1/1
plants	land plants	Najadaceae	<i>Najas tenuifolia</i>	water nymph		C		1/1
plants	land plants	Nelumbonaceae	<i>Nelumbo nucifera</i>	pink waterlily		C		2/2
plants	land plants	Nyctaginaceae	<i>Pisonia aculeata</i>	thorny pisonia		C		2/2
plants	land plants	Orchidaceae	<i>Cymbidium canaliculatum</i>			C		1/1

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plants	land plants	Papaveraceae	<i>Argemone ochroleuca subsp. ochroleuca</i>	Mexican poppy	Y			1/1
plants	land plants	Passifloraceae	<i>Passiflora foetida</i>		Y			1/1
plants	land plants	Passifloraceae	<i>Passiflora suberosa subsp. litoralis</i>		Y			1/1
plants	land plants	Phrymaceae	<i>Glossostigma diandrum</i>				C	1/1
plants	land plants	Phyllanthaceae	<i>Antidesma parvifolium</i>				C	1/1
plants	land plants	Phyllanthaceae	<i>Breynia oblongifolia</i>				C	2/2
plants	land plants	Phyllanthaceae	<i>Bridelia leichhardtii</i>				C	1/1
plants	land plants	Phyllanthaceae	<i>Flueggea virosa subsp. melanthesoides</i>				C	3/3
plants	land plants	Phyllanthaceae	<i>Phyllanthus carpentariae</i>				C	1/1
plants	land plants	Phyllanthaceae	<i>Phyllanthus maderaspatensis</i>				C	1/1
plants	land plants	Phyllanthaceae	<i>Phyllanthus reticulatus</i>				C	1/1
plants	land plants	Phyllanthaceae	<i>Poranthera microphylla</i>	small poranthera			C	1/1
plants	land plants	Picrodendraceae	<i>Dissiliaria indistincta</i>				C	1/1
plants	land plants	Picrodendraceae	<i>Petalostigma banksii</i>				C	1/1
plants	land plants	Pittosporaceae	<i>Bursaria incana</i>				C	1/1
plants	land plants	Plantaginaceae	<i>Bacopa floribunda</i>				C	2/2
plants	land plants	Plantaginaceae	<i>Mecardonia procumbens</i>		Y			1/1
plants	land plants	Plantaginaceae	<i>Scoparia dulcis</i>	scoparia	Y			2/2
plants	land plants	Poaceae	<i>Alloteropsis cimicina</i>				C	1/1
plants	land plants	Poaceae	<i>Alloteropsis semialata</i>	cockatoo grass			C	1/1
plants	land plants	Poaceae	<i>Aristida holathera var. holathera</i>				C	1/1
plants	land plants	Poaceae	<i>Arundinella setosa</i>				C	1/1
plants	land plants	Poaceae	<i>Bothriochloa bladhii subsp. bladhii</i>				C	2/2
plants	land plants	Poaceae	<i>Bothriochloa decipiens var. cloncurransis</i>				C	1/1
plants	land plants	Poaceae	<i>Bothriochloa decipiens var. decipiens</i>				C	2/2
plants	land plants	Poaceae	<i>Cenchrus caliculatus</i>	hillside burrgrass			C	1/1
plants	land plants	Poaceae	<i>Cenchrus purpureus</i>		Y			1/1
plants	land plants	Poaceae	<i>Chionachne cyathopoda</i>	river grass			C	2/2
plants	land plants	Poaceae	<i>Chionachne hubbardiana</i>				C	1/1
plants	land plants	Poaceae	<i>Chloris inflata</i>	purpletop chloris	Y			1/1
plants	land plants	Poaceae	<i>Chloris pectinata</i>	comb chloris			C	1/1
plants	land plants	Poaceae	<i>Dactyloctenium radulans</i>	button grass			C	1/1
plants	land plants	Poaceae	<i>Dichanthium annulatum</i>	sheda grass	Y			1/1
plants	land plants	Poaceae	<i>Dichanthium fecundum</i>	curly bluegrass			C	3/3
plants	land plants	Poaceae	<i>Dichanthium sericeum subsp. polystachyum</i>				C	1/1
plants	land plants	Poaceae	<i>Dinebra ligulata</i>				C	1/1
plants	land plants	Poaceae	<i>Dinebra neesii</i>				C	2/2
plants	land plants	Poaceae	<i>Dinebra panicea var. brachiata</i>		Y			1/1
plants	land plants	Poaceae	<i>Echinochloa frumentacea</i>	Siberian millet	Y			1/1
plants	land plants	Poaceae	<i>Echinochloa turneriana</i>	channel millet			C	1/1
plants	land plants	Poaceae	<i>Elytrophorus spicatus</i>				C	1/1
plants	land plants	Poaceae	<i>Enneapogon lindleyanus</i>				C	1/1
plants	land plants	Poaceae	<i>Eragrostis elongata</i>				C	1/1
plants	land plants	Poaceae	<i>Eriochloa crebra</i>	spring grass			C	1/1
plants	land plants	Poaceae	<i>Eriochloa pseudoacrotricha</i>				C	1/1
plants	land plants	Poaceae	<i>Eulalia aurea</i>	silky browntop			C	1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	land plants	Poaceae	<i>Heteropogon triticeus</i>	giant speargrass		C		1/1
plants	land plants	Poaceae	<i>Hymenachne amplexicaulis</i> 'Olive'		Y			2
plants	land plants	Poaceae	<i>Leersia hexandra</i>	swamp rice grass		C		1/1
plants	land plants	Poaceae	<i>Melinis repens</i>	red natal grass	Y			1/1
plants	land plants	Poaceae	<i>Oryza australiensis</i>			C		1/1
plants	land plants	Poaceae	<i>Oryza meridionalis</i>			C		1/1
plants	land plants	Poaceae	<i>Oryza sativa</i>		Y			1/1
plants	land plants	Poaceae	<i>Oxychloris scariosa</i>	winged chloris		C		1/1
plants	land plants	Poaceae	<i>Panicum decompositum</i> var. <i>decompositum</i>			C		1/1
plants	land plants	Poaceae	<i>Panicum laevinode</i>	pepper grass		C		1/1
plants	land plants	Poaceae	<i>Panicum trachyrhachis</i>			C		1/1
plants	land plants	Poaceae	<i>Panicum trichoides</i>			C		1/1
plants	land plants	Poaceae	<i>Rottboellia cochinchinensis</i>		Y			2/2
plants	land plants	Poaceae	<i>Setaria surgens</i>			C		1/1
plants	land plants	Poaceae	<i>Sorghum arundinaceum</i>	Rhodesian Sudan grass	Y			1/1
plants	land plants	Poaceae	<i>Sorghum bicolor</i>	forage sorghum	Y			5/5
plants	land plants	Poaceae	<i>Sorghum halepense</i>	Johnson grass	Y			2/2
plants	land plants	Poaceae	<i>Sorghum nitidum</i> forma <i>aristatum</i>			C		1/1
plants	land plants	Poaceae	<i>Sorghum x alnum</i>		Y			2/2
plants	land plants	Poaceae	<i>Sporobolus actinocladus</i>	katoora grass		C		1/1
plants	land plants	Poaceae	<i>Sporobolus australasicus</i>			C		1/1
plants	land plants	Poaceae	<i>Sporobolus caroli</i>	fairy grass		C		1/1
plants	land plants	Poaceae	<i>Sporobolus jacquemontii</i>		Y			2/2
plants	land plants	Poaceae	<i>Themeda quadrivalvis</i>	grader grass	Y			4/1
plants	land plants	Poaceae	<i>Themeda triandra</i>	kangaroo grass		C		1/1
plants	land plants	Poaceae	<i>Urochloa subquadripara</i>		Y			1/1
plants	land plants	Poaceae	<i>Vacoparis laxiflorum</i>			C		1/1
plants	land plants	Polygonaceae	<i>Persicaria barbata</i>			C		1/1
plants	land plants	Polygonaceae	<i>Persicaria decipiens</i>	slender knotweed		C		1/1
plants	land plants	Polygonaceae	<i>Persicaria lapathifolia</i>	pale knotweed		C		2/2
plants	land plants	Polygonaceae	<i>Polygonum plebeium</i>	small knotweed		C		2/2
plants	land plants	Pontederiaceae	<i>Monochoria australasica</i>			C		1/1
plants	land plants	Pontederiaceae	<i>Monochoria cyanea</i>			C		1/1
plants	land plants	Proteaceae	<i>Grevillea glauca</i>	bushy's clothes peg		C		1/1
plants	land plants	Proteaceae	<i>Grevillea parallela</i>			C		1/1
plants	land plants	Proteaceae	<i>Grevillea striata</i>	beefwood		C		1/1
plants	land plants	Pteridaceae	<i>Adiantum atroviride</i>			C		1/1
plants	land plants	Pteridaceae	<i>Ceratopteris thalictroides</i>			C		1/1
plants	land plants	Pteridaceae	<i>Cheilanthes brownii</i>			C		2/2
plants	land plants	Pteridaceae	<i>Cheilanthes nudiuscula</i>			C		1/1
plants	land plants	Pteridaceae	<i>Cheilanthes pumilio</i>			C		1/1
plants	land plants	Pteridaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>			C		1/1
plants	land plants	Putranjivaceae	<i>Drypetes deplanchei</i>	grey boxwood		C		1/1
plants	land plants	Rhamnaceae	<i>Alphitonia excelsa</i>	soap tree		C		1/1
plants	land plants	Rhamnaceae	<i>Ziziphus mauritiana</i>	Indian jujube	Y			1/1
plants	land plants	Rubiaceae	<i>Dentella repens</i>	dentella		C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	land plants	Rubiaceae	<i>Larsenaikia ochreata</i>			C		1/1
plants	land plants	Rubiaceae	<i>Nauclea orientalis</i>	Leichhardt tree		C		1/1
plants	land plants	Rubiaceae	<i>Pavetta australiensis</i> var. <i>australiensis</i>			C		1/1
plants	land plants	Rubiaceae	<i>Psychotria daphnoides</i> var. <i>daphnoides</i>			C		1/1
plants	land plants	Rubiaceae	<i>Scleromitron galioides</i>			C		1/1
plants	land plants	Rubiaceae	<i>Spermacoce</i> sp. (Lorim Point A.Morton AM1237)			C		1/1
plants	land plants	Rubiaceae	<i>Timonius timon</i> var. <i>timon</i>			C		4/4
plants	land plants	Rutaceae	<i>Acronychia laevis</i>	glossy acronychia		C		1/1
plants	land plants	Salviniaceae	<i>Azolla pinnata</i>	fern azolla		C		1/1
plants	land plants	Salviniaceae	<i>Azolla rubra</i>			C		1/1
plants	land plants	Salviniaceae	<i>Salvinia molesta</i>	salvinia	Y			1/1
plants	land plants	Santalaceae	<i>Exocarpos latifolius</i>			C		1/1
plants	land plants	Sapindaceae	<i>Alectryon connatus</i>	grey birds-eye		C		1/1
plants	land plants	Sapindaceae	<i>Arytera divaricata</i>	coogera		C		1/1
plants	land plants	Sapindaceae	<i>Atalaya multiflora</i>	broad-leaved whitewood		C		1/1
plants	land plants	Sapindaceae	<i>Cardiospermum halicacabum</i> var. <i>halicacabum</i>		Y			1/1
plants	land plants	Sapindaceae	<i>Cupaniopsis anacardioides</i>	tuckeroo		C		2/2
plants	land plants	Sapindaceae	<i>Harpullia hillii</i>			C		2/2
plants	land plants	Sapotaceae	<i>Amorphospermum antilogum</i>			C		1/1
plants	land plants	Sapotaceae	<i>Planchonella cotinifolia</i> var. <i>pubescens</i>			C		1/1
plants	land plants	Scrophulariaceae	<i>Myoporum acuminatum</i>	coastal boobialla		C		1/1
plants	land plants	Solanaceae	<i>Datura inoxia</i>		Y			1/1
plants	land plants	Solanaceae	<i>Nicotiana glauca</i>	tree tobacco	Y			1/1
plants	land plants	Solanaceae	<i>Solanum ellipticum</i>	potato bush		C		2/2
plants	land plants	Solanaceae	<i>Solanum sporadotrichum</i>			NT		1/1
plants	land plants	Solanaceae	<i>Solanum torvum</i>	devil's fig	Y			1/1
plants	land plants	Sparrmanniaceae	<i>Corchorus olerorius</i>	jute		C		1/1
plants	land plants	Sparrmanniaceae	<i>Grewia australis</i>			C		1/1
plants	land plants	Sparrmanniaceae	<i>Grewia graniticola</i>			C		1/1
plants	land plants	Sparrmanniaceae	<i>Grewia savannicola</i>			C		1/1
plants	land plants	Stackhousiaceae	<i>Stackhousia intermedia</i>			C		1/1
plants	land plants	Sterculiaceae	<i>Brachychiton</i>					1/1
plants	land plants	Stylidiaceae	<i>Stylidium rotundifolium</i>			C		1/1
plants	land plants	Thymelaeaceae	<i>Pimelea sericostachya</i>			C		1/1
plants	land plants	Turneraceae	<i>Turnera ulmifolia</i>		Y			3/3
plants	land plants	Vitaceae	<i>Cissus cardiophylla</i>			C		1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992*.

The codes are Extinct (EX), Extinct in the Wild (PE), Critically Endangered (CR), Endangered (E), Vulnerable (V), Near Threatened (NT), Special Least Concern (SL) and Least Concern (C).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*.

The values of EPBC are Extinct (EX), Extinct in the Wild (XW), Critically Endangered (CE), Endangered (E), Vulnerable (V) and Conservation Dependent (CD).

Records - The first number indicates the total number of records of the taxon (wildlife records and species listings for selected areas).

This number is output as 99999 if it equals or exceeds this value. A second number located after a / indicates the number of specimen records for the taxon.

This number is output as 999 if it equals or exceeds this value.

Appendix C

BioCondition Survey Report

GHD Haughton Pipeline 2 Biocondition Survey

Introduction

This short report explains the method and results of a field based BioCondition survey along the proposed Haughton Pipeline 2 alignment. Map (GIS layers) files and a spreadsheet containing BioCondition results accompany this report.

Survey was conducted along the length of the alignment from the proposed pickup point in the Burdekin River near Mt Dalrymple to its end at the Upper Haughton from 15 to 28 March 2022. The weather was warm and dry and the ground layer was largely fertile making herbaceous plant identification relatively easy. Eighteen (18) BioCondition sites were surveyed along the alignment.

A number of limitations to the survey are discussed as well as sources of information used to accurately assign Regional Ecosystem codes to sections of the pipeline alignment.

GIS operations were carried out using QGIS (QGIS Development Team (2022)). Plant names and naturalised status follow Brown (2021).

Method - Desktop

Determining the location and number of sites

A verified and updated version of the V12 Regional Ecosystem map coverage (DES (2021)) developed by NRA (NRA (2021)) was intersected with the proposed pipeline alignment buffered 20m to match the expected 40m wide clearing footprint.

The area of each mapped RE and non-remnant area within this layer was calculated and used to create a list of Assessment Units (AUs) as per BioCondition guidelines (Eyre et al. (2015)). Two sites were proposed in each AU with an area of 2 ha or more and one site for the remaining AUs larger than 0.5ha (the size of a standard BioCondition plot).

Ideally, extensive AUs should be surveyed across their range of occurrence to capture condition differences due to management style and other variables.

RE mapping in 40m buffer

The pipeline alignment GIS layer was buffered 20m either side and this layer was divided along its length at mapped vegetation boundaries. Following field work and using a range of sources, RE codes were applied to these sections (some of these were modified to reflect boundaries encountered on the ground) of the buffered pipeline alignment. Sources used area given in Table 1. Field data collected as part of this project was used as the primary source of information in labelling sections with RE codes. Along inaccessible sections of the alignment, secondary and tertiary sources were used to infer the correct RE code for sections of the project area. In addition, various 1969 vintage aerial photograph frames (QAP1959013, QAP1958037 and QAP1956039) were used along with current satellite imagery (Department of Resources (Queensland) (2022)).

Table 1: Sources used in assigning RE codes to polygons

Source	Details	Importance	Reference
Field Data	Field observations made as part of this project, both quaternary level observations and BioCondition surveys.	Primary	This project
RE mapping V12	Most recent published version of State Regional Ecosystem mapping.	Secondary	DES (2021)
Land Unit Mapping	Land unit mapping derived from air photo interpretation, internal report to Burdekin Dry Tropics.	Secondary	Kahler (2010)
NRA Sites	Field observations provided in report to GHD on behalf of Townsville City Council.	Secondary	NRA (2021)
Landsystem Mapping	CSIRO land unit mapping from 1952, precursor and foundation to RE mapping in Queensland.	Tertiary	Christian et al. (1953)
Soils mapping	Soils mapping projects carried out by the State, typically includes details on soils structure and texture as well as landform information.	Tertiary	Reid and Baker (1984), Thompson et al. (1990)

Method - Field

BioCondition survey method

The pipeline was accessed by vehicle and on foot through various properties. Field survey method followed that outlined in Eyre et al. (2015). Tree heights were measured using a clinometer and laser rangefinder.

Linear (stream) sites were surveyed with the 100m tape situated at the toe of bank in the streambed and all measurements and surveys were conducted on the bank side of the tape (i.e. the nested plots within the BioCondition site were all shifted so a long edge sat on the 100m tape line). The outside box, normally 100m by 50m was elongated to 200m by adding 50m to each end of the 100m tape. The outside box extended out 25m upslope from the 100m tape.

Navigation and Map Correction Notes

Quaternary (rapid) sites were surveyed where confirmation of REs was required. Typically, plant layer height and cover notes were collected along with photographs.

Notes were made where navigation issues were encountered.

Results – Desktop

A number of Assessment Units were derived from the RE coverage as shown in Table 2. As the RE coverage was partly inaccurate, additional Assessment Units were created post-field to accommodate REs present on site but not found in the existing mapping. These are given at the bottom of Table 2.

Table 2: REs along alignment and corresponding Assessment Units

RE List by Area	Area (ha)	Assessment Units	Sites required
11.3.7 Total	32.37	AU1 (11.3.7)	2
11.3.35 Total	26.07	AU2 (11.3.35)	2
11.3.9 Total	24.34	AU3 (11.3.9)	2
11.3.30 Total	9.91	AU4 (11.3.30)	2
non-rem 11.3.35	5.44	AU5 (non-rem 11.3.35)	2
11.3.25b Total	3.44	AU6 (11.3.25b)	2
non-rem 11.3.7	2.86	AU7 (non-rem 11.3.7)	2
11.3.4a Total	2.63	AU8 (11.3.4a)	2
11.12.1 Total	2.41	AU9 (11.12.1)	2
11.3.10 Total	2.41	AU10 (11.3.10)	2
11.3.25 Total	1.46	AU11 (11.3.25)	1
non-rem 11.3.25	0.65	AU12 (non-rem 11.3.25)	1
		Total Sites Required:	22
REs excluded due to size restrictions			
11.3.35a Total	0.44	AU13 (11.3.35a)	1
11.3.13 Total	0.13	AU14 (11.3.13)	1
AUs added post-field			
non-rem 11.3.31	unknown	AU15 (non-rem 11.3.31)	-
11.3.31	unknown	AU16 (11.3.31)	-
non-rem 11.3.30	unknown	AU17 (non-rem 11.3.30)	-
non-rem 11.12.1	unknown	AU18 (non-rem 11.12.1)	-

Results – Field

REs and Assessment Units

A number of remnant REs were recognised in the field (Table 3). Non-remnant areas were assigned possible or original RE codes, however, these should be seen only as the most likely possibility based on what limited evidence was available. Attached GIS files (Digital Attachment 4 and Digital Attachment 5) label sections along the alignment and in the stockpile areas and tracks with Assessment Unit and RE codes as per Table 2 and Table 3.

Table 3: REs in the alignment

RE Code and AU Code	Short Description from REDD ¹	Concept as Used in this Report
11.3.4a AU8	<i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict. Occurs on deep, loose neutral to alkaline red or pale uniform sand or non-sodic texture contrast soil. This unit has very low subsoil salinity in all profiles (Burgess 2003). Floodplain (other than floodplain wetlands). (BVG1M: 9e)	<i>Corymbia tessellaris</i> dominated woodlands on loose sandy soils of (typically) abandoned levees.
11.3.7 AU1	<i>Corymbia</i> spp. open woodland on alluvial plains.	Woodlands including <i>Eucalyptus platyphylla</i> and <i>Corymbia clarksoniana</i> on loamy soils of active and abandoned levees.
11.3.31 AU16	<i>Ophiuros exaltatus</i> , <i>Dichanthium</i> spp. grassland on alluvial plains.	Wooded grasslands or very open woodlands in broad drainage depressions with heavy, sometimes gilgaied and cracking, clay soils. Typically wooded with <i>Eucalyptus platyphylla</i> or <i>Corymbia tessellaris</i> .
11.3.25b AU11	<i>Melaleuca leucadendra</i> and/or <i>M. fluviatilis</i> , <i>Nauclea orientalis</i> open forest. A range of other canopy or sub-canopy tree species also occur including <i>Pandanus tectorius</i> , <i>Livistona</i> spp., <i>Eucalyptus tereticornis</i> , <i>Corymbia tessellaris</i> , <i>Millettia pinnata</i> , <i>Casuarina cunninghamiana</i> , <i>Livistona decora</i> , <i>Lophostemon suaveolens</i> or <i>L. grandiflorus</i> , rainforest species and, along drainage lines, <i>Eucalyptus camaldulensis</i> or <i>E. tereticornis</i> . A ground layer of tall grasses such as <i>Chionachne cyathopoda</i> , <i>Mnesithea rottboellioides</i> or <i>Heteropogon triticeus</i> may be present. Often occurs on coarse sand spits and levees within larger river channels. Riverine wetland or fringing riverine wetland. (BVG1M: 22c)	Streams including bed, banks and levees with <i>Melaleuca</i> spp. and <i>Lophostemon grandiflorus</i> woodland. Typically a range of other tree species are present. Sandy and loamy soils.
11.3.35 AU2	<i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains.	Woodland of <i>Eucalyptus platyphylla</i> and / or <i>Corymbia tessellaris</i> woodland or open woodland on plains with duplex or clay sodic soils.

¹Queensland Herbarium (2021).

BioCondition Sites

Eighteen (18) BioCondition sites were surveyed (see Table 4).

Table 4: BioCondition survey sites and results

BioCondition Site Number	RE Assigned	Assessment Unit	BioCondition Site Score	BioCondition Landscape Score	BioCondition Total Score	BioCondition Class
BC01	11.3.7	AU1	41.5	20	61.5	2
BC02	Non-rem (Originally 11.3.7)	AU7	38	5	43	3
BC03	Non-rem (Originally 11.3.31)	AU15	0	4	4	4
BC04	11.3.35	AU2	47.5	19	66.5	2
BC05	Non-rem (Originally 11.3.31)	AU16	8	20	28	3
BC06	Non-rem (Originally 11.3.31)	AU16	13	20	23	3
BC07	11.3.35	AU2	33	20	53	3
BC08	11.3.35	AU2	48.5	19	67.5	2
BC09	11.3.35	AU2	45.5	19	64.5	2
BC10	Non-rem (Originally 11.3.30)	AU17	39.5	19	58.5	2
BC11	11.3.25b	AU6	53.5	20	73.5	2
BC12	11.3.35	AU2	43	20	63	2
BC13	11.3.4a	AU8	35	20	55	3
BC14	11.3.35	AU2	48	20	68	2
BC15	11.3.35	AU2	43.5	14	57.5	3
BC16	11.3.35	AU2	51	20	71	2
BC17	Non-rem (Originally 11.3.35)	AU5	5.5	0	5.5	4
BC18	11.3.25b	AU6	47.5	19	66.5	2

The grassland RE 11.3.31 was observed on site. Its remnant status was decided after comparing field data with the 3-part definition given in the *Vegetation Management Act 1999* (QLD). BioCondition benchmark information is not published for this RE. Figures used in assessing the condition of RE11.3.31 areas were drawn partly from the REDD entry for this RE and are presented in Table 5. Note that attributes relating to woody plants are not used in assessing grassland REs.

Table 5: Benchmark figures used in assessing the condition of RE11.3.31 areas.

Grass Species Richness	Forb Species Richness	Perennial Grass Cover	Litter Cover
8	6	70	30

Areas and overall proportions of each AU in both the buffered pipeline alignment and the stockpile areas and tracks are given in the attached spreadsheet ('GHD Haughton Pipeline 2 BioCondition Scores') in worksheet 'RE and AU Areas'. These areas were calculated in GIS (QGIS 2022) and summarised in MS Excel.

Attached GIS files (Digital Attachment 4 and Digital Attachment 5) contain area figures (in hectares) for both the buffered pipeline alignment and the stockpile areas.

Site photos, a zip folder showing GIS locations and BioCondition field data sheets are available from this [Dropbox folder](#):

(<https://www.dropbox.com/scl/fo/y89s9zj07y029jnq1rtu/h?dl=0&rlkey=plf4shok05up7sdzzgtulnskh>)

Survey Effort

GIS shapefiles showing the extent of on-ground survey, both the tracks traversed and the site data collected, are included in the attached GIS files (Digital Attachment 2 and Digital Attachment 3).

Limitations and Notes

Field survey

Access was limited in places due to lack of vehicle tracks or flooded areas. As a result, some stretches of the alignment were not well surveyed.

RE descriptions

The REDD descriptions of REs in the project area are sometimes not well defined, particularly with respect to typical landforms. Consequently, RE concepts used in assigning RE codes to plant communities found on site area explained in Table 3.

Remnant status of grasslands

The Remnant status of grassland REs is mostly only able to be determined by field survey (wooded REs can, to a degree, be identified as remnant through aerial photo and satellite image interpretation). Some grassland areas labelled as Remnant in the attached GIS layers may be non-remnant, depending on the composition of the ground layer.

Misalignment of provided map layers

Slight misalignment between on-ground cleared areas, especially vehicle tracks, and provided GIS layers indicating proposed haul roads were assumed to have resulted from hand digitising errors. In such cases, the provided alignments were regarded as indicative and that the intent was to use existing cleared property tracks and roads.

Category R area

Quaternary site Q19a was captured in an area marked by the State as Category R (regrowth watercourse) under the VM Act. It's not clear what this might mean in terms of regulation of activities under the VM Act.

Attachments

The following files are provided as separate digital attachments:

Digital Attachment 1- GHD Haughton Pipeline 2 BioCondition Scores

Digital Attachment 2- GHD Haughton Pipeline 2 Field Data Points

Digital Attachment 3- GHD Haughton Pipeline 2 Field Data Tracks

Digital Attachment 4- GHD Haughton Pipeline 2 Revised REs in Construction Footprint

Digital Attachment 5- GHD Haughton Pipeline 2 Stockpile Infrastructure Areas

Photographs and Field Data Sheets available for a limited time at this [Dropbox link](https://www.dropbox.com/scl/fo/y89s9zj07y029jng1frtu/h?dl=0&rlkey=plf4shok05up7sdzzgtulnsh):
<https://www.dropbox.com/scl/fo/y89s9zj07y029jng1frtu/h?dl=0&rlkey=plf4shok05up7sdzzgtulnsh>.

Document Information

GHD Haughton Pipeline 2 Biocondition Survey		
Version:	Contributor and Details:	Print/Release date
Final	Chris Kahler, author.	15 April 2022
Quality Checks:	Checked by:	Date:
Text, GIS files and attachments.	Chris Kahler	15 April 2022
Document File path:		
/Users/Chris/Documents/EcologicalInterpretation/Job Folders/GHD/GHD Haughton Pipeline stage 2/reporting/WorkingCopies/Report/GHD Haughton Pipeline 2 Biocondition Survey.docx		
Purpose:		
Report, attached spreadsheet and GIS layers prepared by Chris Kahler of Ecological Interpretation (ecointerp@mac.com) under contract by GHD to address client obligations regarding BioCondition survey along the Haughton 2 Pipeline, Lower Burdekin, North Queensland.		
Other:		
All GIS operations carried out in the production of this report used Quantum GIS open source software (QGIS Development Team (2022)).		
Plant names and naturalised status follow Brown (2021).		

References

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Appendix D

**Fauna and weed species identified during
field surveys**

Fauna species recorded in the Project area

Scientific name	Common name	Status		Total number of individuals	Observation type
		NC Act	EPBC Act		
Birds					
<i>Struthidea cinerea</i>	Apostlebird	LC	NL	6	Obs
<i>Anhinga novaehollandiae</i>	Australasian Darter	LC	NL	12	Obs
<i>Sphecotheres vieilloti</i>	Australasian Figbird	LC	NL	4	Obs
<i>Anthus novaeseelandiae</i>	Australasian Pipit	LC	NL	1	Obs
<i>Alectura lathamii</i>	Australian Brush-turkey	LC	NL	2	Obs
<i>Ardeotis australis</i>	Australian Bustard	LC	NL	8	Obs
<i>Cracticus tibicen</i>	Australian Magpie	LC	NL	6	Obs
<i>Pelecanus conspicillatus</i>	Australian Pelican	LC	NL	2	Obs
<i>Corvus coronoides</i>	Australian Raven	LC	NL	2	Obs
<i>Threskiornis molucca</i>	Australian White Ibis	LC	NL	5	Obs
<i>Ceyx azureus</i>	Azure Kingfisher	LC	NL	1	Obs
<i>Milvus migrans</i>	Black Kite	LC	NL	9	Obs
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	LC	NL	6	Obs
<i>Artamus cinereus</i>	Black-faced Woodswallow	LC	NL	2	Obs
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	LC	NL	1	Obs
<i>Poephila cincta cincta</i>	Black-throated Finch (southern)	E	E	2	Obs
<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater	LC	NL	9	Obs
<i>Dacelo leachii</i>	Blue-winged Kookaburra	LC	NL	18	Obs
<i>Haliastur indus</i>	Brahminy Kite	LC	NL	1	Obs
<i>Grus rubicunda</i>	Brolga	LC	NL	2	Obs
<i>Falco berigora</i>	Brown Falcon	LC	NL	2	Obs
<i>Accipiter fasciatus</i>	Brown Goshawk	LC	NL	1	Obs
<i>Lichmera indistincta</i>	Brown Honeyeater	LC	NL	1	Obs
<i>Coturnix ypsilophora</i>	Brown Quail	LC	NL	3	Obs
<i>Cincloramphus cruralis</i>	Brown Songlark	LC	NL	2	Obs
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater	LC	NL	1	Obs
<i>Cacomantis variolosus</i>	Brush Cuckoo	LC	NL	3	Obs
<i>Burhinus grallarius</i>	Bush Stone-curlew	LC	NL	8	Obs
<i>Scythrops novaehollandiae</i>	Channel-billed Cuckoo	LC	NL	6	Obs
<i>Lonchura castaneothorax</i>	Chestnut-breasted Mannikin	LC	NL	12	Obs
<i>Irediparra gallinacea</i>	Comb-crested Jacana	LC	NL	2	Obs
<i>Ocyphaps lophotes</i>	Crested Pigeon	LC	NL	7	Obs

Scientific name	Common name	Status		Total number of individuals	Observation type
		NC Act	EPBC Act		
<i>Neochmia phaeton</i>	Crimson Finch	LC	NL	18	Obs
<i>Geopelia cuneata</i>	Diamond Dove	LC	NL	16	Obs
<i>Eurystomus orientalis</i>	Dollarbird	LC	NL	14	Obs
<i>Taeniopygia bichenovii</i>	Double-barred Finch	LC	NL	30	Obs
<i>Eudynamys orientalis</i>	Eastern Koel	LC	NL	1	Obs
<i>Ardea modesta</i>	Eastern Great Egret	LC	NL	2	Obs
<i>Dromaius novaehollandiae</i>	Emu	LC	NL	2	Obs
<i>Gerygone palpebrosa</i>	Fairy Gerygone	LC	NL	2	Obs
<i>Todiramphus macleayii</i>	Forest Kingfisher	LC	NL	10	Obs
<i>Lichenostomus fuscus</i>	Fuscous Honeyeater	LC	NL	1	Obs
<i>Eolophus roseicapillus</i>	Galah	LC	NL	6	Obs
<i>Cisticola exilis</i>	Golden-headed Cisticola	LC	NL	8	Obs
<i>Ptilonorhynchus nuchalis</i>	Great Bowerbird	LC	NL	3	Obs
<i>Cracticus torquatus</i>	Grey Butcherbird	LC	NL	1	Obs
<i>Colluricincla harmonica</i>	Grey Shrike-thrush	LC	NL	3	Obs
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler	LC	NL	1	Obs
<i>Chalcites basalis</i>	Horsfield's Bronze-Cuckoo	LC	NL	2	Obs
<i>Microeca fascinans</i>	Jacky Winter	LC	NL	1	Obs
<i>Dacelo novaeguineae</i>	Laughing Kookaburra	LC	NL	8	Obs
<i>Myiagra rubecula</i>	Leaden Flycatcher	LC	NL	9	Obs
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant	LC	NL	8	Obs
<i>Chalcites minutillus</i>	Little Bronze-Cuckoo	LC	NL	1	Obs
<i>Philemon citreogularis</i>	Little Friarbird	LC	NL	2	Obs
<i>Microcarbo melanoleucos</i>	Little Pied Cormorant	LC	NL	4	Obs
<i>Anseranas semipalmata</i>	Magpie Goose	LC	NL	3	Obs
<i>Grallina cyanoleuca</i>	Magpie-lark	LC	NL	10	Obs
<i>Vanellus miles</i>	Masked Lapwing	LC	NL	7	Obs
<i>Dicaeum hirundinaceum</i>	Mistletoebird	LC	NL	2	Obs
<i>Falco cenchroides</i>	Nankeen Kestrel	LC	NL	4	Obs
<i>Philemon corniculatus</i>	Noisy Friarbird	LC	NL	2	Obs
<i>Manorina melanocephala</i>	Noisy Miner	LC	NL	6	Obs
<i>Oriolus sagittatus</i>	Olive-backed Oriole	LC	NL	4	Obs
<i>Nectarinia jugularis</i>	Olive-backed Sunbird	LC	NL	2	Obs
<i>Anas superciliosa</i>	Pacific Black Duck	LC	NL	3	Obs
<i>Platycercus adscitus</i>	Pale-headed Rosella	LC	NL	8	Obs
<i>Cacomantis pallidus</i>	Pallid Cuckoo	LC	NL	1	Obs

Scientific name	Common name	Status		Total number of individuals	Observation type
		NC Act	EPBC Act		
<i>Geopelia striata</i>	Peaceful Dove	LC	NL	15	Obs
<i>Centropus phasianinus</i>	Pheasant Coucal	LC	NL	13	Obs
<i>Cracticus nigrogularis</i>	Pied Butcherbird	LC	NL	4	Obs
<i>Strepera graculina</i>	Pied Currawong	LC	NL	2	Obs
<i>Merops ornatus</i>	Rainbow Bee-eater	LC	NL	22	Obs
<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	LC	NL	14	Obs
<i>Malurus melanocephalus</i>	Red-backed Fairy-wren	LC	NL	13	Obs
<i>Calyptorhynchus banksii</i>	Red-tailed Black-Cockatoo	LC	NL	5	Obs
<i>Malurus elegans</i>	Red-winged Fairy-wren	LC	NL	2	Obs
<i>Aprosmictus erythropterus</i>	Red-winged Parrot	LC	NL	12	Obs
<i>Platalea regia</i>	Royal Spoonbill	LC	NL	1	Obs
<i>Rhipidura rufifrons</i>	Rufous Fantail	LC	Mig	2	Obs
<i>Cincloramphus mathewsi</i>	Rufous Songlark	LC	NL	1	Obs
<i>Pachycephala rufiventris</i>	Rufous Whistler	LC	NL	6	Obs
<i>Trichoglossus chlorolepidotus</i>	Scaly-breasted Lorikeet	LC	NL	2	Obs
<i>Myzomela sanguinolenta</i>	Scarlet Honeyeater	LC	NL	2	Obs
<i>Dicrurus bracteatus</i>	Spangled Drongo	LC	NL	9	Obs
<i>Threskiornis spinicollis</i>	Straw-necked Ibis	LC	NL	2	Obs
<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern)	V	V	19	Obs
<i>Pardalotus striatus</i>	Striated Pardalote	LC	NL	1	Obs
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	LC	NL	5	Obs
<i>Podargus strigoides</i>	Tawny Frogmouth	LC	NL	3	Obs
<i>Corvus orru</i>	Torresian Crow	LC	NL	15	Obs
<i>Lalage leucomela</i>	Varied Triller	LC	NL	3	Obs
<i>Aquila audax</i>	Wedge-tailed Eagle	LC	NL	2	Obs
<i>Smicronis brevirostris</i>	Weebill	LC	NL	8	Obs
<i>Hirundo neoxena</i>	Welcome Swallow	LC	NL	1	Obs
<i>Haliastur sphenurus</i>	Whistling Kite	LC	NL	10	Obs
<i>Ardea pacifica</i>	White-necked Heron	LC	NL	2	Obs
<i>Coracina papuensis</i>	White-bellied Cuckoo-shrike	LC	NL	4	Obs
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	LC	NL	1	Obs
<i>Artamus leucorhynchus</i>	White-breasted Woodswallow	LC	NL	12	Obs
<i>Egretta novaehollandiae</i>	White-faced Heron	LC	NL	3	Obs
<i>Lichenostomus unicolor</i>	White-gaped Honeyeater	LC	NL	2	Obs

Scientific name	Common name	Status		Total number of individuals	Observation type
		NC Act	EPBC Act		
<i>Ardea pacifica</i>	White-necked Heron	LC	NL	2	Obs
<i>Gerygone albogularis</i>	White-throated Gerygone	LC	NL	2	Obs
<i>Melithreptus albogularis</i>	White-throated Honeyeater	LC	NL	2	Obs
<i>Rhipidura leucophrys</i>	Willie Wagtail	LC	NL	11	Obs
<i>Lichenostomus flavus</i>	Yellow Honeyeater	LC	NL	12	Obs
<i>Taeniopygia guttata</i>	Zebra Finch	LC	NL	1	Obs
Mammals					
<i>Macropus agilis</i>	Agile Wallaby	LC	NL	12	Obs; Cam
<i>Felis catus</i>	Cat			1	Obs
<i>Trichosurus vulpecula</i>	Common Brushtail Possum	LC	NL	24	Obs
<i>Macropus giganteus</i>	Eastern Grey Kangaroo	LC	NL	7	Obs; Cam
<i>Isodon macrourus</i>	Northern Brown Bandicoot	LC	NL	1	Obs
<i>Sus scrofa</i>	Pig			8	Obs; Cam
<i>Oryctolagus cuniculus</i>	Rabbit			1	Obs
<i>Aepyprymnus rufescens</i>	Rufous Bettong	LC	NL	2	Obs
<i>Wallabia bicolor</i>	Swamp Wallaby	LC	NL	1	Obs
<i>Canis lupus</i>	Wild Dog			4	Obs; Cam
Reptiles					
<i>Cryptoblepharus adamsi</i>	Adams' Snake-eyed Skink	LC	NL	4	Obs
<i>Hemidactylus frenatus</i>	Asian House Gecko			1	Obs
<i>Dendrelaphis punctulatus</i>	Common Tree Snake	LC	NL	2	Obs
<i>Pseudonaja textilis</i>	Eastern Brown Snake	LC	NL	1	Obs
<i>Varanus varius</i>	Lace Monitor	LC	NL	1	Obs
<i>Demansia vestigiata</i>	Lesser Black Snake	LC	NL	1	Obs
<i>Liasis fuscus</i>	Water Python	LC	NL	1	Obs
Amphibians					
<i>Rhinella marina</i>	Cane Toad			20	Obs; Cam
<i>Cyclorana novaehollandiae</i>	Eastern Snapping Frog	LC	NL	1	Obs
<i>Litoria caerulea</i>	Green Tree Frog	LC	NL	4	Obs

Notes:

NC Act: LC (Least Concern), SL (Special Least Concern), NT (Near Threatened), V (Vulnerable), E (Endangered), CR (Critically Endangered)

EPBC Act: NL (not listed), Mig (Migratory), V (Vulnerable), E (Endangered), CE (Critically Endangered)

Observation type: Obs (Observation), Cam (Remote Camera)

Invasive weeds recorded in the Project area

Family	Scientific name	Common name	Cover/density
Apocynaceae	<i>Cryptostegia grandiflora</i>	Rubber vine	CW
Apocynaceae	<i>Nerium oleander</i>	Oleander	OL
Asteraceae	<i>Xanthium occidentale</i>		AL
Cactaceae	<i>Opuntia stricta</i>		OW
Caesalpiniaceae	<i>Parkinsonia aculeata</i>	Parkinsonia	CL
Convolvulaceae	<i>Argyrea nervosa</i>		OL
Euphorbiaceae	<i>Jatropha gossypifolia</i>	Bellyache bush	AL
Euphorbiaceae	<i>Ricinus communis</i>	Castor oil bush	CL
Fabaceae	<i>Abrus precatorius</i>	Crabs-eye vine	OL
Fabaceae	<i>Clitoria ternatea</i>		OL
Fabaceae	<i>Macroptilium lathyroides</i>		CL
Fabaceae	<i>Stylosanthes hamata</i>		OW
Fabaceae	<i>Stylosanthes scabra</i>		CW
Lamiaceae	<i>Basilicum polystachyon</i>		CW
Lamiaceae	<i>Mesosphaerum suaveolens</i>		AL
Malvaceae	<i>Urena lobata</i>	Urena weed	OL
Mimosaceae	<i>Vachellia farnesiana</i>		OL
Passifloraceae	<i>Passiflora foetida</i>		OW
Poaceae	<i>Bothriochloa pertusa</i>		OW
Poaceae	<i>Cenchrus ciliaris</i>		CL
Poaceae	<i>Chloris gayana</i>	Rhodes grass	CL
Poaceae	<i>Chloris inflata</i>	Purpletop chloris	OW
Poaceae	<i>Cynodon dactylon</i>		OW
Poaceae	<i>Dichanthium annulatum</i>	Sheda grass	OW
Poaceae	<i>Dichanthium aristatum</i>	Angleton grass	CW
Poaceae	<i>Hymenachne amplexicaulis</i>	Hymenachne	CL
Poaceae	<i>Megathyrsus maximus</i>		AL
Poaceae	<i>Melinis repens</i>	Red Natal grass	OW
Poaceae	<i>Sporobolus jacquemontii</i>		OL
Poaceae	<i>Themeda quadrivalvis</i>	Grader grass	AL
Poaceae	<i>Urochloa mutica</i>		AL
Portulacaceae	<i>Portulaca pilosa</i>		OL
Rhamnaceae	<i>Ziziphus mauritiana</i>	Indian jujube	AW
Sparrmanniaceae	<i>Grewia asiatica</i>		CL
Verbenaceae	<i>Lantana camara</i>	Lantana	OL
Verbenaceae	<i>Stachytarpheta jamaicensis</i>	Jamaica snakeweed	OL

Notes:

Cover and density classes: OL – Occasional and localised, OW – Occasional and widespread, CL – Common and localised, CW – Common and widespread, AL – Abundant and localised and AW – Abundant and widespread

Appendix E

Risk framework

The initial impact is re-assessed following mitigation as a residual impact indicating the mitigation measures effectiveness.

- High Effectiveness – no impact to species and/or habitats due to prevention and/or avoidance. Negligible residual impact.
- Moderate Effectiveness – direct and indirect impacts are minimised, residual impact is reduced by two bands e.g. severe reduced to moderate. Unless reduced to low then this is moderately effective.
- Low Effectiveness – minimal reduction in impact through control, survey and observation measures. Reduced by one band e.g. high to moderate.

Table E1 Risk matrix used to assess impacts and residual impacts

Likelihood	Consequence				
	Negligible	Low	Moderate	High	Severe
Certain	Negligible	Low	High	Severe	Severe
Almost certain	Negligible	Low	Moderate	High	Severe
Likely	Negligible	Low	Moderate	High	High
Possible	Negligible	Negligible	Low	Moderate	High
Unlikely	Negligible	Negligible	Negligible	Low	Low

Table E2 Criteria used to define likelihood

Likelihood	Criteria used to define likelihood
Certain	It is very probable that the risk event could occur in any year (>95%)
Almost certain	It is more probable than not that the risk event could occur in any year (>50%)
Likely	It is equally probable that the risk event could or could not occur in any year (50%)
Possible	It is less probable than not that the risk event could occur in any year (<50%)
Unlikely	It is improbable that the risk event could occur in any year. (<5%) The risk event is only theoretically possible or would require exceptional circumstances to occur.

Table E3 Criteria used to define the severity of the impact

Magnitude	Criteria used to define severity of impact
Severe	Permanent impacts AND/OR extreme intensity AND/OR regional extent (i.e. impact at a population level)
High	Long duration AND/OR high intensity AND/OR large extent (i.e. major impact to individuals with minor impacts at a population level)
Moderate	Moderate duration AND/OR moderate intensity AND/OR localised extent (i.e. moderate level impacts to individuals with no impact at a population level)
Low	Short duration AND/OR low intensity AND/OR very localized extent (i.e. low level impacts to individuals that have no impact at a population level)
Negligible	Very short duration AND/OR negligible intensity AND/OR (i.e. negligible impact to individuals)



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