Appendix T

Species Management Plan

Haughton Pipeline Stage 2 Project

High Risk Species Management Program

Townsville City Council

8 February 2022

→ **The Power of Commitment**

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Executive summary

GHD Pty Ltd (GHD) has been commissioned by Townsville City Council (TCC) to prepare a High Risk and Low Risk Species Management Program (SMP) for the proposed Haughton Pipeline Stage 2 (HPS2) Project which includes a pump station, high voltage power supply and pipeline. The HPS2 will transfer 397 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 North from a new pump station to be constructed on the Burdekin River to the Upper Haughton Irrigation Channel (Stage 1.1 works). The proposed action, along with the previously constructed Stage 1 and Stage 1.1, are collectively known as the Haughton Pipeline Duplication Project (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.

This document fulfils the requirements of a High and Low Risk SMP for the Project and has been prepared using ecological data obtained via desktop analysis and field surveys, with two ecological surveys undertaken for the Project in 2021. The following species are included in this High Risk SMP:

– Black-throated finch (southern) (*Poephila cincta cincta*) endangered under the NC Act
– Squatter pigeon (southern) (*Geophaps scripta scripta*) vulnerable under the NC Act
– Bare-rumped sheathtail bat (*Saccolaimus saccolaimus nudicluniatus*) vulnerable under the NC Act
– Eastern osprey (*Pandion cristatus*) special least concern under the NC Act
– Short-beaked echidna (*Tachyglossus aculeatus*) special least concern under the NC Act
– Colonial breeding bat species – listed as special least concern under the NC Act.

The report describes the methods and results of the ecological field surveys that have been undertaken for the Project. These confirmed the presence of the black-throated finch (southern) and squatter pigeon (southern). The bare-rumped sheathtail bat, eastern osprey, short-beaked echidna and two species of colonial breeding microbats are considered likely to occur. Three other species listed under the NC Act are also considered likely to occur, but are not included in this SMP as they do not utilise specific breeding places (i.e. koala (*Phascolarctos cinereus*)) or do not breed in Queensland (i.e. white throated needletail (*Hirundapus caudacutus*) and fork-tailed swift (*Apus pacificus*)).

Substantial avoidance of impact to breeding places has been achieved through the preliminary site selection and design phases. The Project occurs in a landscape that has been subject to generations of cattle grazing and localised intensive agriculture, with irrigated cropping concentrated in areas adjacent to the Burdekin River. The Project footprint has been predominantly located in open grazing areas that hold low breeding habitat values for the target species. Despite achieving substantial avoidance of impact, localised sections of the Project footprint intersect woodland areas that are likely to support animal breeding places.

The survey effort has provided a reliable basis for mapping habitat values within the Project area. For each target species, the distribution of predicted breeding habitat was mapped using Regional Ecosystem (RE) communities that are identified as essential habitat factors for the species by the Department of Resources (DoR), field-verified at 40 sites across the Project area and information on habitat condition and quality, assessed at 35 sites within the Project area. This has identified areas of potential breeding habitat for the black-throated finch (southern) and bare-rumped sheathtail bat within the Project footprint. An inventory of hollow-bearing trees, nests and other breeding places was undertaken along the length of the Project alignment to mark the locations of confirmed breeding places, particularly for colonial microbats and the location of larger hollows that represent potential roosting or breeding sites for the bare-rumped sheathtail bat.

The Project has the potential to cause localised direct and indirect impact to breeding places during construction. Operational impacts on breeding places are considered negligible and do not require mitigation. A framework for avoidance and minimisation of the residual impacts to breeding has been outlined for the construction phase. Key avoidance measures include:

– Temporal avoidance of clearing within the peak breeding season in areas of breeding habitat for the black-throated finch (southern) (i.e. February to May) and for the bare-rumped sheathtail bat (i.e. December to January)
– Where temporal avoidance is not possible and clearing of breeding habitat for the black-throated finch (southern) is required in the peak breeding season, targeted surveys will be undertaken in areas of potential breeding habitat in the weeks prior to clearing. This will confirm the locations of nesting sites to facilitate risk avoidance by suitably qualified and experienced spotter-catchers.
– Supervision of all clearing of mapped breeding habitat areas for black-throated finch (southern), bare-rumped sheathtail bat, eastern osprey, short-beaked echidna and colonial breeding microbats, and any drinking and dispersal habitat for the southern squatter pigeon (southern) by suitably qualified and experienced fauna spotter-catchers employing the following measures to mitigate impact to breeding places:
    - Sequential clearing of habitat towards areas of refuge outside the Project footprint
    - Establishing no-go areas outside of the construction corridor
    - Inspections of breeding places by spotter-catchers prior to clearing
    - Encouraging wildlife to vacate breeding places of their own accord via tree tapping and other measures
    - Dismantling high-risk trees in sections where animals are known or thought to be present
    - Flushing areas of squatter pigeon habitat prior to undertaking works
    - Salvaging key hollows likely to provide roosting sites for the bare-rumped sheathtail bat for use in areas adjacent to the Project footprint.
– Adherence to the following contingency measures:
    - Encouraging wildlife to vacate the clearing footprint on their own accord
    - Relocating any wildlife that will not vacate the clearing footprint of their own accord to safe areas outside the clearing footprint by suitably qualified and experienced fauna spotter-catchers using appropriate handling and storage protocols
    - Safe capture and transport of any injured wildlife or eggs to an appropriate wildlife carer by the fauna spotter-catcher.

Consistent with the requirements for all High Risk and Low Risk SMPs an electronic Animal Breeding Place Register will be established and maintained by for the duration of construction, reporting to the Department of Environment and Science (DES) at the following frequencies as specified in the DES SMP guidelines:

– Every 6-months for species included in the High Risk SMP and
– Every 12 months for species in the Low Risk SMP.

The framework outlined in this High Risk and Low Risk SMP provides a realistic and achievable mechanism for avoiding and minimising impacts to breeding places on animals listed under the NC Act. While the majority of impacts on wildlife breeding places will be experienced during the clearing phase, the High Risk SMP will be maintained for the standard SMP duration of three years. This will provide a framework for effective management of impacts to breeding places through the life of the construction program. Management and maintenance of the High Risk SMP, Low Risk SMP and electronic Animal Breeding Place Register will be overseen by the construction contractor and/or the contracted spotter-catcher.

This report is subject to, and must be read in conjunction with, the limitations set out in sections 1.2 and the assumptions and qualifications contained in section 1.3 and 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 *Environment Protection and Biodiversity Conservation Act 1999*
ESCP	Site and stage specific Erosion and Sediment Control Plans
MNES	Matters of National Environmental Significance
NC Act	Queensland *Nature Conservation Act 1992*
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's Pipeline (HPS2) Project. The HPS2 Project is required to accommodate increased water demand due to regional population and industrial growth. The HPS2 Project includes a new pump station, pipeline and associated ancillary works (herein 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 397 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 north from a new pump station that will be constructed on the Burdekin River adjacent the existing SunWater Tom Fenwick pump station to the Upper Haughton Irrigation Channel (Stage 1.1 works). 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 end of 2022, with completion of the construction phase by mid 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.

Extensive ecological surveys have been undertaken as part of the baseline environmental approvals for the Project, with surveys undertaken by two consultants (Natural Resources Assessment (NRA) and GHD) during 2021. These identified a number of conservation significant species listed under the *Nature Conservation Act 1992* (NC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that occur or are considered likely to occur in the Project area.

Two conservation significant fauna species listed under the NC Act have been confirmed present: the black-throated finch (southern) (*Poephila cincta cincta*) and squatter pigeon (southern) (*Geophaps scripta scripta*). An additional six species listed under the NC Act were considered likely to occur: koala (*Phascolarctos cinereus*), bare-rumped sheathtail bat (*Saccolaimus saccolaimus nudicluniatus*), white-throated needletail (*Hirundapus caudacutus*), fork-tailed swift (*Apus pacificus*), short-beaked echidna (*Tachyglossus aculeatus*) and eastern osprey (*Pandion haliaetus*).

1.1 Purpose of this report

Under Section 335 of the *Nature Conservation (Animals) Regulation 2020* (NC Reg), any activity which tampers with the breeding place of protected animals requires a Species Management Program (SMP) to be prepared and subsequently approved by the Department of Environment and Science (DES) prior to the commencement of works. A High Risk SMP is required where activities will affect breeding places for species listed as special least concern, least concern colonial breeders, near threatened, vulnerable, endangered, critically endangered or extinct in the wild under the NC Act.

Substantial avoidance measures have been undertaken through the site selection and preliminary design phases to reduce the impact on wildlife habitat by placing infrastructure in previously cleared, open areas wherever possible. While the Project is located on grazing land and predominantly impacts areas with limited habitat value, localised pockets of breeding habitat for species listed under the NC Act will be impacted by the Project.

This High Risk SMP has been prepared to address the requirements in the NC Reg to provide a High Risk SMP and Impact Management Plan (IMP) for the Project based on the potential impact on breeding places for species listed under the NC Act. This document also supports the preparation of a Low Risk SMP for impacts to species listed as least concern under the NC Act. The purpose of this report is to assess the potential threat to animal breeding places from the Project and to provide a framework for avoidance and mitigation of impacts to breeding places through the construction and immediate post-construction phase of the Project.

1.2 Scope and limitations

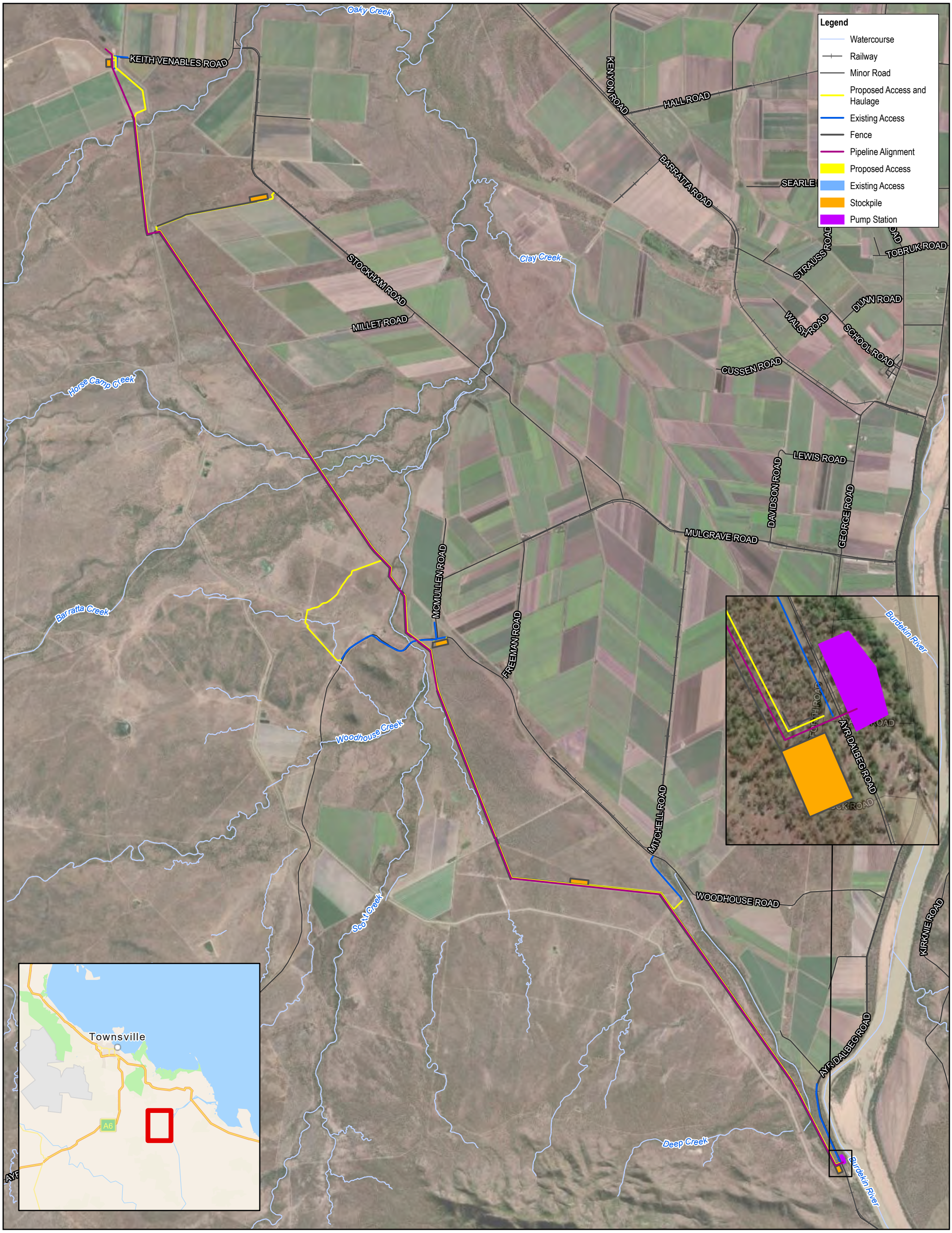
GHD has been commissioned to prepare a High Risk SMP under the NC Reg. This report has been prepared by GHD for Townsville City Council and may only be used and relied on by Townsville City Council for the purpose agreed between GHD and Townsville City Council as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Townsville City Council 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. Field verified regional ecosystem (RE) mapping was provided by NRA in the Environmental Analysis Report [NRA, 2021].

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.



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

Townsville City Council
Haughton Pipeline Stage 2 - High Risk SMP

Project No. **12537606**
Revision No. **0**
Date **1/20/2022**

Haughton Pipeline Stage 2 project area

FIGURE 1-1

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Print date: 20 Jan 2022 - 12:14c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout (2021); World Navigation Map: Department of Resources, Dept.of Environment and Science, Esri, HERE, Garmin, FAO, NOAA, USGS
World Imagery: Earthstar Geographics

2. Application details

2.1 Applicant details

Details of the proponent are described in

Table 2.1 Applicant details

Applicant Name	Townsville City Council
ABN	44 741 992 072
Address	143 Walker Street Townsville 4810
Contact Details	Robert Kent (TCC - Principal Major Projects) Email: robert.kent@townsville.qld.gov.au Phone: 07 4727 8986

2.2 Location details

2.2.1 Project description

The Project includes construction and operation of a new pump station and water pipeline that extends 28.5 km north-west from the Burdekin River commencing at a new pump station site located 17 km south of Clare in North Queensland.

2.2.1.1 Construction activities

The Project will result in the construction of a 28.5 km long 1800 mm diameter 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. Four sections of the pipeline will be constructed using trenchless construction methods (pipe jacking) including Ayr-Dalberg Rd, under existing SunWater irrigation siphons, Scotts Creek and the existing SunWater Haughton Main Channel (irrigation channel). Construction is scheduled to take approximately 30 months or two and half years, with construction works to commence October 2022 and be completed by mid 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.

2.2.1.2 Temporary and permanent impacts

The Project will result in 124.66 ha of temporary disturbance and 13.13 ha of permanent footprint impacts. Temporary disturbance will be associated with parts of the Project footprint that will be cleared for construction and rehabilitated as outlined in Section 6.1.4. Permanent impacts will be associated with parts of the Project footprint that will be cleared for permanent infrastructure. The temporary and permanent impact areas are defined below.

Temporary clearance impacts for MNES

– 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 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

– 28.5 km long buried pipeline and a 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 – to be determined
– Substation site – to be determined
– Power supply works – to be determined

2.2.1.3 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 one 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 6.1.4.

2.2.2 Description of the existing environment

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. Large portions of the Project area are impacted by vegetation clearing, cattle grazing, cultivated agriculture and sowing of exotic pasture grasses. Portions of the Project area contain very sparse open woodland with high levels of fragmentation occurring to the east of the Project area. Patches of non-remnant cleared areas are scattered across the Project area, predominantly in the southern and northern sections of the Project area. The Project area is connected to remnant habitat further north and west, providing connectivity for species within the region.

Substantial areas of grass and shrub layers were dominated by weed species, with tree layers dominated by native *Eucalyptus, Corymbia, Melaleuca* and *Casuarina* species. Thirty-six invasive weed species were identified during the GHD field survey. Six restricted weeds under the *Biosecurity Act 2014* were recorded within the Project area: rubber vine (*Cryptostegia grandiflora*), chinee apple (*Ziziphus mauritiana*), parkinsonia (*Parkinsonia aculeata*), bellyache bush (*Jatropha gossypiifolia*), hymenachne (*Hymenachne amplexicaulis*) and American rat's tail grass (*Sporobolus jacquemontii)* (Plate 2-1). Three restricted invasive pests were recorded during the field survey, these included cat (*Felis catus*), pig (*Sus scrofa*) and rabbit (*Oryctolagus cuniculus*). More information on the remnant vegetation values and broad habitats of the Project area is detailed in Section 4.5.

Plate 2-1 Dense chine apple (left) and rubber vine (right) in the Project area

2.3 Approved agents

The preparation of this High Risk SMP has been completed by an approved agent of TCC. The actions outlined in this program are only to be undertaken by suitably qualified and experienced persons employed, contracted or subcontracted either by TCC or by an entity employed, contracted or subcontracted by TCC and who are undertaking TCC supported activities. This includes authorised wildlife carers and veterinarians. Roles and responsibilities of those involved in implementation of management measures are provided in Section 6.

3. Terms

3.1 Terms of approval

To allow the High Risk SMP to fully cover the construction and post-construction phase, and to allow for periodic review of the program, the High Risk SMP will be in effect for a term of three years.

4. Assessment of wildlife breeding places

4.1 Species included in the High Risk SMP

This High Risk SMP applies to the potential breeding places of fauna species which are listed as special least concern, near threatened, vulnerable, endangered, critically endangered or extinct in the wild under the NC Reg or are least concern colonial breeders that have the potential to be directly or indirectly tampered with during works for the Project. This High Risk SMP applies to the following species:

– Black-throated finch (southern) (*Poephila cincta cincta*) endangered under the NC Act
– Squatter pigeon (southern) (*Geophaps scripta scripta*) vulnerable under the NC Act
– Bare-rumped sheathtail bat (*Saccolaimus saccolaimus nudicluniatus*) vulnerable under the NC Act
– Eastern osprey (*Pandion cristatus*) special least concern under the NC Act
– Short-beaked echidna (*Tachyglossus aculeatus*) special least concern under the NC Act
– Colonial breeding bat species – listed as special least concern under the NC Act.

Eight additional fauna species listed under the NC Act that are considered likely to occur in the Project area have not been included in the High Risk SMP due to the absence of breeding habitat within the Project area:

– Koala (*Phascolarctos cinereus*) The koala was considered likely to occur within the Project area but is not typically included in High Risk SMP's given the species is not reliant on habitual breeding places.
– White-throated needletail (*Hirundapus caudacutus*) and fork-tailed swift (*Apus pacificus*) Both species were considered likely to occur within the Project area. These species are migratory and do not breed in Australia. As such, the Project will have no impact on their breeding habitat.

The High Risk SMP includes methods to mitigate impact on breeding places for species listed as least concern under the NC Act and will fulfil the requirements of a Low Risk SMP.

4.2 Breeding place definition

In accordance with Section 335 of the NC Reg, an animal breeding place includes locations or habitat where:

– The animal is preparing, or has prepared, the place for incubating or rearing the animal's offspring; or
– The animal is breeding, or is about to breed, and is physically occupying the place; or
– The animal and the animal's offspring are physically occupying the place, even if the occupation is only periodical; or
– The animal has used the place to incubate or rear the animal's offspring and is of a species generally known to return to the same place to incubate or rear offspring in each breeding season for the animal.

4.3 Desktop assessment

4.3.1 Desktop assessment methods

A desktop review was undertaken for the Project area to provide location-specific information on the conservation significant species with potential to occur. 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.

The following searches were undertaken:

– Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST)
– DAWE species profile and threats (SPRAT) database and listing advice
– Department of Environment and Science WildNet database
– DES species profile search database
– Atlas of Living Australia (ALA) database
– Biomaps WildNet species records
– Department of Resources (DoR) Essential habitat mapping

4.3.2 Desktop assessment results

Essential habitat and historical records of conservation significant species within the vicinity of the Project area are shown in Figure 4.1.

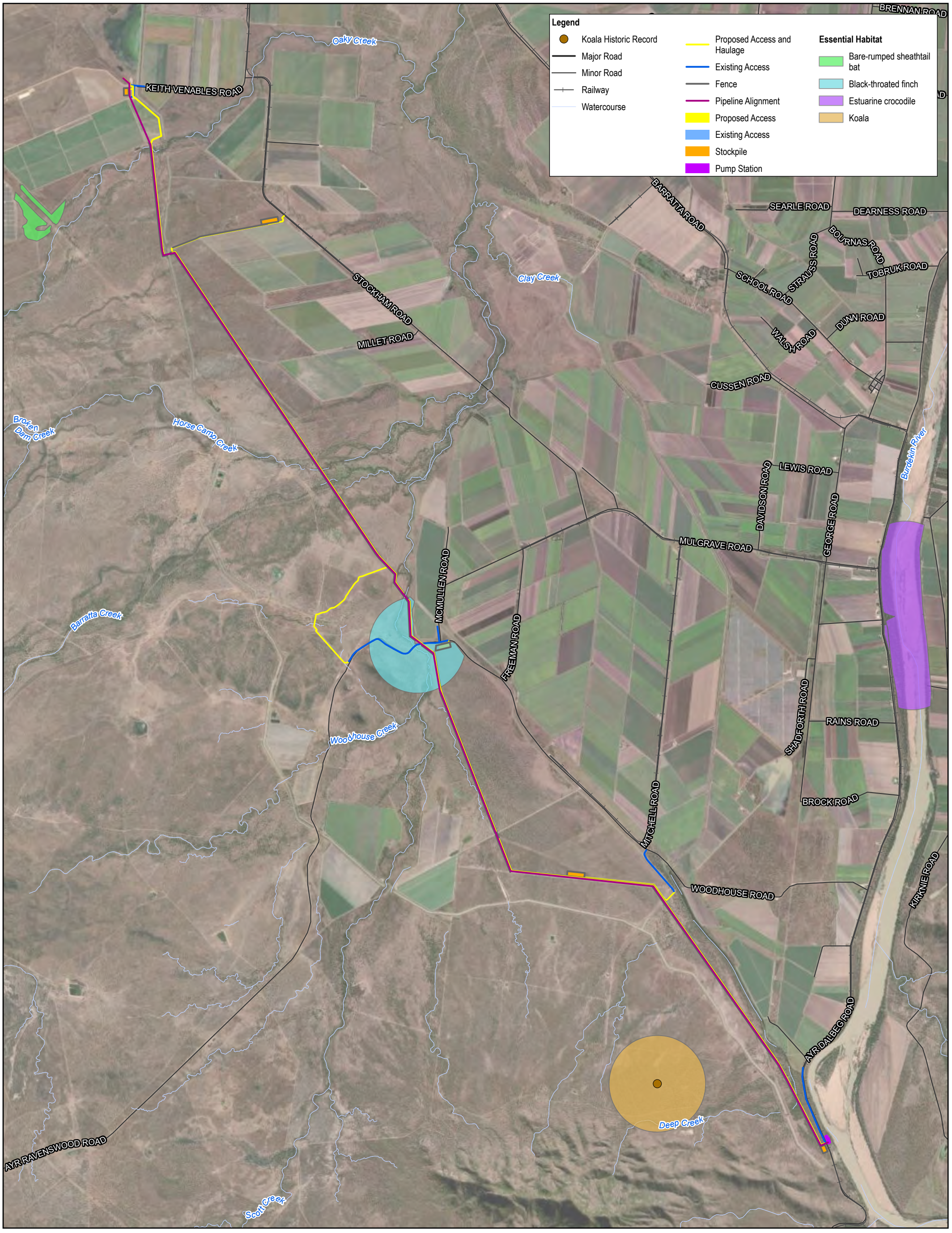
4.3.2.1 Essential habitat

The Project intersects one polygon of essential habitat for the estuarine crocodile (*Crocodylus porosus*). Essential habitat for the following species is recorded within the landscape immediately surrounding the Project area:

– Koala
– Squatter pigeon (southern)
– Black-throated finch (southern).

4.3.2.2 Historical records of NC Act listed species

A total of 33 conservation significant species were identified in the desktop search extent. Of those, 29 species were predicted to occur in PMST results, and 16 have been historically recorded within the desktop search extent. The records are shown in Appendix A. This includes 13 special least concern migratory bird species. Historical records of conservation significant species are dispersed in low densities within the surrounding landscape, with some recorded along the Burdekin River and in woodland west, north and south of the Project. Areas lining the Burdekin River, to the east of the Project area have been extensively converted to cropped land and retain few historical records of conservation significant species. The distribution of historical species records and essential habitat is mapped in Figure 4-1.



Paper Size ISO A3

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Kilometres

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

GHD

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Essential habitat and historical records of conservation significant species within the vicinity of the Project area

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FIGURE 4-1

N:\AU\Townsville\Projects\42\12537606\GIS\Maps\APRX\12537606\12537606_HRSMP.aprx 12537606_HRSMP_008_EssHab_Rev0
Print date: 20 Jan 2022 - 15:04c

Data source: DoR: Roads, Railway, Watercourses, Essential Habitat v10 (2021); GHD: Site Layout (2021); DES: Wildnet Records (2021); World Imagery: Earthstar Geographics. Created by: xlee

Table 4.1 Conservation significant species historically recorded or predicted to occur in the desktop search extent

Species	Common name	EPBC Act status	NC Act status	Source	Number in search extent
Species historically recorded within desktop search extent					
Poephila cincta cincta	Black-throated finch (southern)	E	E	WO, PMST	15
Geophaps scripta	Squatter pigeon (southern)	V	V	WO; PMST	2
Hirundapus caudacutus	White-throated needletail	V, Mig	V	WO; PMST	1
Rhipidura rufifrons	Rufous fantail	Mig	SL	WO; PMST	2
Phascolarctos cinereus	Koala	V	V	WO; PMST	21
Dasyurus hallucatus	Northern quoll	E	LC	WO, PMST	2
Monarcha melanopsis	Black-faced monarch	Mig	SL	WO, PMST	3
Symposiachrus trivirgatus	Spectacled monarch	Mig	SL	WO,	3
Pandion haliaetus	Osprey	Mig	SL	WO, PMST	1
Myiagra cyanoleuca	Satin flycatcher	Mig	SL	WO, PMST	1
Apus pacificus	Fork-tailed swift	Mig	SL	WO, PMST	2
Gelochelidon nilotica	Gull-billed tern	Mig	SL	WO	2
Hydroprogne caspia	Caspian tern	Mig	SL	WO	5
Rhipidura rufifrons	Rufous fantail	Mig	SL	WO, PMST	2
Gallinago hardwickii	Latham's snipe	Mig	SL	WO, PMST	1
Plegadis falcinellus	Glossy ibis	Mig	SL	WO	4
Species predicted to occur in PMST only					
Calidris ferruginea	Curlew sandpiper	CE	CE	PMST	
Erythrotriorchis radiatus	Red goshawk	V	E	PMST	
Falco hypoleucos	Grey falcon	V	V	PMST	
Neochmia ruficauda ruficauda	Star finch (eastern)	E	E	PMST	
Numenius madagascariensis	Eastern curlew	CE, Mig	E	PMST	
Rostratula australis	Australian painted snipe	E	E	PMST	
Turnix olivii	Buff-breasted button-quail	E	E	PMST	
Tyto novaehollandiae kimberli	Masked owl (northern)	V	V	PMST	
Hipposideros semoni	Semon's leaf-nosed bat	V	E	PMST	
Macroderma gigas	Ghost bat	V	E	PMST	
Rhinolophus robertsi	Large-eared horseshoe bat	V		PMST	
Saccolaimus saccolaimus nudicluniatus	Bare-rumped sheathtail bat	V	E	PMST	
Xeromys myoides	Water mouse	V	V	PMST	
Denisonia maculata	Ornamental snake	V	V	PMST	
Egernia rugosa	Yakka skink	V	V	PMST	
Lerista vittata	Mount Cooper striped skink	V	V	PMST	
Pristis pristis	Freshwater sawfish	V		PMST	

4.4 Field assessment

4.4.1 Summary of survey effort

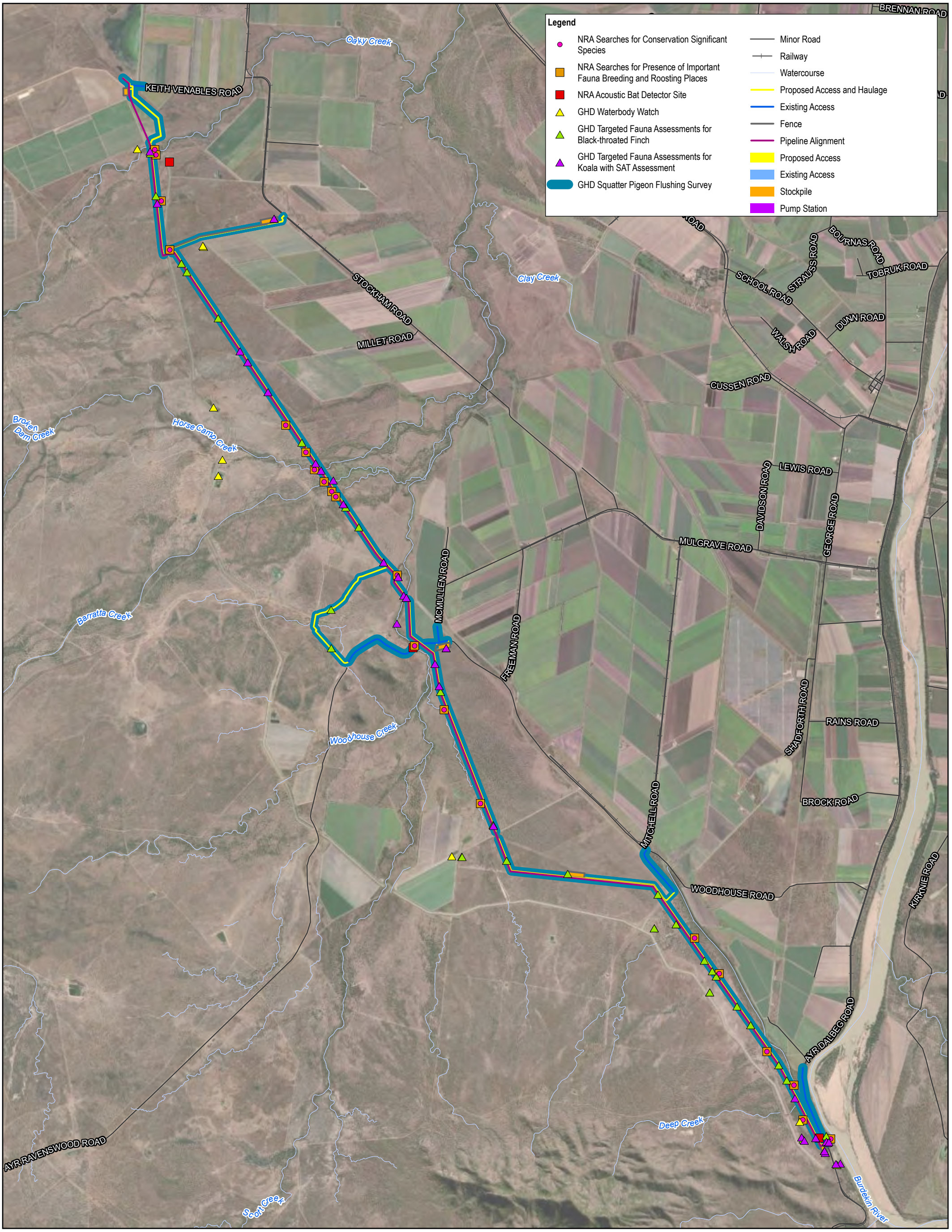
Two field ecology surveys have been undertaken by GHD and NRA for the Project during 2021 as detailed in Table 4.2.

Table 4.2 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	– 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	– Quaternary RE verification – 8 sites – Targeted flora searches for *Eucalyptus raveretiana* – 11 sites – Fauna and habitat assessments for black-throated finch (southern) – 35 sites – Daytime waterbody watches / area searches – 14 sites – Koala habitat assessments and targeted koala scat searches using the Spot Assessment Technique (SAT) method – 30 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)

Surveys were undertaken at across the Project area to providing appropriate survey coverage within each vegetation community, habitat and geographic location present along the Project footprint. Areas of high ecological value corresponding with areas of mapped remnant vegetation, waterways and waterbodies were subject to more intensive survey effort.

Survey effort per species undertaken for the Project is detailed in Table 4.3. The distribution of fauna survey effort within the Project area is summarised in Figure 4.2.



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Kilometres

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

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Distribution of survey effort

FIGURE 4-2

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Print date: 20 Jan 2022 - 12:16c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Survey Effort (2021); World Imagery: Earthstar Geographics. Created by: xlee

Table 4.3 Summary of survey effort per species

Species	Recommended surveys and conditions	Surveys undertaken
Black-throated finch (southern)	Waterbody watch surveys for at least three hours after first light, preferably two waterbody watches per water source (minimum of 12 hours/water source)	0.5 hours x 2 observers per waterbody (14 sites) – 14 hours of waterbody watches
	Targeted searches in woodland and grasslands surrounding water source for black-throated finch, nests and calls, 1 hour/ha maximum of 10 hours per search area (that is 600 m radius of waterbody) (DEWHA 2009)	Vigilant area searches surveying for black-throated finch over 6 x 10 hour days for two ecologists (120 search hours)
Squatter pigeon (southern)	Area searches/diurnal bird surveys (15 hours over 3 days) Flushing surveys (10 hours over 3 days) (DEWHA 2010a)	Area searches/diurnal bird surveys (6 x 10 hour days for two ecologists) Driving/flushing surveys for the squatter pigeon (southern)– 464 km (based on two vehicles driving around the Project area over 6 days)
Bare-rumped sheathtail bat	Acoustic detection (16 detector nights) Trapping (16 mist-net nights) Roost searches (1-2 hours per survey day) (DEWHA 2010b)	Survey of the entire footprint, recording the location of all hollow-bearing trees including large hollows that represent potential roost sites for bare-rumped sheathtail bat. Surveys were not undertaken for the species, assuming the species was present.
Eastern osprey	No survey guidelines	Area searches/diurnal bird surveys (6 x 10 hour days for two ecologists)
Short-beaked echidna	No survey guidelines	Area searches/diurnal bird surveys (6 x 10 hour days for two ecologists)
Colonial breeding bat species	No survey guidelines	Survey of the entire footprint, recording the location of all hollow-bearing trees that represent potential roosting sites for colonial breeding microbats.

4.4.2 Qualifications of the survey team

All surveys were undertaken by suitably qualified ecologists with experience in undertaking ecological assessments in Queensland. The qualifications and experience of field team members are outlined in Table 4.4.

Table 4.4 Qualifications and experience of the field survey team

Ecologist	Company	Qualifications	Experience
Simon Hodgkison	GHD	BSc MSc PhD (Ecology)	15 years' ecological consulting and 5 years' research experience in Queensland
Peter Moonie	GHD	BSc Hons (Ecology)	10 years' consulting experience in Queensland and 10 years' consulting experience in Western Australia
Pascale Lin	GHD	BSc	5 years' consulting experience in Queensland.
Rhiannon Williams	NRA	BSc Hons	7 years' experience
Peter Buosi	NRA	BAppSc Hons	24 years' experience

4.4.3 Likelihood of occurrence assessment

For each conservation significant species that was identified in the desktop search extent, its' likelihood of occurrence' in the Project area was assessed, based on the results of desktop and field survey observations. The likelihood of occurrence ranking was based on the following framework:

– **Confirmed present:** Species recorded during the field survey.
– **Likely to occur:** Species has been recorded in the desktop search extent and suitable habitat is present in the Project area. Note this includes all habitat and does not necessarily include breeding habitat.
– **May occur:** Species distribution incorporates the Project area; however, only marginal habitat 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 and/or suitable habitat is generally lacking from the Project area. Species within this category were not subject to further impact assessment.

The likelihood of occurrence assessment for conservation significant species is provided in Appendix C.

4.4.4 Criteria used to map potential breeding habitat

The distribution of potential breeding habitat was assessed and mapped based on surveys of habitat value and condition undertaken at 35 rapid habitat assessment sites and 40 quaternary vegetation survey sites. Criteria used to map predicted breeding habitat are outlined in the relevant species sections in Section 4.6. Potential habitat was mapped and refined using the following methods:

– Regional Ecosystem (RE) mapping formed the foundation criteria for mapping predicted habitat for species in this High Risk SMP, using REs nominated as essential habitat factors for each species by the Department of Resources (DoR) and summarised for each species in Appendix B.
– RE confirmation surveys were undertaken predominantly by NRA (2021), using quaternary level vegetation surveys at 40 sites across the Project area, using methods outlined in Neldner et al., (2020). These were used to validate RE mapping.
– Predicted habitat mapping was further refined by undertaking rapid habitat assessments to validate the quality and condition of habitat. Rapid habitat assessments were undertaken at 35 sites across the Project area. At each site the value of habitat and the presence and distribution of breeding habitat was assessed based on the following criteria:
    - The presence of key resources and microhabitats as determined by the structural complexity of vegetation at different strata and the diversity and abundance of ground-level microhabitats

- The presence and relative abundance of key ecological and breeding habitat features such as hollow-bearing trees, burrows, rocky outcrops, caves, nests, suitable substrate and proximity to water sources.
- Assessment of the condition of habitats based on existing disturbance imposed by cattle grazing, clearing, logging, weed infestation, erosion, soil compaction and sedimentation.

Criteria used to map breeding habitat for individual species are outlined in Section 4.6 and Appendix B.

4.5 Field survey results

4.5.1 Overview

Potential breeding habitat was identified within the Project area for the following species:

– Black-throated finch (southern)
– Bare-rumped sheathtail bat
– Short-beaked echidna
– Colonial breeding microbats

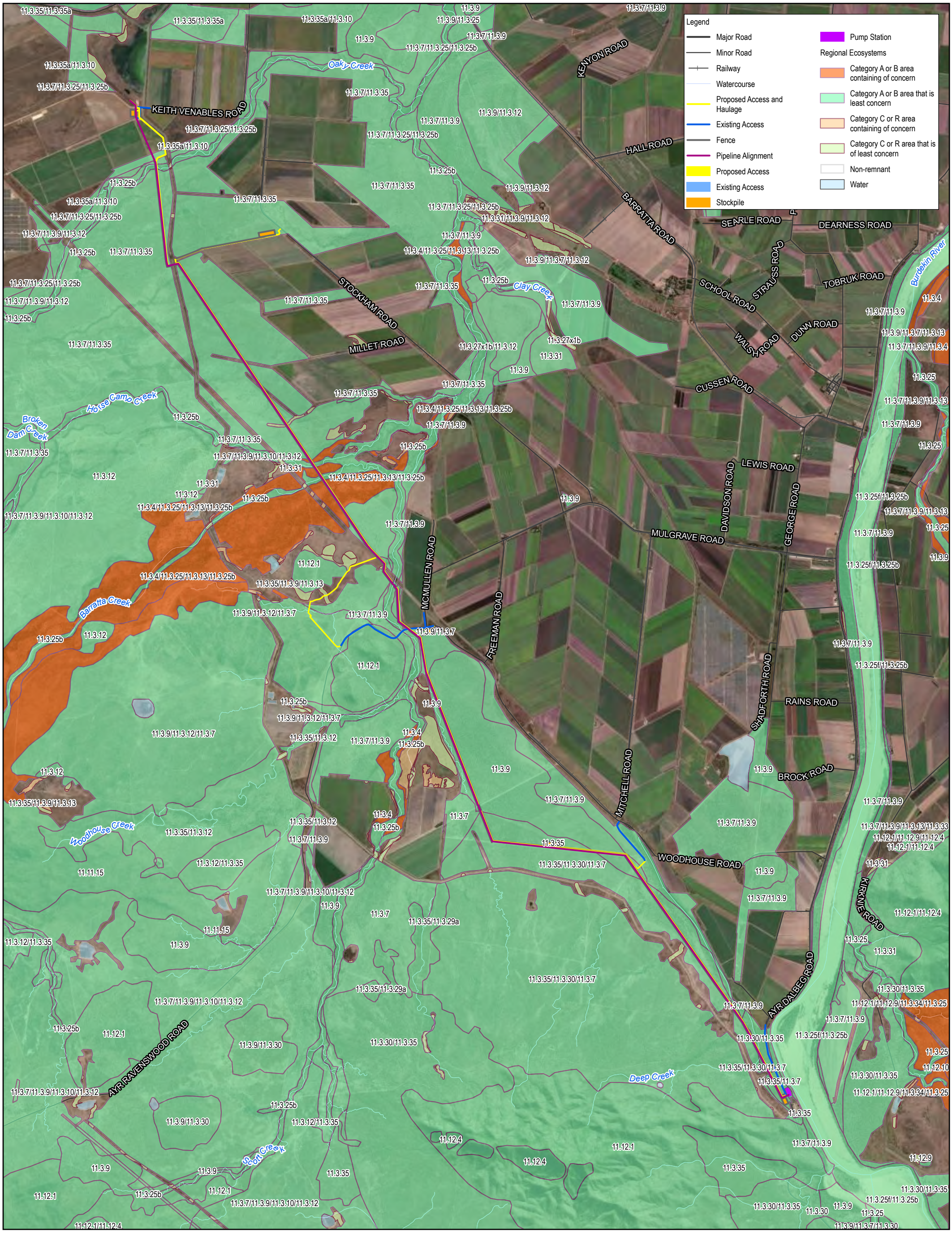
No suitable breeding habitat for the squatter pigeon (southern) or eastern osprey was recorded within the Project area. All species with a remote chance of breeding within the Project area have been included to provide a framework for minimising impacts to these species. For each species, a summary of their occurrence in the Project area and the value and distribution of breeding habitats is provided below.

4.5.2 Vegetation within the Project area

As detailed in Section 4.4.3, RE communities represent the foundation criteria used to map predicted habitat for species in this High Risk SMP. Based on the field verified data the 11 REs are present within the Project footprint as shown in Table 4.5 and presented in Figure 4.3.

Table 4.5 Regional Ecosystem mapping

Regional Ecosystem	VM Act Status	Description
11.3.4	Least Concern	*Eucalyptus tereticornis and/or Eucalyptus spp*. woodland on alluvial plains
11.3.7	Least Concern	*Corymbia spp*. open woodland on alluvial plains
11.3.9	Least Concern	*Eucalyptus platyphylla, Corymbia spp.* woodland on alluvial plains
11.3.10	Least Concern	*Eucalyptus brownii* woodland on alluvial plains
11.3.12	Least Concern	*Melaleuca viridiflora, M. argentea +/- M. dealbata* woodland on alluvial plains
11.3.13	Of Concern	*Grevillea striata* open woodland on coastal alluvial plains
11.3.25b	Least Concern	*Melaleuca leucadendra* and/or *M. fluviatilis, Nauclea orientalis* open forest
11.3.30	Least Concern	*Eucalyptus crebra, Corymbia dallachiana* woodland on alluvial plains
11.3.35	Least Concern	*Eucalyptus platyphylla, Corymbia clarksoniana* woodland on alluvial plains
11.3.35a	Least Concern	*Corymbia tessellaris, C. clarksoniana* and E*ucalyptus platyphylla* woodland
11.12.1	Least Concern	*Eucalyptus crebra* woodland on igneous rocks



Paper Size ISO A3

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Kilometres

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

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Field verified RE mapping within the Project area

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FIGURE 4-3

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Print date: 20 Jan 2022 - 12:18c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Regional Ecosystems v12 with Field-verified Edits (2021); World Imagery: Earthstar Geographics. Created by: xlee

4.5.3 Wildlife habitats within the Project area

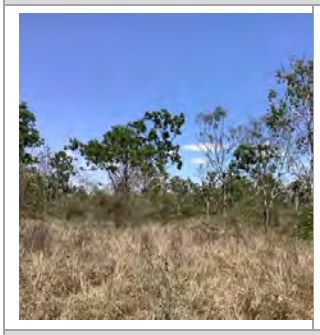
The Project occurs in a landscape that has been subject to generations of cattle grazing and localised intensive agriculture, with irrigated cropping concentrated in areas adjacent to the Burdekin River. Extensive land clearing has been historically undertaken and the understorey of most remnant woodland areas has been extensively altered through pressures imposed by cattle grazing, sowing of buffel (*Cenchrus ciliaris*) and other exotic pasture grasses and extensive infestations of weeds including chinee apple (*Ziziphus mauritiana*), rubber vine (*Cryptostegia grandiflora*), lantana (*Lantana camara*), parthenium (*Parthenium hysterophorus*), parkinsonia (*Parkinsonia aculeata*) and bellyache bush (*Jatropha gossypiifolia*). Despite this, remnant woodland was extensively distributed throughout the Project area. Despite the existing disturbance, parts of the Project area retain potential breeding habitat values for a range of fauna including species listed under the NC Act.

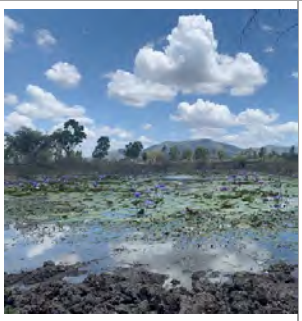
The following six broad habitat types were observed within the Project area, as described in Table 4.6 and mapped in Figure 4.4:

– Open woodland with a native grassy ground layer
– Open woodland with highly disturbed ground layer
– Mature riparian woodland lining ephemeral or semi-permanent watercourses
– *Melaleuca viridiflora* low woodland
– Permanent watersources
– Cleared or highly modified grazing land

Information on the ecology and distribution of breeding habitat for NC Act listed species is detailed in Section 4.6.

Table 4.6 Wildlife habitats present within the Project area

Habitat type	Characteristics	Ecological values
Open Eucalypt woodland with native grassy ground layer		
	Tall canopy layer at low to moderate densities Moderate abundance of hollow-bearing trees Sparse low native shrubs Native grasses present in moderate densities with low levels of weeds Logs, woody debris and other complex ground-level microhabitats present in high densities	Nesting and foraging habitat for canopy-dwelling birds Refuges and basking areas for snakes, dragons, skinks and geckos Foraging habitat for ground-dwelling mammals Potential conservation significant species – black-throated finch (southern), bare-rumped sheathtail bat, squatter pigeon (southern)
Open Eucalypt woodland with disturbed ground layer		
	Tall canopy layer at low to moderate densities Moderate abundance of hollow-bearing trees Sparse low native shrubs High levels of shrubby weeds including parkinonia, chinnee apple, bellyache bush Heavily grazed ground layer dominated by buffel grass and exotic grass species	Nesting and foraging habitat for canopy-dwelling birds Refuges and basking areas for snakes, dragons, skinks and geckos Foraging habitat for ground-dwelling mammals Potential conservation significant species – black-throated finch (southern), bare-rumped sheathtail bat, squatter pigeon (southern)
Mature riparian woodland lining ephemeral or semi-permanent watercourses		
	Mature canopy trees present in moderate-high abundance High abundance of hollow-bearing trees Patches of dense shrubs and sub-canopy tree species Ephemeral and semi-permanent water sources Sandy substrate suitable for burrowing	Den sites for arboreal mammals Drinking sites for birds and mammals Nesting and foraging habitat for canopy, shrub and ground-dwelling birds Refuges and breeding sites for amphibians Foraging habitat for snakes Foraging and roosting habitat for microbats Movement corridors for birds, reptiles and mammals Potential conservation significant species – black-throated finch (southern), bare-rumped sheathtail bat, squatter pigeon (southern)
Melaleuca viridiflora low woodland		
	Low *Melaleuca viridiflora* in moderate localised densities Taller Eucalypts and other canopy trees present in very low densities Hollow-bearing trees generally absent Shrub layer generally absent Taller native and exotic grasses	Nesting and foraging habitat for shrub and ground-dwelling birds Refuges and breeding sites for amphibians Foraging habitat for snakes Potential conservation significant species – black-throated finch (southern), squatter pigeon (southern)
Permanent watersources		

Habitat type	Characteristics	Ecological values
	Occasional large hollow-bearing trees Permanent water sources Sandy substrate suitable for burrowing Distribution: Scattered throughout the Project area	Nesting and foraging habitat for waterbirds Drinking sites for birds and mammals Breeding and foraging habitat for amphibians Foraging habitat for snakes Breeding and foraging habitat for fish and turtles Foraging and roosting habitat for microbats Potential conservations significant species – black-throated finch (southern), squatter pigeon (southern)
Cleared and highly modified grazing land		
	Canopy and shrub layer generally absent Notably high abundance of hollow stags High density of course woody debris and hollow ground logs Ground-layer heavily altered – subject to grazing	Foraging habitat for raptors and birds adapted to open landscapes Foraging and roosting habitat for microbats Refuge and foraging habitat for snakes, dragons and skinks Foraging habitat for macropods and rabbits Potential conservation significant species – Nil

Legend

- Major Road
- Minor Road
- Railway
- Watercourse
- Proposed Access and Haulage
- Existing Access
- Fence
- Pipeline Alignment
- Proposed Access
- Existing Access
- Stockpile
- Pump Station

Wildlife Habitat Type

- Cleared or highly modified grazing land
- Mature riparian woodland lining ephemeral or semi-permanent watercourses
- Melaleuca viridiflora low woodland
- Open woodland with a native grassy ground layer
- Open woodland with highly disturbed ground layer
- Permanent water sources

Paper Size ISO A3

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Kilometres

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

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GHD

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Distribution of wildlife habitats within the Project area

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FIGURE 4-4

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Print date: 20 Jan 2022 - 15:57c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout (2021), Wildlife Habitat Type (2022); World Imagery: Earthstar Geographics. Created by: xlee

4.6 Conservation significant species

4.6.1 Likelihood of occurrence assessment

Based on the results of the likelihood of occurrence assessment, two conservation significant fauna species were **confirmed present** within the Project area, and a further five were considered **likely to occur** within the Project area. Of the remaining 38 conservation significant species identified in desktop searches, 24 **may occur**. The remaining 14 species 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 Table 4.7.

Table 4.7 Conservation significant species known or likely to occur

Scientific name	Common name	EPBC Act status	NC Act status
Confirmed present			
Poephila cincta cincta	Black-throated finch (southern)	E	E
Geophaps scripta scripta	Squatter pigeon (southern)	V	V
Likely to occur			
Phascolarctos cinereus	Koala	V	V
Saccolaimus saccolaimus nudicluniatus	Bare-rumped sheathtail bat	V	E
Hirundapus caudacutus	White-throated needletail	V, Mig	V
Apus pacificus	Fork-tailed swift	Mig	SL
Pandion haliaetus	Osprey	Mig	SL

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

4.6.2 Black-throated finch (southern)

4.6.2.1 Ecology of the species

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

The southern subspecies is known to occur in the Townsville-Charters Towers region and in scattered sites in central Queensland including Ingham (DAWE 2021a). 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 2021a). The species 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 species during the dry season, especially during drought years (DAWE 2021a).

4.6.2.2 Occurrence in the Project area

Desktop search results

The black-throated finch (southern) was identified within the PMST (Appendix A) as having potential to occur within a 30 km radius from a central point within the Project area. Essential habitat for the species is mapped south-east, west, north and north-east of the Project area. A search of WildNet (Appendix A) reported 15 historical records within 30 km of the search coordinates.

Field survey results

Two black-throated finch (southern) were confirmed present in the southern extent of Project area 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 species has been confirmed present within the Project area. Under the Significant impact guidelines for the endangered black-throated finch (DEWHA 2009a), actions proposed within 5 km of confirmed records of the species within post-1995 will require habitat assessment. Where suitable habitat exists, the species should be considered present. Therefore, the Project area is considered to be within 5 km of a record (i.e. black-throated finches 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 footprint suitable for foraging by the black-throated finch are provided below in Table 4.8. 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 4.8 Black-throated finch foraging grasses within the Project area

Scientific name	Common name
Aristida holathera	Erect kerosine grass
Bothriochloa bladhii subsp. bladhii	Forest bluegrass
Bothriochloa decipiens	Pitted grass
**Bothriochloa pertusa*	Indian bluegrass
**Chloris gayana*	Rhodes grass
**Chloris inflata*	Purpletop chloris
**Dichanthium annulatum*	Sheda grass
**Dichanthium aristatum*	Angleton grass
Dichanthium sericeum subsp. sericeum	Queensland bluegrass

Scientific name	Common name
Enteropogon ramosus	Twirly windmill grass
Eragrostis sororia	
Eragrostis sp (indet)	
Eriochloa pseudoacrotricha	Early spring cupgrass
Eulalia aurea	Silky browntop
Heteropogon contortus	Black speargrass
**Melinis repens*	Red natal grass
Oryza australiensis	Australian wild rice
Panicum decompositum	Australian millet
Sporobolus jacquemontii	Rat's tail grass
Themeda triandra	Kangaroo grass
**Urochloa mutica*	Para grass

Note: '*' – introduced species

Water sources including stock dams, troughs and ephemeral watercourses and drainage lines were present across the Project area. Substantial areas were heavily degraded by cattle grazing and with areas of groundcover dominated by sida.

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).

In the order of 76.72 ha of nesting habitat and 40.77 ha of foraging habitat for the black-throated finch (southern) is present within the Project area.

The distribution of breeding and foraging habitat is mapped in Figure 4.5.

Plate 4-1 Black-throated finch recorded in the Project area

4.6.2.3 Criteria used to map breeding 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 species has been recorded in 21 regional ecosystems (REs) (all of which occur in Queensland) since 1994 (DAWE 2021).

Table 4.9 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 conserve all existing populations of the Black-throated Finch (southern).	Areas within 5 km of a post-1995 record of the species. As extensive surveys over multiple seasons haven't been undertaken in accordance with the guidelines, a precautionary approach will be taken. Therefore the entire area is mapped as an important area, assuming that the species will occur.
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).	Remnant REs listed as essential habitat factors by DoR 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 species include: – 9.12.1 *Eucalyptus crebra* and/or *E. xanthoclada* and/or *E. drepanophylla* low open woodland on igneous rocks – 9.12.4 *Eucalyptus shirleyi* and/*or E. melanophloia* and/or *Corymbia peltata* and/or *Callitris intratropica* low open woodland on igneous rocks – 9.12.19 *Eucalyptus crebra* or *E. granitica +/- Corymbia citriodora subsp. citriodora +/- E. portuensis* mixed woodland on igneous hills – 9.12.22 *Eucalyptus drepanophylla, Corymbia clarksoniana* or *C. intermedia* and *C. dallachiana* woodland on steep rugged igneous ranges – 9.12.24 *Eucalyptus drepanophylla or E. crebra* and/or *E. xanthoclada* and *Corymbia peltata* woodland on igneous rocks – 11.3.4*Eucalyptus tereticornis and/or Eucalyptus spp*. woodland on alluvial plains – 11.3.9 Eucal*yptus platyphylla, Corymbia spp.* woodland on alluvial plains – 11.3.10 *Eucalyptus brownii* woodland on alluvial plains – 11.3.12 *Melaleuca viridiflora, M. argentea +/- M. dealbata* woodland on alluvial plains – 11.3.13 *Grevillea striata* open woodland on coastal alluvial plains – 11.3.25 *Eucalyptus tereticornis or E. camaldulensis* woodland fringing drainage lines – 11.3.27 Freshwater wetlands – 11.3.30 *Eucalyptus crebra, Corymbia dallachiana* woodland on alluvial plains – 11.3.33 *Eremophila mitchellii* open woodland on alluvial plains – 11.3.35 *Eucalyptus platyphylla, Corymbia clarksoniana* woodland on alluvial plains – 11.11.1 *Eucalyptus crebra +/- Acacia rhodoxylon* woodland on old sedimentary rocks with varying degrees of metamorphism and folding

Habitat	Commonwealth definition	Criteria used to map habitat
		– 11.11.15 *Eucalyptus crebra* woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics – 11.12.1 *Eucalyptus crebra* woodland on igneous rocks – 11.12.9 *Eucalyptus platyphylla* woodland on igneous rocks
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.	Remnant REs with a native grassy understorey within 3 km of permanent water including watercourses and stock dams. REs within a 10 km buffer relevant to the species include: – 9.12.1 *Eucalyptus crebra* and/or *E. xanthoclada* and/or *E. drepanophylla* low open woodland on igneous rocks – 9.12.4 *Eucalyptus shirleyi* and/*or E. melanophloia* and/or *Corymbia peltata* and/or *Callitris intratropica* low open woodland on igneous rocks – 9.12.19 *Eucalyptus crebra* or *E. granitica +/- Corymbia citriodora subsp. citriodora +/- E. portuensis* mixed woodland on igneous hills – 9.12.22 *Eucalyptus drepanophylla, Corymbia clarksoniana* or *C. intermedia* and *C. dallachiana* woodland on steep rugged igneous ranges – 9.12.24 *Eucalyptus drepanophylla or E. crebra* and/or *E. xanthoclada* and *Corymbia peltata* woodland on igneous rocks – 11.3.4*Eucalyptus tereticornis and/or Eucalyptus spp*. woodland on alluvial plains – 11.3.9 *Eucalyptus platyphylla, Corymbia spp.* woodland on alluvial plains – 11.3.10 *Eucalyptus brownii* woodland on alluvial plains – 11.3.12 *Melaleuca viridiflora, M. argentea +/- M. dealbata* woodland on alluvial plains – 11.3.13 *Grevillea striata* open woodland on coastal alluvial plains – 11.3.25 *Eucalyptus tereticornis or E. camaldulensis* woodland fringing drainage lines – 11.3.27 Freshwater wetlands – 11.3.30 *Eucalyptus crebra, Corymbia dallachiana* woodland on alluvial plains – 11.3.33 *Eremophila mitchellii* open woodland on alluvial plains – 11.3.35 *Eucalyptus platyphylla, Corymbia clarksoniana* woodland on alluvial plains – 11.11.1 *Eucalyptus crebra +/- Acacia rhodoxylon* woodland on old sedimentary rocks with varying degrees of metamorphism and folding – 11.11.15 *Eucalyptus crebra* woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics – 11.12.1 *Eucalyptus crebra* woodland on igneous rocks – 11.12.9 *Eucalyptus platyphylla* woodland on igneous rocks

4.6.2.4 Distribution and quality of breeding habitat

Mapping of potential habitat was refined, based on consideration of habitat condition and maturity, and weed infestation. Many areas of remnant woodland habitat within the Project area were highly degraded, had extensive infestation of weeds and/or had undergone historical land clearing. Despite this, remnant woodland representing potential nesting habitat for the species is present across the Project area as well as north, south, east and west of the HDPD Project area. Due to weed infestation and degradation from pastural land uses, nesting habitat values were considered relatively low in parts of the Project area. The distribution of potential nesting habitat for the black-throated finch is mapped in Figure 4.5. Representative photos of areas of suitable breeding habitat are shown in Plate 4-2.

Plate 4-2 Areas of potential breeding habitat for the black-throated finch (southern) within the Project area

Paper Size ISO A3

0 1 2

Kilometres

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

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GHD

Townsville City Council
Haughton Pipeline Stage 2 - High Risk SMP

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

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FIGURE 4-5

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Print date: 20 Jan 2022 - 12:19c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Potential Habitat, Field Record (2021); World Imagery: Earthstar Geographics. Created by: xlee

4.6.3 Squatter pigeon (southern)

4.6.3.1 Ecology of the species

The squatter pigeon is listed as vulnerable under the NC Act

Squatter pigeon (southern) habitat includes remnant and regrowth open forest and woodland dominated by *Eucalyptus, Corymbia, Acacia* and *Callitris* species with tussock grassy understoreys and within 3 km of water sources (DAWE 2021). Breeding and foraging habitat is generally restricted to well-draining, gravelly, sandy or loamy soils with a tussock-grassy understorey (Squatter Pigeon Workshop 2011). 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). Squatter pigeon (southern) habitat typically does not exceed 33 percent vegetation ground cover (Squatter Pigeon Workshop 2011). Individuals can occur in modified or degraded habitats that are within 100 m of remnant trees or patches of habitat (Squatter Pigeon Workshop 2011).

Breeding habitats are typically located on stony rises within 1 km of permanent water (Squatter Pigeon Workshop 2011). The Commonwealth listing advice identifies potential breeding habitat as land zone 5 (sandy plains and plateaus) and 7 (ironstone jump-ups) REs (Squatter Pigeon Workshop 2011). While not recognised in the Commonwealth habitat description, land zone 11 REs listed as essential habitat factors for the species by the DoR are located on metamorphosed undulating areas and lower slopes with shallow, gravelly soils (Wilson and Taylor 2012), and are therefore consistent with the definition of breeding habitat. The breeding season of the squatter pigeon (southern) is poorly understood, and has been suggested to occur through the year, depending on local conditions (Higgins et al. 2006).

4.6.3.2 Occurrence in the Project area

Desktop search results

The squatter pigeon was not identified within the PMST (Appendix A) as having potential to occur within a 30 km radius from a central point within the Project area. A search of WildNet (Appendix A) reported 13 historical records within 30 km of the search coordinates.

Field survey results

Ten 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.

Drinking and dispersal habitat for the squatter pigeon 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 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).

Foraging, nesting and drinking and dispersal 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 squatter pigeon (southern).

No suitable breeding habitat or foraging habitat for the squatter pigeon (southern) is present within the Project area. 120.74 ha of drinking and dispersal habitat is present within the Project footprint.

The distribution of breeding and foraging habitat is mapped in Figure 4.6.


Plate 4-3 *Squatter pigeons recorded adjacent to the Project area*

4.6.3.3 Criteria used to map breeding 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 water bodies or courses.

Soil landscapes are good indicators of where natural, 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 understories 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 4.10 *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 listing advice for the species. In the absence of a formal definition, the definition outlined in the Significant impact guidelines 1.1 applies.	All foraging and breeding habitat (as defined below) was considered habitat critical to the survival of the species.
Foraging	Natural foraging habitat for the Squatter Pigeon (southern) is any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by *Eucalyptus, Corymbia, Acacia* or *Callitris* 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 well-draining, sandy or loamy soils on low, gently sloping, flat to undulating plains and foothills (i.e. Queensland Regional Ecosystem Land Zone 5), and lateritic (duplex) soils on low 'jump-ups' and escarpments (i.e. Queensland Regional Ecosystem 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	Remnant and regrowth REs listed as essential habitat factor by DoR within 3 km of permanent or seasonal waterbodies (including watercourses, irrigation channels, stock dams and natural wetlands) on suitable soil (i.e. land zone 5 or 7 RE as included in the listing advice and also any land zone 10 and 11). REs within a 10 km buffer relevant to the species include: – 11.11.1 *Eucalyptus crebra +/- Acacia rhodoxylon* woodland on old sedimentary rocks with varying degrees of metamorphism and folding – 11.11.15 *Eucalyptus crebra* woodland to open woodland on deformed and metamorphosed

Habitat	Commonwealth definition	Criteria used to map habitat
	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).	sediments and interbedded volcanics
Breeding	Breeding habitat occurs on stony rises occurring on sandy or gravelly soils, within 1 km of a suitable, permanent waterbody (Squatter Pigeon Workshop 2011).	Remnant or regrowth RE that is listed as an essential habitat factor by DoR and occurs on suitable soil (i.e. land zone 5 or 7 RE as included in the listing advice and also land zone 10 and 11) within 1 km of permanent or seasonal waterbodies (including watercourses, irrigation channels, stock dams and wetlands). REs within a 10 km buffer relevant to the species include: – 11.11.1 *Eucalyptus crebra +/- Acacia rhodoxylon* woodland on old sedimentary rocks with varying degrees of metamorphism and folding – 11.11.15 *Eucalyptus crebra* woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics
Drinking and dispersal	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 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	Remnant or regrowth landzone 3 RE that is listed as an essential habitat by DoR or areas of non-remnant that occur within 100 m of foraging or breeding habitat. REs within 10 km buffer include: – 11.3.4 *Eucalyptus tereticornis and/or Eucalyptus spp*. woodland on alluvial plains – 11.3.7 *Corymbia spp*. open woodland on alluvial plains – 11.3.9 *Eucalyptus platyphylla, Corymbia spp.* woodland on alluvial plains – 11.3.10 *Eucalyptus brownii* woodland on alluvial plains – 11.3.12 *Melaleuca viridiflora, M. argentea +/- M. dealbata* woodland on alluvial plains – 11.3.13 *Grevillea striata* open woodland on coastal alluvial plains – 11.3.25 *Eucalyptus tereticornis or E. camaldulensis* woodland fringing drainage lines – 11.3.27 Freshwater wetlands – 11.3.30 *Eucalyptus crebra, Corymbia dallachiana* woodland on alluvial plains – 11.3.35 *Eucalyptus platyphylla, Corymbia clarksoniana* woodland on alluvial plains

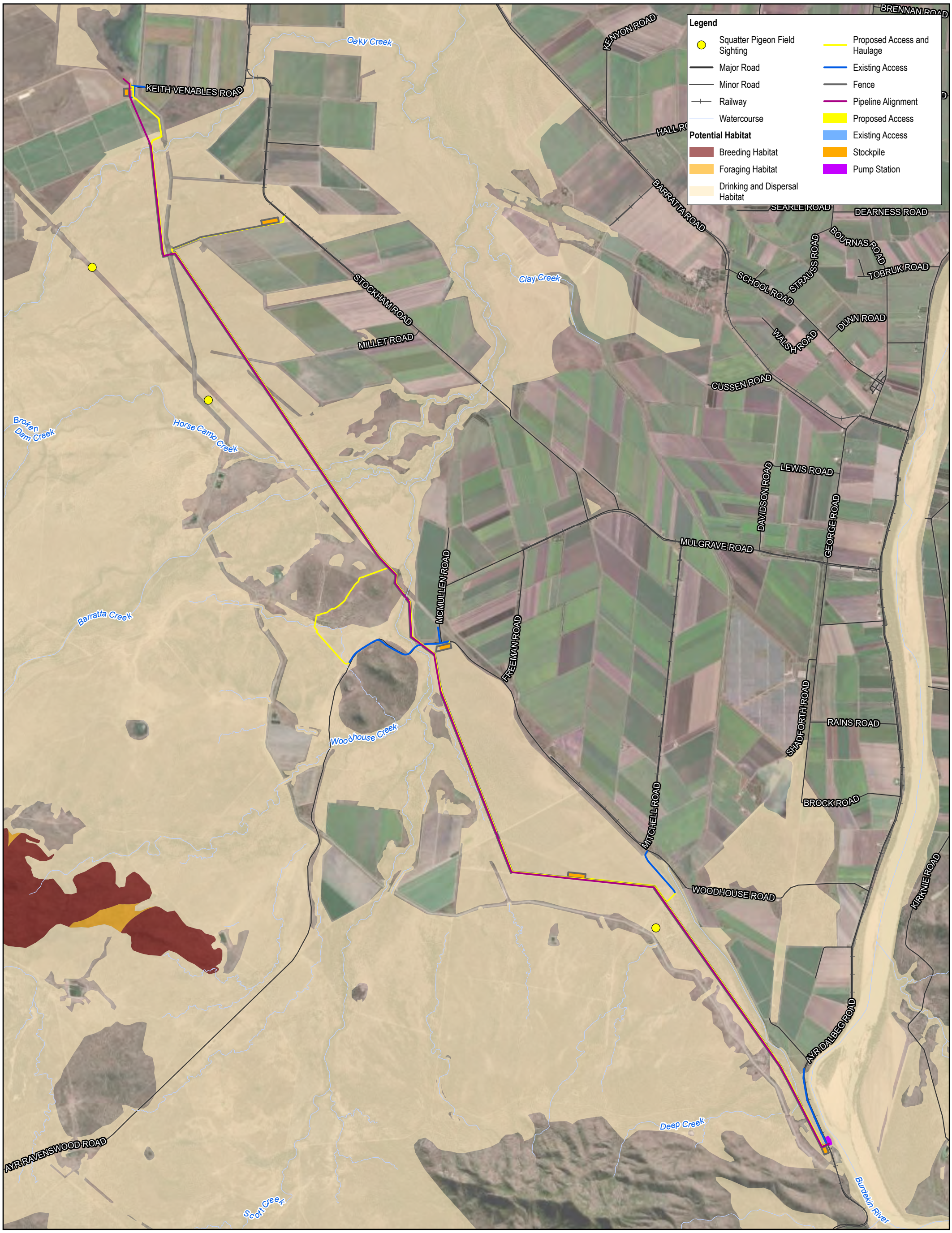
Habitat	Commonwealth definition	Criteria used to map habitat
	the distance of cleared land between remnant trees or patches of habitat does not exceed 100 m, individuals may be found foraging in, or moving across modified or degraded environments (Squatter Pigeon Workshop 2011).	

4.6.3.4 Distribution and quality of breeding habitat

No suitable breeding habitat was observed within the Project area. No suitable land zone or REs were confirmed present. All habitat across the Project area was located on land zone 3 (Plate 4-4). All areas within, and extensive areas surrounding the Project area are mapped suitable for drinking and dispersal only.

Breeding habitat suitable for the squatter pigeon occurs to the west of the Project area, on undulating rises and low hills. The distribution of potential breeding habitat for the squatter pigeon (southern) is mapped in Figure 4.6.

Plate 4-4 *Areas of unsuitable breeding habitat for the squatter pigeon within the Project area*



Paper Size ISO A3

0 1 2

Kilometres

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

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Haughton Pipeline Stage 2 - High Risk SMP

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

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FIGURE 4-6

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Print date: 20 Jan 2022 - 12:25c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Potential Habitat, Field Record (2021); World Imagery: Earthstar Geographics. Created by: xlee

4.6.4 Bare-rumped sheathtail bat

4.6.4.1 Ecology of the species

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

In Queensland, the species is known to occur from Ayr to the Iron Ranges (TSSC 2016). 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 *Eucalyptus* or *Corymbia* species intermingled with coastal lowland rainforest (TSSC 2016). The species has been suggested 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 2021a). The species has been recorded using large, deep hollows for roosting and breeding in species *E. platyphylla, E. miniata, E. tetrodonta* and *Melaleuca leucadendra* syn. *leucodendron* (TSSC 2016). 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.

4.6.4.2 Occurrence in the Project area

Desktop search results

The bare-rumped sheathtail bat was identified within the PMST (Appendix A) as having potential to occur within a 30 km radius from a central point within the Project area. Essential habitat for the species is mapped north-west of the Project area.

Field survey results

The bare-rumped sheathtail bat was not confirmed present during any of the field surveys undertaken for the Project. NRA potentially recorded the species using acoustic bat detectors – several *Saccolaimus* sp. calls were recorded in suitable habitat for the bare-rumped sheathtail bat, however the recordings were unable to be differentiated between the bare-rumped sheathtail bat or the yellow-bellied sheathtail bat (*Saccolaimus flaviventris*) (NRA 2021). Given the presence of suitable habitat and species' prevalence in the region, the bare-rumped sheathtail bat was considered likely to occur within the Project area.

The GHD 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, that are too small to provide roosts for the bare-rumped sheathtail bat, but represents potential future roosting sites. Suitable foraging habitat is broadly mapped across the Project area. Suitable foraging habitat in the Project footprint 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. 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 sheathtail bat are shown in Figure 4.7.

4.6.4.3 Criteria used to map breeding 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 & Thomson 2007; Reardon et al. 2010; Dennis 2012).

Table 4.11 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 (*Eucalyptus miniata*) and Darwin Stringybark (Churchill 1998; Compton & 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	Moderate and large hollows in *E. platyphylla* were mapped as potential roost trees and small hollow-bearing *E. platyphylla* were mapped as future potential roost trees. All areas within 200 m of moderate and large roost trees (*E. platyphylla* only) were also mapped as potential roosting habitat.

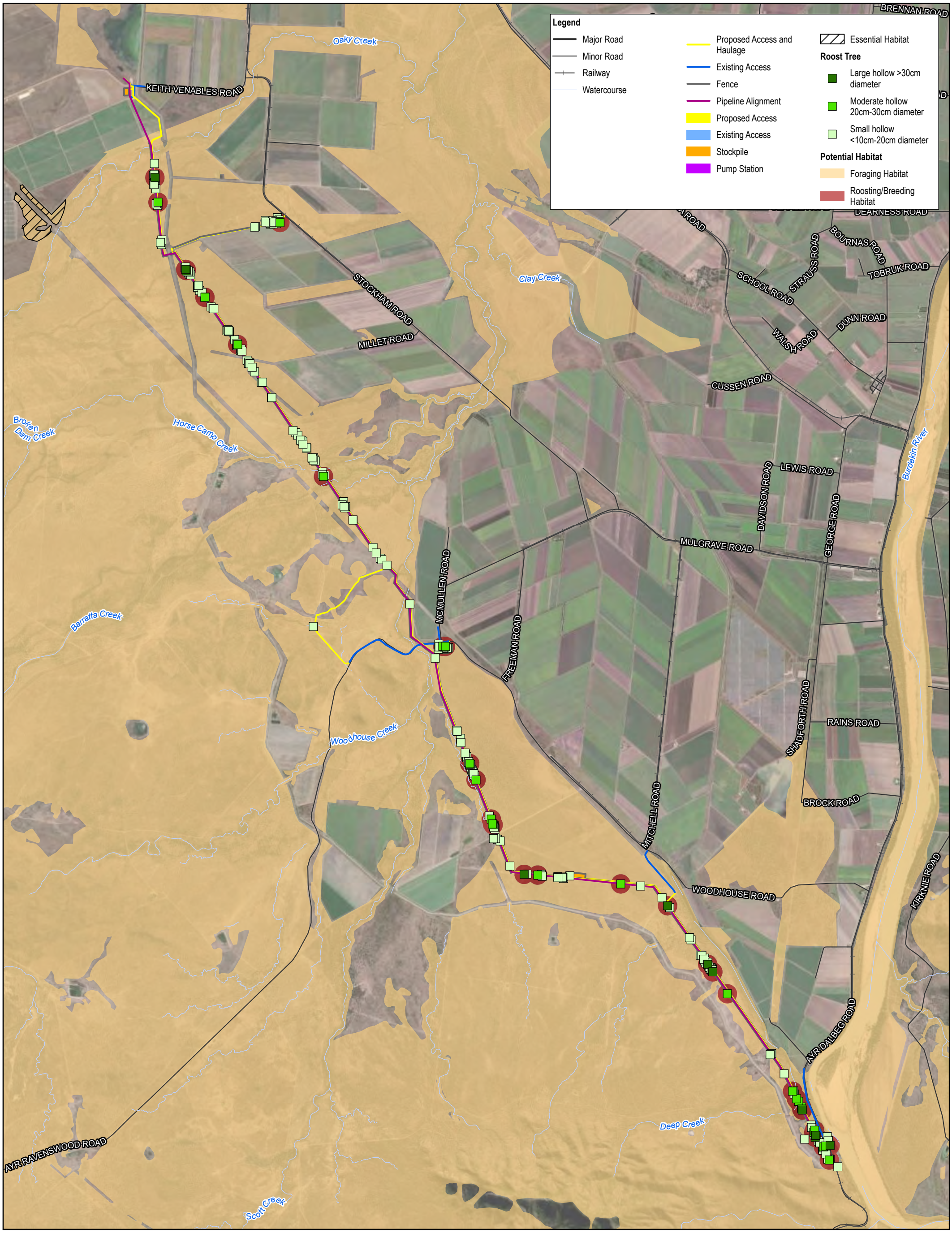
Habitat	Commonwealth definition	Criteria used to map habitat
	hollows ranging between 18 cm and 29 cm diameter (Schulz and Thomson 2007; Churchill 2008).	
Foraging	Only anecdotal information is available, based on habitat around roosts or from shot specimens. No information is available on foraging habitat shifts between the dry and wet seasons (Schulz & 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: - 11.3.4 *Eucalyptus tereticornis* and/or *Eucalyptus spp*. woodland on alluvial plains – 11.3.9 Eucal*yptus platyphylla, Corymbia spp.* woodland on alluvial plains – 11.3.10 *Eucalyptus brownii* woodland on alluvial plains – 11.3.12 *Melaleuca viridiflora, M. argentea +/- M. dealbata* woodland on alluvial plains – 11.3.13 *Grevillea striata* open woodland on coastal alluvial plains – 11.3.25 *Eucalyptus tereticornis or E. camaldulensis* woodland fringing drainage lines – 11.3.27 Freshwater wetlands – 11.3.30 *Eucalyptus crebra, Corymbia dallachiana* woodland on alluvial plains – 11.3.33 *Eremophila mitchellii* open woodland on alluvial plains – 11.3.35 *Eucalyptus platyphylla, Corymbia clarksoniana* woodland on alluvial plains – 11.11.1 *Eucalyptus crebra +/- Acacia rhodoxylon* woodland on old sedimentary rocks with varying degrees of metamorphism and folding – 11.11.15 *Eucalyptus crebra* woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics – 11.12.1 *Eucalyptus crebra* woodland on igneous rocks – 11.12.9 *Eucalyptus platyphylla* woodland on igneous rocks

4.6.4.4 Distribution and quality of breeding habitat

Suitable roosting/breeding habitat for the bare-rumped sheathtail bat is scattered across the Project area, with majority of habitat mapped in the southern and northern sections of the Project area in *E. platyphylla* woodland as mapped in Figure 4.7. Potential roosting/breeding habitat was recorded in large and moderate hollow-bearing *E. platyphylla* trees. Small hollow-bearing *E. platyphylla* trees were recorded across the Project area but contained hollows smaller than those known to represent potential breeding sites for the species. Surveys for roosting habitat was only undertaken within the Project area, therefore no comments can be made on the distribution of suitable roosting habitat outside of the survey area.

Suitable roosting habitat is shown in Plate 4-5.

Plate 4-5 *Potential bare-rumped sheathtail bat breeding habitat within the Project area*



Paper Size ISO A3

0 1 2

Kilometres

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

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GHD

Townsville City Council
Haughton Pipeline Stage 2 - High Risk SMP

Distribution of potential bare-rumped sheathtail bat habitat within and surrounding the Project area

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Revision No. **0**
Date **1/21/2022**

FIGURE 4-7

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Print date: 21 Jan 2022 - 16:50c

Data source: DoR: Roads, Railway, Watercourses, Essential Habitat v10 (2021); GHD: Site Layout, Roost Trees, Potential Habitat (2021); World Imagery: Earthstar Geographics. Created by: xlee

4.6.5 Eastern osprey

4.6.5.1 Ecology of the species

The eastern osprey is listed as special least concern under the NC Act.

The breeding range of the eastern osprey extends around the northern coast of Australia (including many offshore islands) from Albany in Western Australia to Lake Macquarie in NSW, with a separate population occurring in south Australia (DAWE 2021a). The Eastern Osprey is considered to be moderately common in Australia (Olsen 1998). The species is most abundant in northern Australia, where high population densities occur in remote areas (Garnett 1993; Johnstone & Storr 1998). The species occurs in littoral and coastal habitats and wetlands, of tropical and temperate Australia. Eastern osprey are known to travel inland along major rivers where they require extensive areas to forage in open fresh, brackish or saline water (DAWE 2021a). Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea (OEH, 2020) or major rivers.

4.6.5.2 Occurrence in the Project area

Desktop search results

The eastern osprey was identified within the PMST (Appendix A) as having potential to occur within a 30 km radius from a central point within the Project area. A search of WildNet (Appendix A) reported one historical record within 30 km of the search coordinates.

Field survey results

The species was not recorded during the field survey. However, the species has been historically recorded within the desktop search extent. Potential foraging and nesting habitat was recorded along the southern section of the Project area, along the Burdekin River. The eastern osprey is considered likely to occur.

No suitable foraging or nesting habitat is present within the Project footprint. Potential habitat for the eastern osprey is mapped in Figure 4.8.

4.6.5.3 Criteria used to map breeding habitat

Commonwealth general habitat definition: The eastern osprey is mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging (DAWE 2021a).

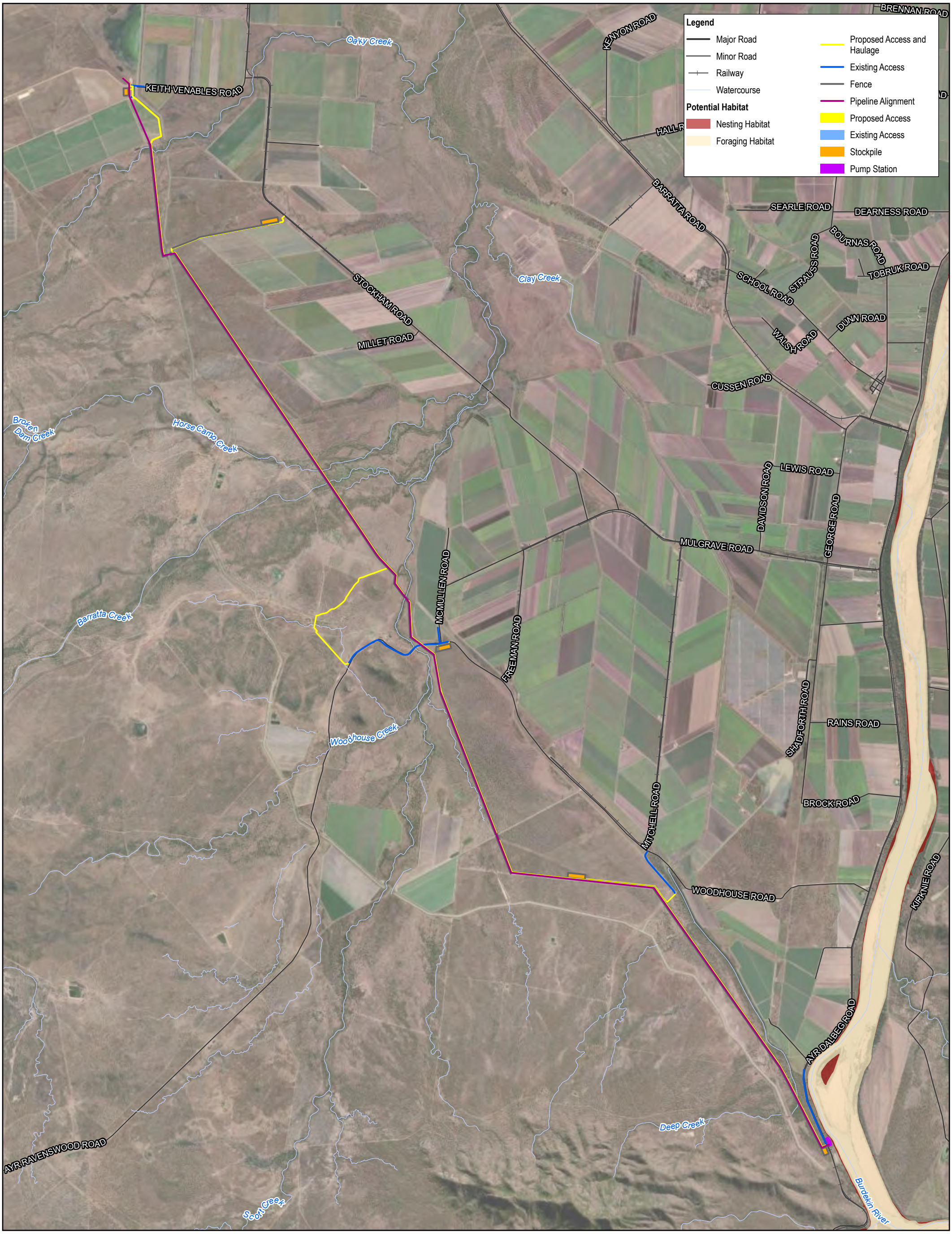
Table 4.12 Criteria used to map habitat for the eastern osprey

Habitat	Commonwealth definition	Criteria used to map habitat
Foraging	The eastern osprey forages over clear estuarine and inshore marine waters and coastal rivers (NSW Scientific Committee, 2009)	Area of Burdekin River and riparian fringe along the Burdekin river, no further back than the top bank and no side tributaries
Breeding	The eastern osprey nests in tall (usually dead or dead-topped) trees in coastal habitats from open woodland to open forest, within 1-2 km of water (NSW Scientific Committee, 2009)	Area of riparian fringe along the Burdekin river, no further back than the top bank and no side tributaries

4.6.5.4 Distribution and quality of breeding habitat

No suitable breeding habitat was observed within the Project area. Suitable breeding habitat was mapped outside of the southern section of the Project area, along the riparian fringe of the Burdekin River (Figure 4.8). Breeding habitat for the species is mapped where the riparian fringe is intact along the river (Plate 4-6). Habitat within the riparian fringe was good condition, historical clearing had been undertaken in areas, such as for the Sunwater pump station.

Plate 4-6 Suitable breeding habitat for the eastern osprey outside of the Project area



Paper Size ISO A3

0 1 2

Kilometres

N

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

GHD

Townsville City Council
Haughton Pipeline Stage 2 - High Risk SMP

Distribution of potential eastern osprey habitat within and surrounding the Project area

Project No. **12537606**
Revision No. **0**
Date **1/20/2022**

FIGURE 4-8

N:\AU\Townsville\Projects\42\12537606\GIS\Maps\APRX\12537606\12537606_HRSMP.aprx 12537606_HRSMP_007_EasternOspreyHab_Rev0
Print date: 20 Jan 2022 - 12:32c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Potential Habitat (2021); World Imagery: Earthstar Geographics. Created by: xlee

4.6.6 Short-beaked echidna

4.6.6.1 Ecology of the species

The short-beaked echidna is listed as special least concern under the NC Act.

The short-beaked echidna is widely distributed throughout Australia, occurring in a broad range of habitats, wherever there is suitable availability of ant or termite prey. Echidnas breed from the end of June to early September (Rismiller 1993). The species has specialist nursery burrows and shelters in hollow logs but otherwise does not have any fixed nest or shelter sites. Given the species broad habitat tolerances, the short-beaked echidna can occur in almost all landscapes including deserts, closed forest, woodland, rainforest, heath, cleared agricultural and grazing land and suburbia.

4.6.6.2 Occurrence in the Project area

Desktop search results

The short-beaked echidna has not been historically recorded within the desktop search extent. Although the species has not been historically recorded present, the species has broad habitat tolerances and has potential to use habitat within the Project area.

Field survey results

The short-beaked echidna was not confirmed present within the Project area during the field survey. No signs of the species such as diggings were observed during the field survey.

123.58 ha of suitable breeding habitat for the short-beaked echidna is present within the Project area.

4.6.6.3 Criteria used to map breeding habitat

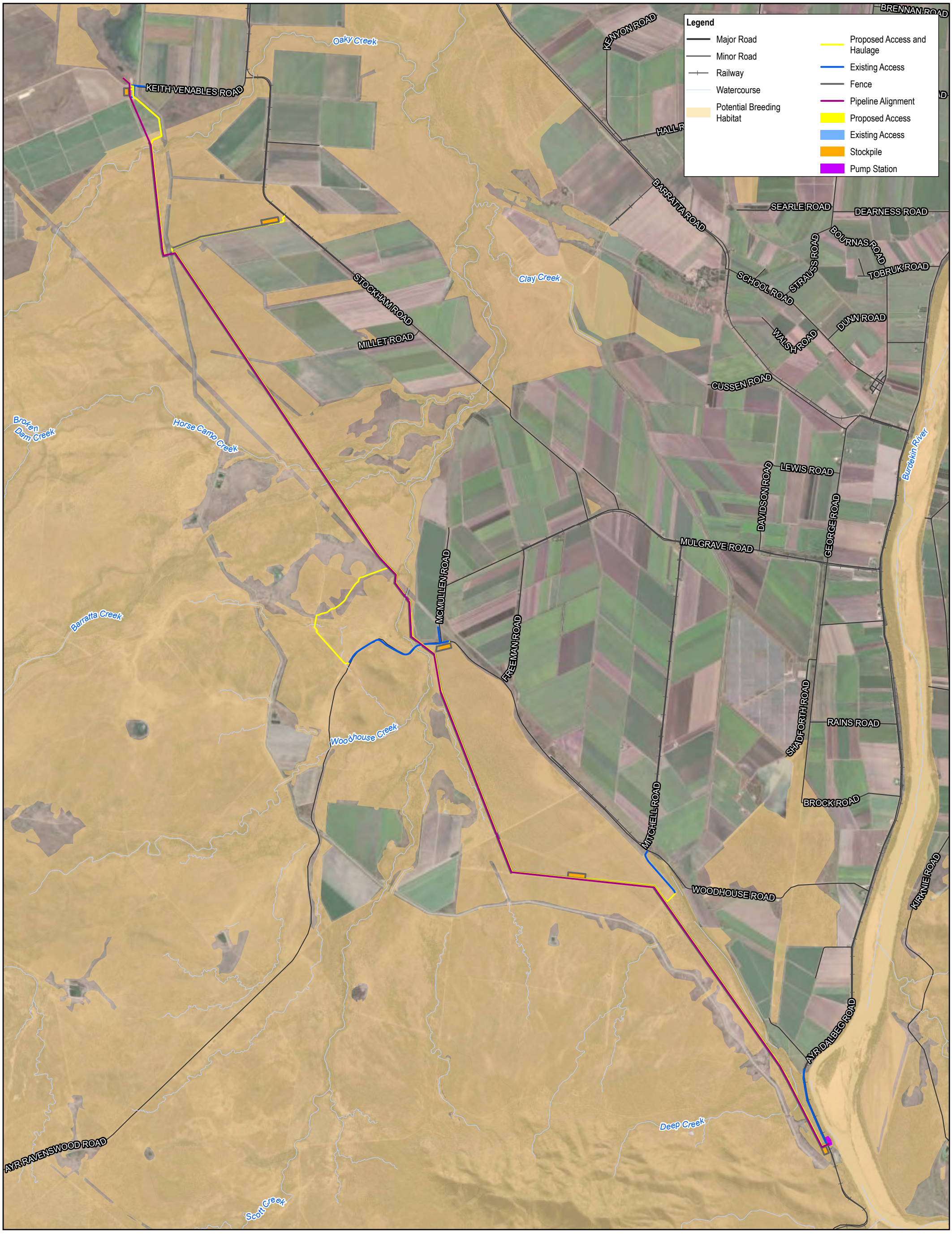
Mapping of breeding habitat was based on remnant vegetation mapping, verified at 40 locations across the Project area. The species has the potential to breed in almost any remnant habitat area, where there is suitable ground-level complexity. All remnant RE vegetation areas were considered potential breeding habitat for the species.

4.6.6.4 Distribution and quality of breeding habitat

Suitable breeding habitat for the short-beaked echidna was observed in remnant woodland across the Project area. Non-remnant areas were generally cleared and heavily grazed, and were considered of low breeding value for the species.

The distribution of potential breeding habitat is mapped in Figure 4.9.

Plate 4-7 Suitable breeding habitat for the short-beaked echidna within the Project area



Paper Size ISO A3

0 1 2

Kilometres

N

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

Townsville City Council
Haughton Pipeline Stage 2 - High Risk SMP

Distribution of potential short-beaked echidna breeding habitat within and surrounding the Project area

Project No. **12537606**
Revision No. **0**
Date **1/21/2022**

FIGURE 4-9

N:\AU\Townsville\Projects\42\12537606\GIS\Maps\APRX\12537606\12537606_HRSMP.aprx 12537606_HRSMP_010_Echidna_Rev0
Print date: 21 Jan 2022 - 16:50c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout (2021), Potential Habitat (2022); World Imagery: Earthstar Geographics. Created by: xlee

4.6.7 Colonial breeding microbats

4.6.7.1 Ecology of the species

Breeding and foraging habitat for the two recorded colonial breeding microbat species includes a range of forests including moist eucalypt, dry sclerophyll, rainforest, vine thicket, wet and dry sclerophyll, dense coastal and banksia scrub (OEH 2019, OEH 2020). Roosting habitat can include caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges, and sometimes building (OEH 2019, OEH 2020). Maternity colonies form in spring, with pups being born in early summer (OEH 2019, OEH 2020).

4.6.7.2 Occurrence in the Project area

Desktop search results

A search of WildNet (Appendix A) reported one record of the little bent wing bat (*Miniopterus australis*) and the eastern bent wing bat (*Miniopterus orianae oceanensis*) within 30 km of the search coordinates.

Field survey results

The species were not recorded during the field survey, however the species has been historically recorded within the desktop search extent. Potential roosting places were recorded along the Project area in 296 small, 35 moderate and 12 large hollow-bearing trees.

Potential roosting places for colonial breeding microbats are mapped in Figure 4.10.

4.6.7.3 Criteria used to map breeding habitat

Mapping of roosting places was based on the presence of small, moderate and large hollow-bearing trees across the extent of the Project area. All *Eucalyptus* and *Corymbia* hollow-bearing trees were considered potential roosting/breeding sites for colonial breeding microbats.

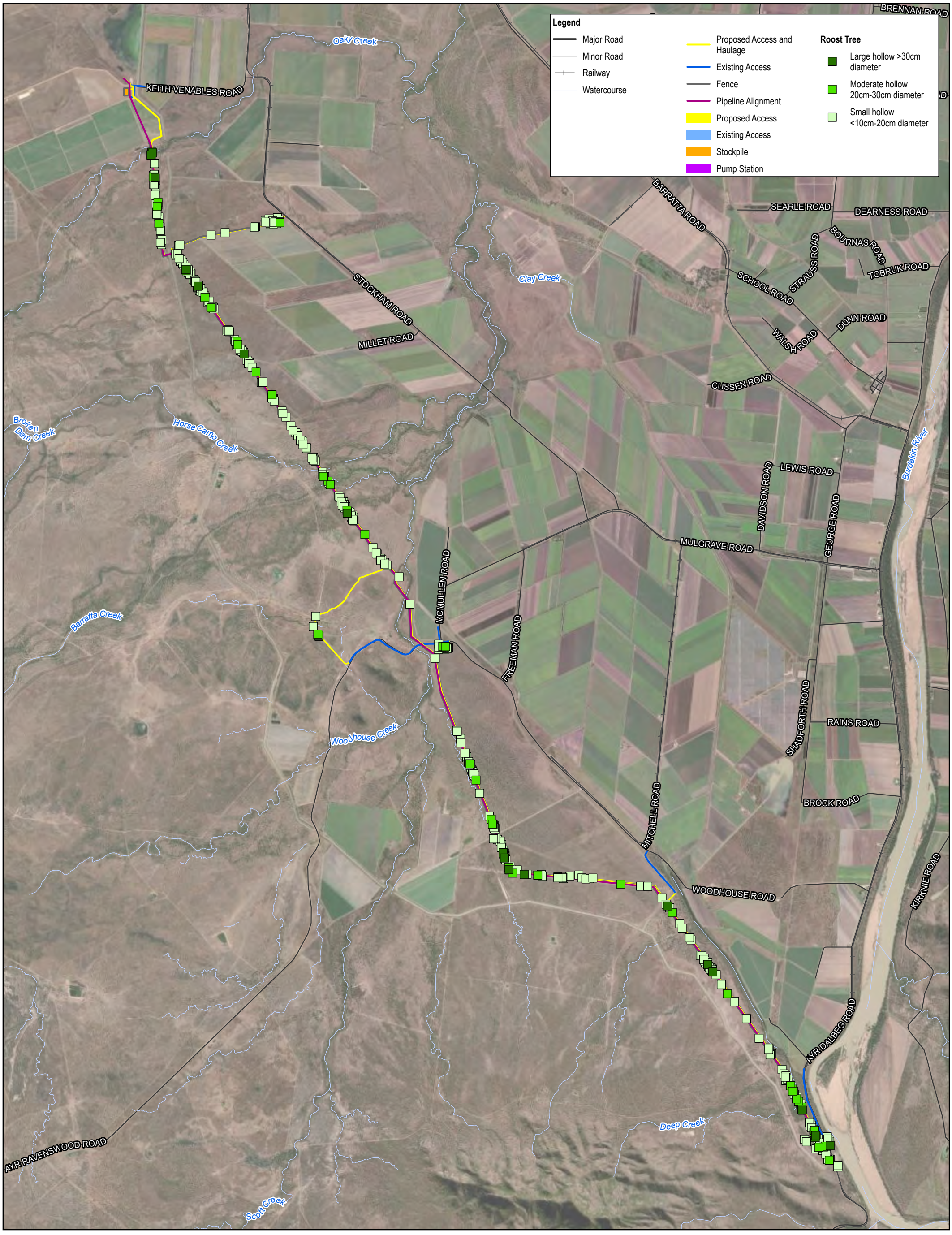
Potential breeding places for colonial breeding microbats are mapped in Figure 4.10.

4.6.7.4 Distribution and quality of breeding habitat

Small hollow-bearing trees were present across the entire Project area, with moderate and large hollow-bearing trees scattered along the alignment. Surveys for roosting places was only undertaken within the Project area, therefore no comments can be made on the distribution of suitable roosting habitat outside of the survey area.

Suitable roosting/breeding habitat is shown in Plate 4-8.

Plate 4-8 ***Suitable roosting places for colonial breeding microbats in Corymbia dallachiana and Eucalyptus platyphylla hollow-bearing trees***



Paper Size ISO A3

0 1 2

Kilometres

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

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GHD

Townsville City Council
Haughton Pipeline Stage 2 - High Risk SMP

Distribution of potential roosting places for colonial breeding microbats within the Project area

Project No. **12537606**
Revision No. **0**
Date **1/20/2022**

FIGURE 4-10

N:\AU\Townsville\Projects\42\12537606\GIS\Maps\APRX\12537606\12537606_HRSMP.aprx 12537606_HRSMP_011_BatRoosting_Rev0
Print date: 20 Jan 2022 - 15:44c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Roost Trees (2021); World Imagery: Earthstar Geographics. Created by: xlee

5. Impact assessment

5.1 Overview

This section details the framework for avoiding and minimising impacts to breeding places for species listed under the NC Act as defined in Section 4.1, through the Project's construction and early post-construction phases. The nature of the impact is detailed in Section 5.2. More information on the framework for avoidance and minimisation of impact to breeding places is detailed in Section 6.

5.2 Nature of impact

5.2.1 Overview of impacts

This section provides a summary of the ecological impacts potentially resulting from construction of the Project. During the construction phase, the Project is expected to result in localised losses of habitat, predominantly due to clearing for the pump station, buried pipeline alignment, access tracks and haulage roads, stockpiles, and temporary disturbance of wildlife through construction light, noise, vibration and increased vehicle movements, as well as the potential for erosion and sedimentation. Once operational, the Project is unlikely to have a substantial impact for most environmental matters, outside of the operational risk of vehicle collision for sedentary birds. The collision risk is also not considered relevant to the SMP as there is no impacts on breeding habitat for key species at risk of vehicle strike i.e. squatter pigeon (southern).

5.2.2 Construction phase impacts

Construction of the Project is scheduled to take approximately 30 months or 2 and half years, with construction works to commence in end of 2022 and be completed by mid 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. Construction impacts have been minimised by locating the Project footprint predominantly in open areas that have been subject to historical land clearing and cattle grazing where practicable. Despite this, the Project footprint intersects some large open woodland remnants. Unmitigated, the following impacts are expected to result from construction of the Project:

– Loss of habitat and breeding habitat for NC Act listed species
– Injury and mortality of wildlife
– Fragmentation of habitat and breeding places
– Disturbance to breeding activities and other wildlife behaviours
– Habitat degradation
– Introduction and spread of invasive species
– Disturbance to waterways.

5.2.2.1 Loss of vegetation and wildlife habitat

The Project will result in 124.66 ha of temporary disturbance and 13.13 ha of permanent footprint impacts. Temporary disturbance will be associated with parts of the Project footprint that will be cleared for construction and rehabilitated as outlined in Section 6.1.4. Permanent impacts will be associated with parts of the Project footprint that will be cleared for permanent infrastructure. The temporary and permanent impact areas are defined below.

– Temporary clearance impacts for MNES
    - 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 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
  - 28.5 km long buried pipeline and a 4 m wide gravel access road along the length of the pipeline
  - Pump station site – as per the extent of the pump station site (1.63 ha)
  - Power supply works – to be determined however will likely include a new substation in close proximity to the pump station from either the existing Ergon or Powerlink supply, and overhead electrical supply to the pump station site

The Project has a combined Project footprint of 124.66 ha and will result in the loss of the following broad habitat types:

– 109.54 ha of open woodland with a native grassy ground layer, representing 79.5 percent of the Project footprint
– 6.25 ha of open woodland with highly disturbed ground layer, representing 4.5 percent of the Project footprint
– 6.49 ha of mature riparian woodland lining ephemeral or semi-permanent watercourses , representing 4.7 percent of the Project footprint
– 1.28 ha of *Melaleuca viridiflora* low woodland, representing 0.9 percent of the Project footprint
– 0.47 ha of permanent water sources, representing 0.3 percent of the Project footprint
– 13.73 ha of cleared or highly modified grazing land, representing 10.0 percent of the Project footprint

5.2.2.2 Loss of habitat and breeding habitat for NC Act listed species

The predicted loss of habitat and breeding habitat for conservation significant species is detailed in Table 5.1.

Table 5.1 Loss of predicted habitat and breeding habitat for NC Act listed species

Species	Loss of breeding habitat (ha)
Black-throated finch (southern)	Temporary loss: 43.61 ha Permanent loss: 33.11 ha
Squatter pigeon (southern)	0 ha
Bare-rumped sheathtail bat	10 large and 27 moderate hollow-bearing *E. platyphylla* trees Temporary loss of 34.40 ha Permanent loss of 4.69 ha
Eastern osprey	0 ha
Short-beaked echidna	123.58 ha
Colonial breeding microbats	12 large, 35 moderate and 296 small hollow-bearing *Eucalyptus* and *Corymbia* trees

5.2.2.3 Injury and mortality of wildlife

Vegetation clearance during construction of the Project may result in injury and mortality of local fauna sheltering in hollows, nests and ground habitat (logs, burrows, soil, leaf litter and beneath rocks). Increased traffic during the construction phase may increase local incidence of fauna injury and mortality through vehicle strike and collision. Species most at risk include nocturnal species that are likely to be sheltering during the daytime when clearing activities are underway and slow-moving species or sedentary species that are unlikely to be able to flee the clearing zone (e.g. koalas, small ground–dwelling mammals, reptiles and frogs). Entrapment of wildlife within excavations poses an additional threat to wildlife. Most at risk wildlife includes wide-roaming fauna like macropods, snakes and echidnas. Conservation significant species with heightened risk of injury or mortality during construction include the squatter pigeon (southern) (due to its sedentary nature and habit of foraging on access tracks).

5.2.2.4 Fragmentation of habitat and breeding places

Habitat fragmentation is the process by which large, contiguous areas of habitat are converted into smaller, more isolated patches, separated by areas of reduced habitat value (Haddad et al 2015). Habitat fragmentation can

isolate populations by creating barriers to fauna movement. The quality and viability of persisting habitats including wildlife breeding places can be degraded by edge effects associated with increased exposure to light, noise, sediment-laden run-off, erosion and weed and pest infestation. The Project area occurs within a landscape which has undergone extensive disturbance and clearing of vegetation as a result of agricultural and cattle grazing purposes. The condition of large areas of the Project area have been impacted by vegetation clearance, cattle grazing, agriculture, sowing of exotic pastural grasses and the presence of weeds. High levels of fragmentation exist in portions of very sparse open woodland in the east. Non-remnant cleared areas are scattered across the Project area, predominantly in the southern and northern sections. As much of the Project area has been located in open woodland areas already subject to grazing, the impacts of habitat fragmentation are expected to be relatively minor and localised. The construction of the Project will result in localised fragmentation where it intersects tracts of open woodland, in these areas clearing of vegetation for the buried pipeline (required to a width of 40 m), pump station and stockpiles are required. However, the localised scale at which this occurs is unlikely to significantly restrict fauna movement. The movement of conservation significant species that are known to occur within the Project area is unlikely to be limited by the open spaces created. Consequently, the fragmentation of habitat is expected to have only localised impacts on the composition of forest bird assemblages, reptile and small ground mammal species, by reducing the area of available habitat for edge-sensitive woodland species that only occur in intact woodland remnants.

5.2.2.5 Disturbance to breeding activities and other wildlife behaviours

Clearance of vegetation has the capacity to cause indirect degradation of adjacent habitats and breeding places due to an increase in the exposure to light, noise and vibration. This has the potential to adversely impact native wildlife through the disruption of foraging, breeding and nesting behaviours (Longcore and Rich, 2004; Popper and Hawkins, 2016). Construction for the Project is scheduled to last approximately 30 months and will therefore have the potential to interfere with three successive breeding seasons for many species. The Project construction will involve a localised increase in vehicle movements over the construction period. This will increase light, noise and vibration disturbance on local wildlife associated with the increased vehicle movements. 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). A summary of the breeding seasons of NC Act listed species with potential to occur in the Project area is detailed in Table 5.2.

Table 5.2 Breeding seasons of NC Act listed fauna species potentially impacted by the Project

Species	Breeding season
Black-throated finch (southern)	Breeding can occur throughout the year under optimal conditions and varies throughout its range (Mitchell 1996; Higgins et al. 2006a; NRA 2007a). In the Townsville area, breeding typically occurs during the wet season, usually between February and May (Mitchell 1996; Higgins et al. 2006; NRA 2007a).
Squatter pigeon (southern)	The breeding season of the squatter pigeon is poorly understood, and has been suggested to occur through the year, depending on local conditions (Higgins et al. 2006). It has been suggested that the breeding season can be refined to mid-October to late January (data in SA Museum; P. Horton, pers. Comm), although clutches have been observed as early as late August and as late as February (Pickett 2000; M. Pickett, pers. comm.).
Bare-rumped sheathtail bat	Reproduction in this species is poorly known and based on a small number of roosts incidentally located during tree-felling operations. Females give birth to a single young, with birth records from Queensland in December and January (Compton & Johnston 1983)
Eastern osprey	The Eastern Osprey breeds from April to February in Australia (DAWE 2021a).
Short-beaked echidna	Echidnas breed from the end of June to early September (Rismiller 1993).
Colonial microbats	Maternity colonies form in spring, with pups being born in early summer (OEH 2019, OEH 2020).

5.2.2.6 Habitat degradation

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 past land-clearing and current grazing activities. Nevertheless, sensitive ecological receptors (e.g. open woodland remnants and aquatic habitats) are particularly susceptible to adverse impacts associated with dust, erosion and sedimentation. These areas require protection through the implementation of appropriate dust management and erosion and sediment control measures during construction. Where the Project footprint intersects water crossings, without mitigation measures there is potential for the Project to cause direct and indirect degradation to sensitive aquatic ecological receptors. Mitigation measures will reduce and limit the risk of habitat degradation through the implementation of routine erosion and sediment controls near waterways.

5.2.2.7 Introduction and spread of invasive species

Construction activities have the potential to introduce and/or spread exotic pests throughout the construction area. This can alter the balance of inter-species competition and predation. Increases in exotic plants and animals can indirectly undermine the productivity of breeding places by physically restricting movement and access to foraging resources or increasing competition and predation. Inappropriate waste disposal and provision of water has the capacity to attract higher local concentrations of feral predators, increasing the predation pressures on local wildlife. Pest fauna species recorded within the Project areas included feral pigs, rabbit and cat. Access tracks created for the Project have the potential to facilitate movement of feral predators, thereby increasing predation pressures on local wildlife. Although the Project area is already likely to be exposed to relatively moderate levels of pest infestation, mitigation measures will be required to limit the spread of pest animals that could result from construction activities.

5.2.2.8 Disturbance to waterways

The Project footprint intersects numerous watercourses and drainage features/unmapped waterways. Without mitigation measures the Project will result in significant disturbance to surface water and waterbodies. The pipeline alignment, access tracks and haulage roads have been sited to minimise the number of water crossings and intersect areas with existing disturbance where practicable. Nevertheless, the Project footprint will intersect a number of mapped watercourses and ephemeral waterways. These are ecologically important for movement of wildlife, as habitat and drinking sites and are potentially susceptible to construction-related disturbance. With the exception of Scotts Creek all watercourses are ephemeral and only experience flow following rain events. The pipeline construction methodology at Scotts Creek will be undertaken by trenchless construction (underground boring). No habitat for conservation significant aquatic species occurs within the Project area, nor will such species be impacted by the Project.

The Project will result in direct impacts on watercourses, earthworks, vehicle movements and other construction activities have the potential to cause indirect degradation of aquatic habitats. Construction activities within and/or in the vicinity of watercourses have the potential to cause degradation of aquatic and riparian habitats through:

– Removal of riparian vegetation
– Run-off, sedimentation and erosion
– Point-source pollution (chemical and fuel spills)
– Establishing barriers to the movement of aquatic fauna
– Disturbance associated with noise, vibration and/or artificial lighting.

Release of sediments into aquatic habitats can result in altered water chemistry (e.g. increased turbidity, decreased oxygen levels, reduced light penetration), change in channel morphology and alteration of substrate composition (Wood and Armitage 1997; Wheeler et al. 2005). These impacts can affect aquatic fauna both directly and indirectly by reducing habitat value and altering trophic dynamics (particularly where substrate and macrophytes are smothered) and feeding behaviours. Use of construction machinery in and around aquatic habitat also has the potential to result in the introduction of contaminants, such as fuels and lubricants. These can result in long-term impacts to aquatic wildlife and their habitats, and can lead to a decline in aquatic species diversity as

sensitive species are competitively excluded by more tolerant species, particularly exotic pest species that typically tolerate degraded habitats.

5.2.3 Operation phase impacts

Operation of the Project will involve the ongoing maintenance of a 21.5 m wide public utility easement containing a 10 m wide zone of influence above the pipeline and 4 m wide permanent gravel access road for the length of the pipeline, and operation of the pump station and substation. For most fauna, the Project's operation phase impacts on breeding places are expected to be negligible. Operation will require very low-levels of vehicle traffic (approximately one vehicle per week), as the volume of traffic movements is expected to be equivalent to that currently undertaken by existing property landholders, the risks to wildlife are considered relatively low. Nevertheless, measures should be taken to mitigate the risks to key species such as the squatter pigeon and koala. During operation of the Project, potential impacts are largely expected to be limited to the potential for vehicle strikes. The potential for vehicle collisions will be reduced through the implementation of mitigation measures. The Project will have low levels of noise and limited artificial lighting sources, localised around the pump station and substation. During operation of the Project, potential impacts on wildlife breeding places are also expected to result in localised exposure to degradation of breeding habitat from dust, run-off and sedimentation adjacent to access tracks. However, this risk will be mitigated through periodic routine erosion and sediment controls. No permanent fencing is proposed, other than surrounding the pump station and substation. The Project will have no direct impact on breeding places or result in any indirect disruption to breeding behaviours in local wildlife or result in any barrier effects that could restrict access to breeding habitats during the operation phase.

5.2.3.1 Disturbance of wildlife behaviour due to noise and vibration

The Project will have low levels of noise and limited artificial lighting sources. During operation of the Project, the pump station and substation will generate low levels of vibration and sound, however these impacts will be localised around the ancillary infrastructure and are not expected to result in significant disturbance to wildlife behaviour. Limited sources of artificial lighting will be used during the operation of the Project for security. Lighting will be kept to a minimum, 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. The risk of disturbance of wildlife behaviour due to noise and vibration is considered low given the limited sources of light, noise and vibration during the operation of the Project.

5.2.3.2 Degradation of habitat by dust, run-off and sedimentation

The construction of the Project will create new unsealed roads with associated traffic (operational staff) expected to be in the order of one vehicle per week. Although the temporary disturbance footprint for the stockpiles, haulage roads and buried pipeline will be rehabilitated, the new unsealed roads will contribute to the release of dust and sediment into the environment. Movements of maintenance vehicles have the potential to cause localised degradation of habitat and breeding places through exposure to dust, run-off and sedimentation. This can reduce the ecological value of breeding places through physical smothering of vegetation (including aquatic macrophytes), changes in nutrient levels, increased weed incursions and declines in species diversity. This risk is considered low given the small number of vehicle movements anticipated. However, the long-term degradation of tracks over time could present a local erosion and sedimentation risk.

5.2.3.3 Introduction and spread of invasive species

Project operation has the potential for introduction and spread of exotic species through the ongoing movement of people and vehicles. As the volume of traffic movements is expected to be equivalent to that currently undertaken by existing property landholders, the risks are considered relatively low.

Exotic fauna species including the feral cat (*Felis catus*), pig (*Sus scrofa*) and rabbit (*Oryctolagus cuniculus*) are known to occur within the Project area. Pest species that are likely to be relatively common and ubiquitous within the region include the rabbit and pig. The clearing and disturbance of remnant vegetation within the OHTL has the potential to facilitate ongoing movement of feral animals, as these typically capable of better utilising heavily altered landscapes.

Six restricted weeds under the *Biosecurity Act 2014* were recorded within the Project area: rubber vine (*Cryptostegia grandiflora*), chinee apple (*Ziziphus mauritiana*), parkinsonia (*Parkinsonia aculeata*), bellyache bush (*Jatropha gossypiifolia*), hymenachne (*Hymenachne amplexicaulis*) and American rat's tail grass (*Sporobolus jacquemontii)*. These species have the potential to cause damage to the ecological integrity of bushland remnants by excluding native plant species that provide food, shelter and nesting resources for native wildlife. Maintenance vehicles servicing the Project area have the potential to spread weeds. Implementation of specific operational protocols can help limit the unintentional spread of weeds into and/or throughout the Project area.

5.2.3.4 Barrier effects and reduced fauna movement

Linear clearing (such as for roads and fences) can cause barrier effects by limiting the capacity for movement, particularly among ground-dwelling fauna. As the Project occurs in a landscape that has already been subject to high levels of fragmentation, vegetation clearing resulting from the Project is likely to impose relatively few barrier effects on local wildlife. A large proportion of the footprint will be subject to temporary vegetation clearance only and rehabilitated after construction, with exception to permanent ancillary infrastructure, the pipeline zone of influence and access roads for maintenance. Temporary fencing around the pipeline will be erected, permanent fencing will only be installed around the pump station and substation infrastructure for security purposes. As such, the permanent barrier effects on wildlife are expected to be minimal.

6. Impact management plan

6.1 Overview

The potential direct and indirect impacts on conservation significant fauna and their breeding habitat have been managed through either avoidance measures in the design phase, or measures to mitigate and minimise impacts through the construction phase. As detailed in Section 5.2.3, operation phase impacts on breeding habitat for NC Act listed species will be negligible. Impact management actions outlined in this High Risk SMP therefore focus on the construction and early post-construction period. Substantial avoidance was achieved during the preliminary site selection and design phases.

A number of measures have been used to reduce the impact to breeding places. The following framework has been used to avoid and manage impacts to wildlife breeding places:

– Design phase avoidance
  - Preliminary avoidance through the site selection and preliminary design phase
  - Ecological surveys to identify risks and map broad areas of breeding habitat
– Construction phase avoidance measures
  - Temporal avoidance of clearing in the breeding season for select species in select areas
  - Pre-clearance surveys to locate individual breeding places for key species (at least three months prior to clearing)
  - Clearing under the supervision of suitably qualified and experienced spotter-catchers (clearing)
– Post-construction rehabilitation
  - Rehabilitation of breeding habitats for key species

Avoidance measures that have been achieved are detailed in Section 6.1.1. The framework to manage and mitigate the residual impacts to breeding places for NC Act listed species is detailed in Section 6.1.2.

6.1.1 Avoidance achieved in the design phase

6.1.1.1 Avoidance through site selection and preliminary designs

Avoidance of impact to wildlife breeding places was achieved in the preliminary design stages of the Project through reducing the construction corridor at riparian zones to 20 m and underboring at Scott Creek. Underboring is also proposed adjacent to the pump station for the Ayr Dalbeg Road and beneath existing Sunwater Siphons and the Haughton Main Channel.

The preliminary designs also sought to minimise ecological impact to wildlife habitats by locating infrastructure in cleared open grazing areas wherever possible. Key outcomes achieved in the preliminary design phase included:

– Locating the Project footprint 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 wherever practicable to avoid or minimise disturbance to vegetation and habitat
– Construction stockpiles and laydown/storage areas have been located within existing cleared or disturbed areas where possible.

6.1.2 Management of High Risk impacts in the construction phase

While design changes have achieved substantial avoidance of impact to breeding habitat, residual impacts on breeding habitat areas remain. A framework for identifying and managing the residual impacts to breeding places has been developed. This will involve:

– Temporal avoidance of the breeding season for select species (i.e. bare-rumped sheathtail bat and southern black-throated finch) where possible
– Pre-clearance surveys of areas of breeding habitat to identify breeding places (i.e. hollow-dependent species)
– Supervision and management of risks to breeding places by experienced fauna spotter-catchers

6.1.2.1 Temporal avoidance

Bird species such as the black-throated finch (southern) are known to breed in loose colonies, multiple nests may be found in a single tree (Higgins et al. 2006; NRA 2006; NRA 2007b). Structurally, black-throated finch (southern) nests are similar to other finch species and can be difficult to differentiate. While nesting has been recorded throughout the year, vegetation clearance during peak breeding season for this species should be avoided (i.e. February to May). Limited reproductive knowledge is known about the bare-rumped sheathtail bat, females have been recorded to give birth to a single young, with birth records from Queensland in December and January (Compton & Johnston 1983). In addition, pregnant females have been recorded from January to March in the Northern Territory (McKean, Friend, & Hertog, 1981), as well as a colony containing juveniles recorded as late as April (Churchill, 2008). While clearing of these areas will be supervised by experienced spotter-catchers and subject to pre-clearance surveys as detailed below, the temporal avoidance will provide an extra level of certainty to manage potential direct and indirect impact to breeding places of these species during clearing. The distribution of areas subject to temporal avoidance is shown in Figure 6.1.

6.1.2.2 Pre-clearance surveys

Initial breeding places surveys were undertaken as part of the ecology surveys completed by GHD in October 2021. Data on the location of potential breeding places for NC Act listed species will be used to direct fauna spotter-catchers to manage impacts to breeding places through the clearing process.

Given the surveys were undertaken outside the peak breeding season for the black-throated finch (southern) it was not possible to confirm the location of nesting sites. Impacts to black-throated finch (southern) nesting sites will be primarily avoided by temporal avoidance measures. Where temporal avoidance is not possible and clearing of breeding habitat is required during the peak breeding season, those areas cleared will be subject to targeted pre-clearance surveys in the weeks prior to clearing to identify and manage risks to individual nesting sites. This will allow spotter-catchers to identify and manage impacts to individual nesting sites.

As part of the strategy to manage impacts to breeding places, pre-clearance surveys will be undertaken in areas of potential breeding habitat for species listed under the NC Act as mapped in the High Risk SMP. Pre-clearance surveys will be undertaken by suitably qualified and experienced fauna spotter-catchers, prior to the commencement of clearing works.

The distribution of areas subject to pre-clearance surveys and temporal avoidance is shown in Figure 6.1..

All breeding places for species listed under the NC Act that will be impacted by the Project will be recorded in an electronic Animal Breeding Place Register and submitted to DES within six months of clearing. Clearing of all areas subject to pre-clearance surveys will also be supervised by experienced fauna spotter-catchers, implementing the measures detailed in Section 6.1.2.3 below.

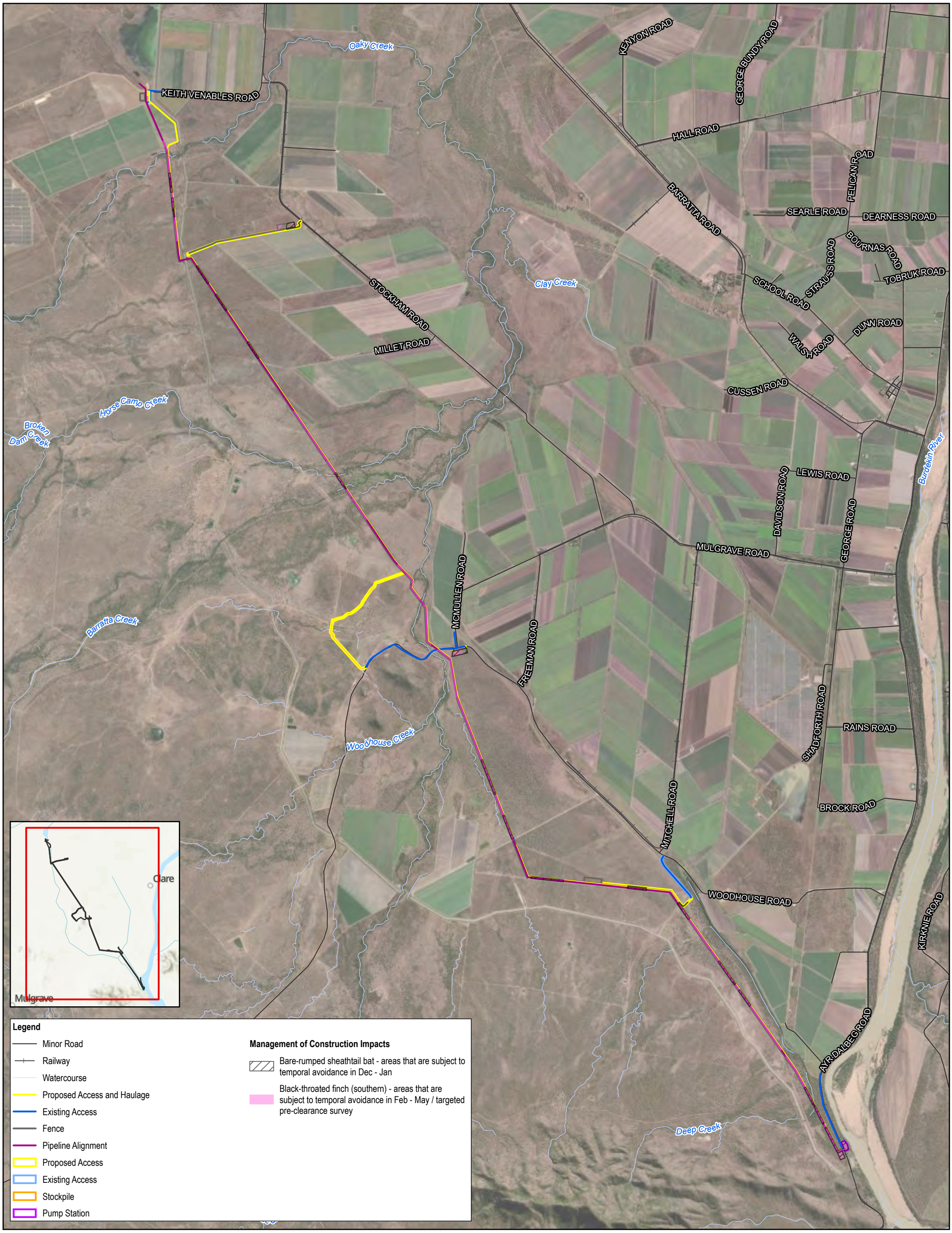
6.1.2.3 Management of impacts through the clearing phase

Clearing of breeding places identified in the pre-clearance survey will be supervised by suitably qualified and experienced fauna spotter-catchers. By directing clearing activities, spotter catchers will manage residual impacts to breeding places identified in the pre-clearance surveys that could not be avoided.

The following are among the key measures that will be used to minimise impact to breeding places:

– Sequential clearing to allow wildlife to move to areas of refugial habitat
– Encouraging wildlife to leave through measures including tree tapping
– Dismantling high-risk trees in sections
– Flushing areas of squatter pigeon habitat prior to undertaking works.

Measures to manage impacts through the clearing are detailed in Table 6.1. Specific measures that will be used to manage impacts to NC Act listed species are also summarised in Table 6.2.



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

Townsville City Council
Haughton Pipeline Stage 2 - High Risk SMP

Distribution of measures to manage construction impacts on wildlife breeding places

Project No. **12537606**
Revision No. **0**
Date **1/21/2022**

FIGURE 6-10

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World Topographic Map: Department of Resources, Dept.of Environment and Science, Esri, HERE, Garmin, FAO, METI/NASA, USGS
World Imagery: Earthstar Geographics. Created by: xlee

KEITH VENABLES ROAD

Oaky Creek

Clare

Mulgrave

Legend

- Minor Road
- Watercourse
- Proposed Access and Haulage
- Existing Access
- Fence
- Pipeline Alignment
- Proposed Access
- Stockpile

Management of Construction Impacts

- Bare-rumped sheathtail bat - areas that are subject to temporal avoidance in Dec - Jan
- Black-throated finch (southern) - areas that are subject to temporal avoidance in Feb - May / targeted pre-clearance survey

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Map Projection: Transverse Mercator
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GHD

Townsville City Council
Haughton Pipeline Stage 2 - High Risk SMP

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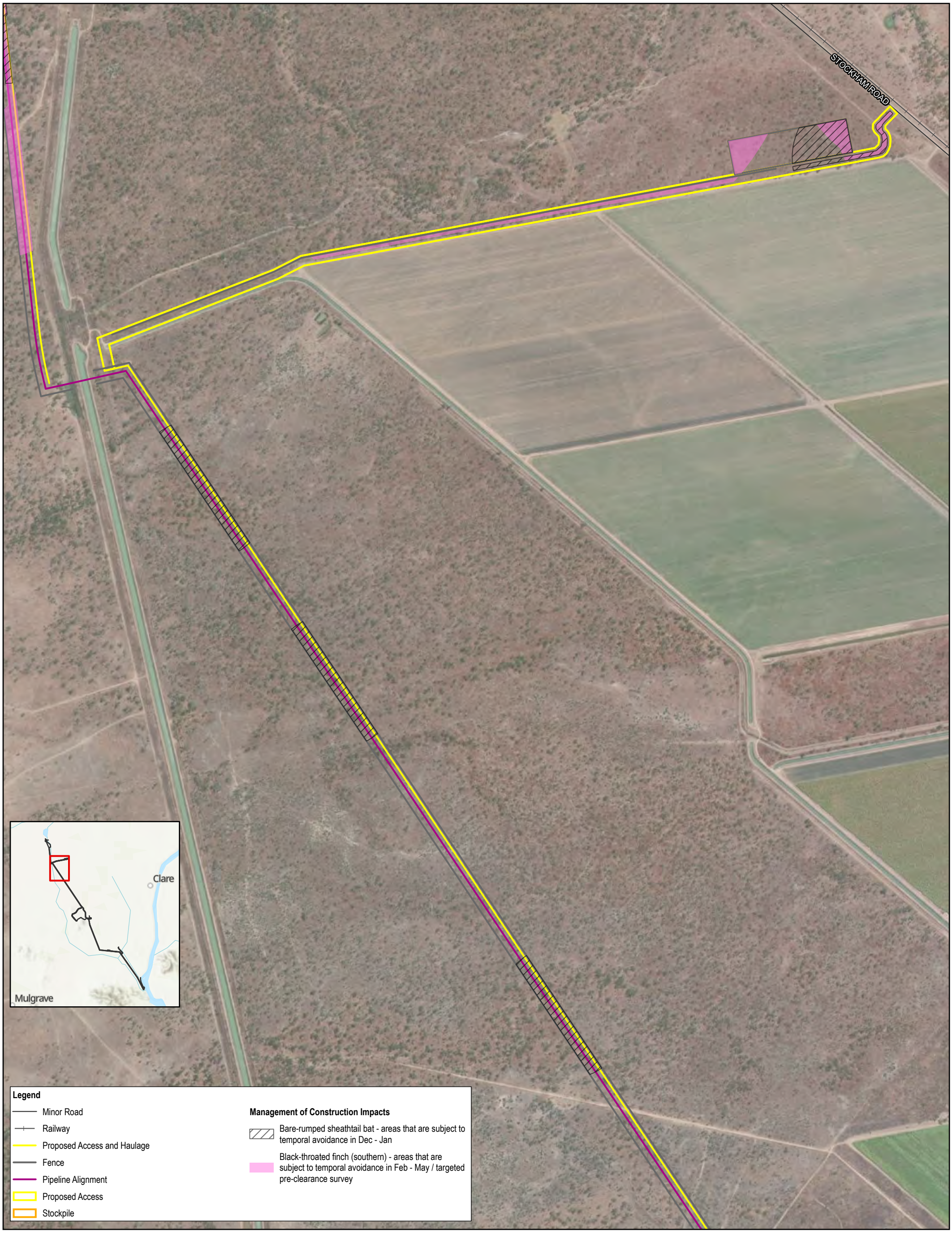

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Haughton Pipeline Stage 2 - High Risk SMP

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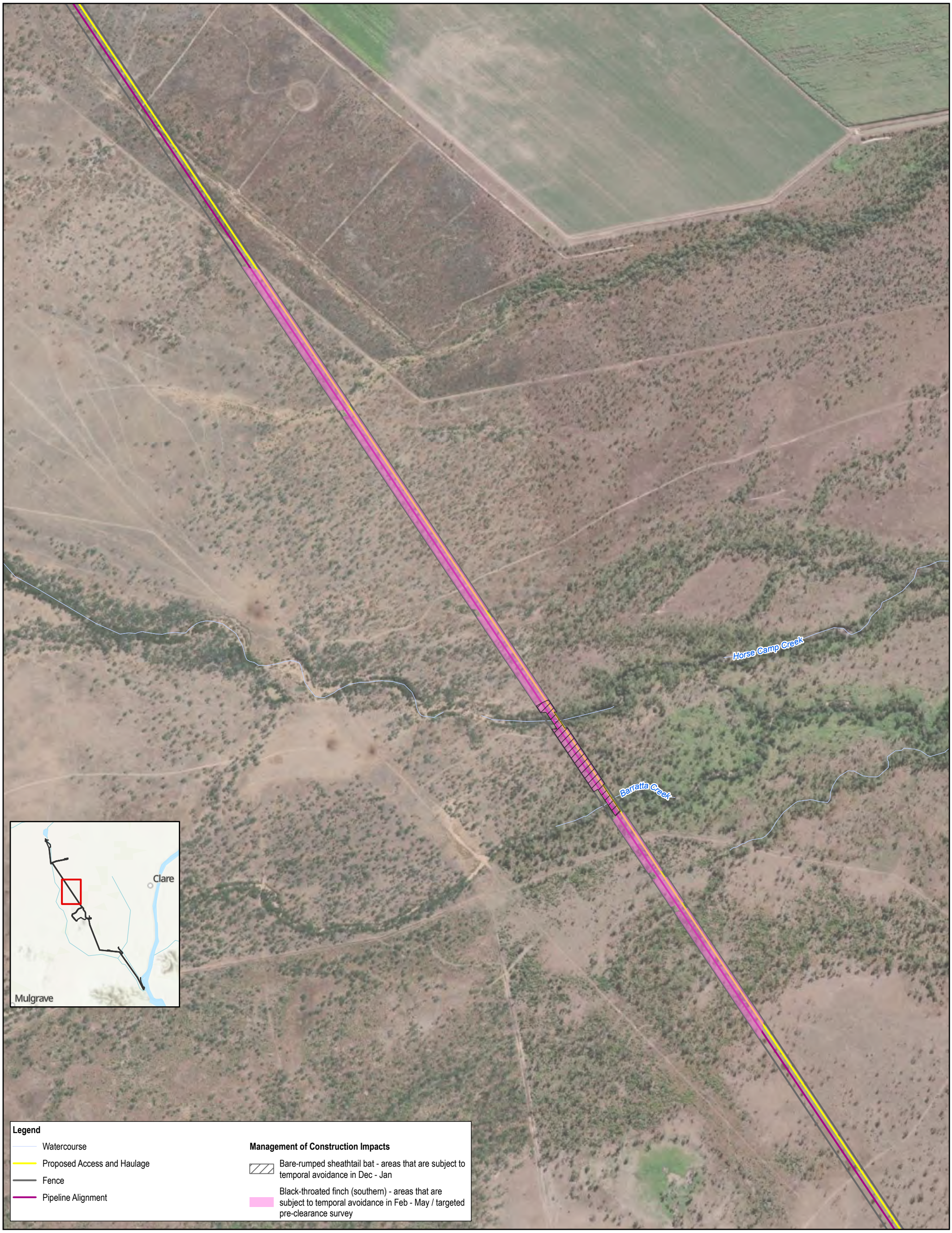

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Haughton Pipeline Stage 2 - High Risk SMP

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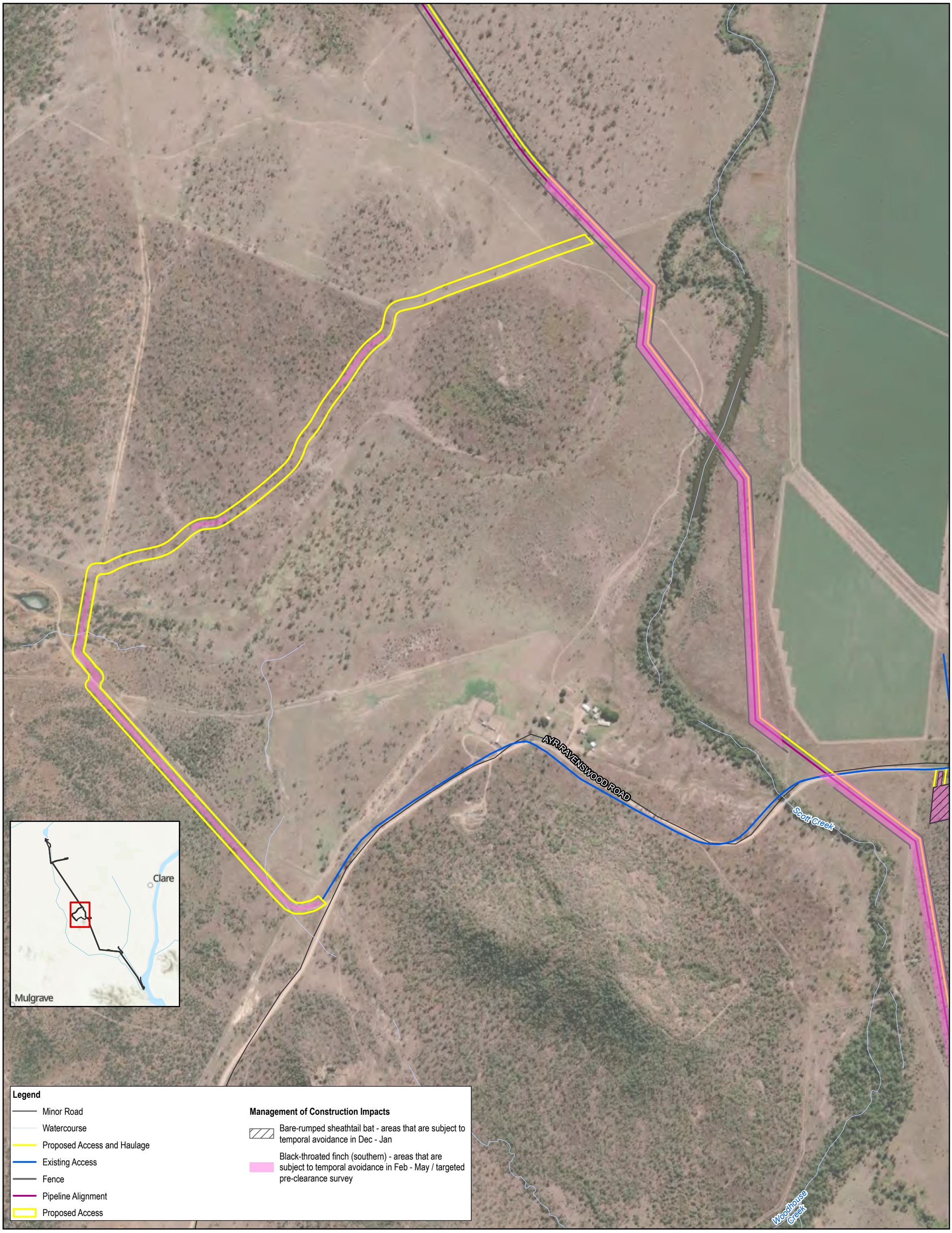

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AYR RAVENSWOOD ROAD
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WOODHOUSE ROAD
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Haughton Pipeline Stage 2 - High Risk SMP

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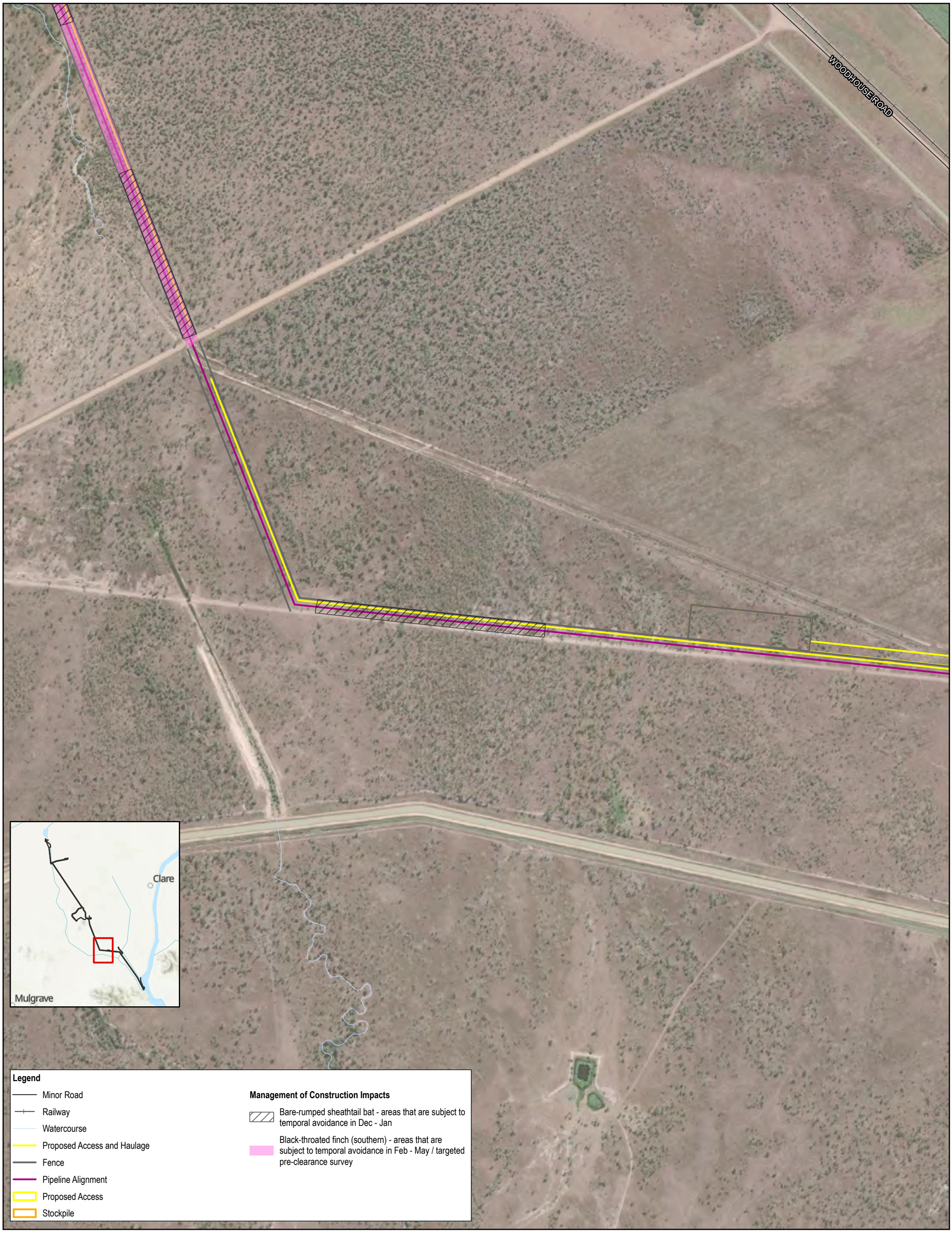

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Townsville City Council
Haughton Pipeline Stage 2 - High Risk SMP

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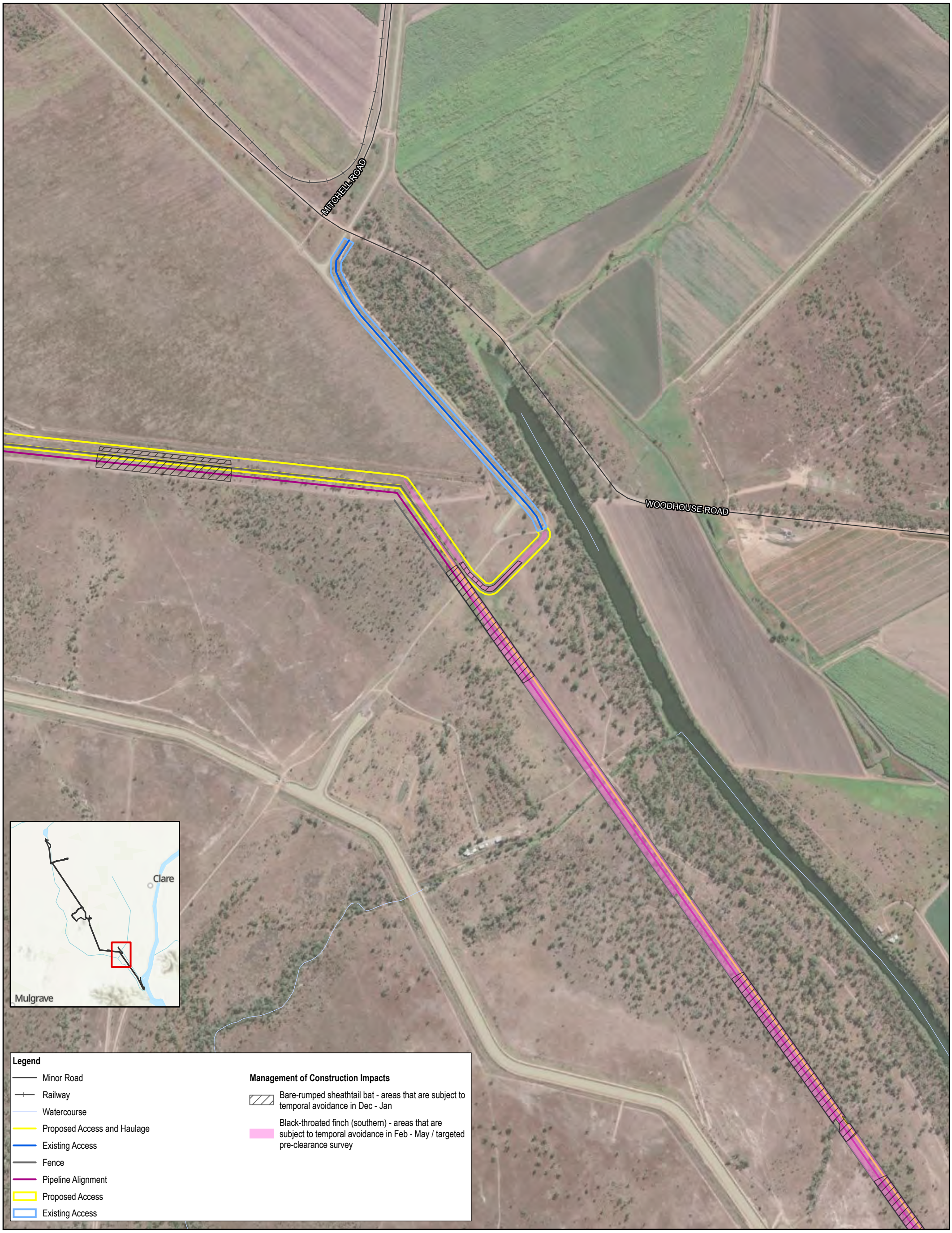

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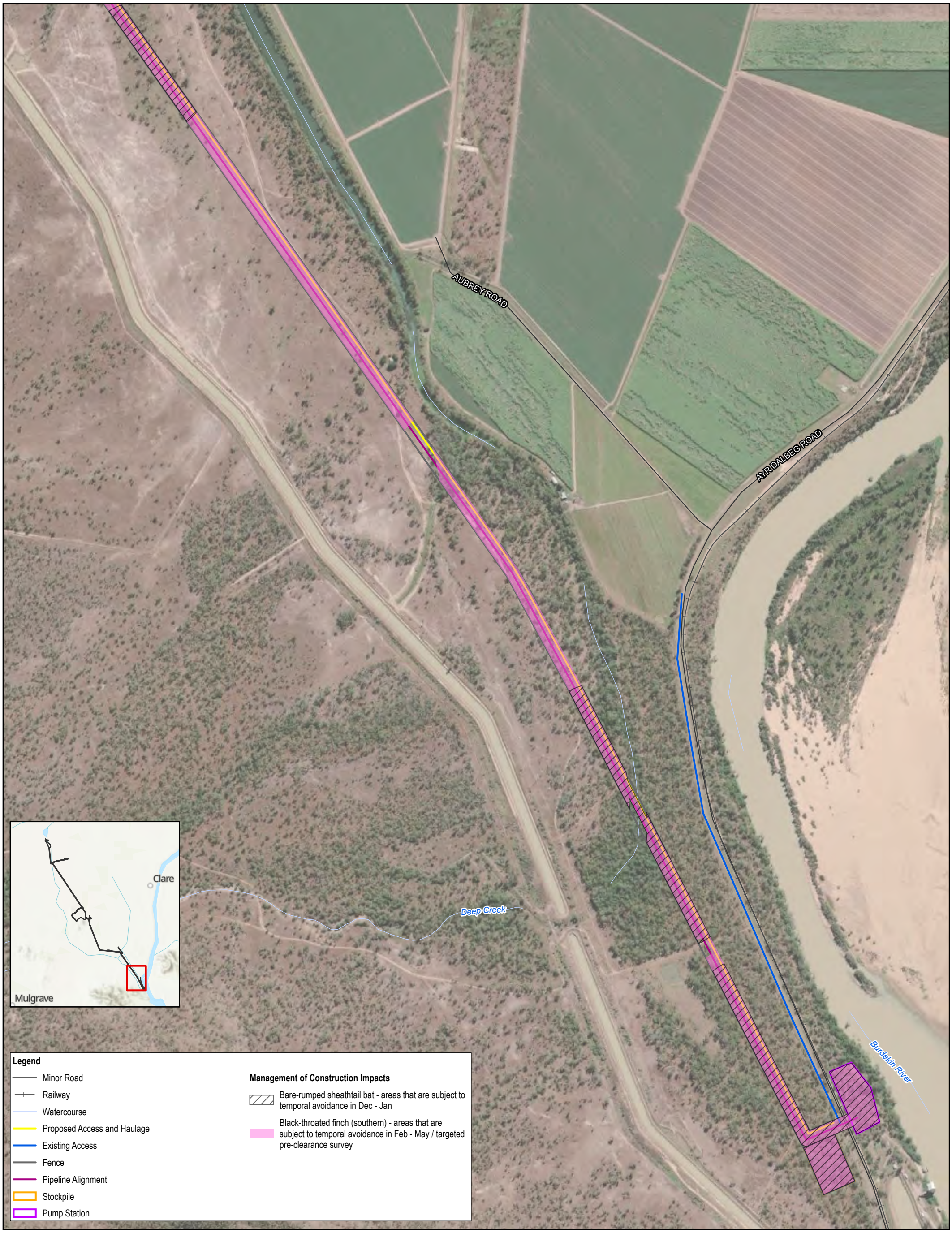

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Table 6.1 Measures to manage impacts to wildlife breeding places through the clearing phase

Objective	Action	Responsibility
Minimise adverse impact to wildlife and wildlife breeding places	Engage suitably qualified and experienced fauna spotter-catchers to undertake pre-clearance surveys prior to clearing and to supervise the clearing process	Construction contractor / fauna spotter-catcher
	Restrict habitat clearing to the minimum amount necessary for the construction within the Project footprint.	
	The extent of vegetation clearing (and 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 extent will be communicated to construction supervisors.	
	Establish and flag no-go areas around areas of ecological and environmental sensitivity including active breeding sites for NC Act listed species	
	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 regarding vegetation clearing protocols. Areas identified for vegetation clearance are to be clearly defined and detailed in site inductions.	
	Inspect all hollow-bearing trees and other terrestrial breeding places prior to clearing. Where hollows can't be inspected, pre-clearance survey for Bare-rump Sheathtail Bat may include potential roost watching at dusk with visual, thermal imaging and active anabat recording.	
	Remove any hollows that occur within the Project footprint that do not contain fauna at the early stages of clearing to avoid fauna relocating to other hollows in the clearing footprint	
	Undertake sequential clearing to allow fauna escape to areas outside the clearing footprint	
	Encourage fauna to leave hollows of their own accord through tree tapping, and other measures implemented by experienced fauna spotter-catchers	
	Where wildlife need to be physically removed from hollows, dismantle the trees in sections under the direction of trained and experienced fauna spotter-catchers and experienced clearing crews	
	Any injury or mortality will be recorded in the register and managed using the contingency measures outlined in Section 6.1.4	
	Any injured or abandoned wildlife will be taken to pre-arranged veterinarians detailed in Section 6.3	
	All nocturnal wildlife removed from trees during clearing will be housed in appropriate temporary holding facilities by experienced spotter-catchers and released at dusk into an area of nearby habitat located outside the Project footprint	
	Trees will be felled immediately after removing wildlife to prevent animals from returning to hollows.	
	All construction works should be restricted to daylight hours to avoid impact on nocturnal species.	
	Habitat enhancement features (e.g. salvaged hollows) will be established outside the clearing area within suitable habitat	

	Rehabilitation of temporary clearance areas including haulage and temporary access roads, stockpiles, and buried pipeline alignment will be undertaken as soon as practicable once these facilities are no longer required (subject to agreement with the landowner).	
	Prepare and implement a final Construction Management Plan (CMP), including a preliminary erosion and sediment control plan, for standards such as weed hygiene, erosion, fuels and hazardous substances, fire, etc. and will include erosion and sediment control measures.	

Table 6.2 Measures to manage impacts to breeding places of NC Act listed species

Objective	Action	Responsibility
Black-throated finch (southern)	Monitor • Pre-clearance surveys of mapped habitat to locate nests • If undertaking in the breeding season, existing nest to be observed at regular intervals (i.e. weekly) to determine the developmental stages of birds (when fledglings become independent) and subsequently when clearing can progress • Spotter-catcher to check all suitable trees prior to clearing Avoid • Minimise clearing of mapped breeding habitat for black-throated finch (southern) during the breeding season (i.e. February to May) • If in the breeding season - fatality of eggs or chicks during the construction period will be avoided by the implementation of the following: • Provision of an exclusion zone (i.e. no civil works and/or broad-scale clearing) surrounding the breeding place, until selective vegetation clearing within the exclusion zone is complete. • Waiting for the finches to complete their breeding cycle (i.e. fledglings' no longer dependant on the nest) prior to selectively clearing the woody vegetation • The establishment of any new finch nests will be prevented by the immediate removal of woody vegetation within the exclusion zone, once the once determined it is not being used for breeding purposes • Disturbance within the breeding area will be avoided by implementing management measures in accordance with the CEMP to control impacts relating to air quality, noise and vibration • Disturbance within the breeding during selective clearing will be minimised by the use of low impact clearing methods (e.g. individual trees removed by hand or chain pulling) Relocate • If nesting chicks are abandoned they are to be placed in the care of a qualified Wildlife Carer. • If birds are injured during the course of vegetation clearing or other construction activities they are to be placed in the care of a qualified wildlife carer	Construction contractor / fauna spotter-catcher
Squatter pigeon (southern)	Despite the absence of breeding habitat, the species carries high risk of mortality during clearing and vehicle movements. Fauna spotter-catchers to flush areas of squatter pigeon habitat on foot prior to clearing. Given the	Construction contractor / fauna spotter-catcher

Objective	Action	Responsibility
	risks to the species, this will be undertaken in foraging, drinking and dispersal, and breeding habitat.	
Hollow-dependent fauna (bare-rumped sheathtail bat, colonial microbats)	Monitor • Pre-clearance survey of mapped breeding habitat areas • Marking the location of all potential roosting trees • potential roost trees to be surveyed at dusk using visual, active anabats, or thermal imaging to determine the present of bats, also burrow inspections if practical • Inspect all potential roosting trees prior to clearing Avoid • Sequential clearing towards areas of refugial habitat and maintaining trees to allow movement of bats to refuge areas • Do not clear potential roosting trees within the likely breeding season – evidence would be the presence of non-volant young. • Felling trees as soon as hollows are vacated to reduce the risk of bats returning to hollows Relocate • Encouraging bats to leave hollows on their own accord, tapping trees and shining spotlights down hollows • Dismantling trees in sections if bats are potentially present	Construction contractor / fauna spotter-catcher
Eastern osprey	No specific measures are required, given the absence of breeding habitat.	Construction contractor / fauna spotter-catcher
Short-beaked echidna	Spotter-catcher to check clearing zone prior to clearing Encourage movement of echidnas and other ground fauna outside the Project footprint Sequential clearing, maintaining an escape route to refugial habitat outside the clearing zone	Construction contractor / fauna spotter-catcher

6.1.3 Management of Low Risk impacts in the construction phase

The Project will comply with the DES' requirements for Low Risk SMP's. As detailed in Section 6.1, potential direct and indirect impacts on fauna and their breeding habitat have been managed through either avoidance measures in the design phase, or measures to mitigate and minimise impacts through the construction and operation phase. Substantial avoidance was achieved during the preliminary site selection and design phases. The Project footprint has been located predominantly in cleared areas subject to decades of cattle grazing. Despite this, areas of remnant woodland will be cleared for the Project and have the potential to impact breeding places for least concern species listed under the NC Act. Requirements for management of impacts on breeding places for least concern fauna are detailed below.

Pre-clearance surveys will be undertaken by suitably qualified and experienced fauna spotter-catchers, prior to the commencement of clearing works. Pre-clearance surveys will be undertaken in areas mapped in Figure 6.1. The pre-clearance surveys will identify and map individual breeding places for least concern species. This information will be used to direct fauna spotter-catchers to manage impacts to breeding places through the clearing process. All breeding places will be recorded in an electronic Animal Breeding Place Register and submitted annually to the DES within 12 months of clearing activities and within 10 business days of expiry of the SMP. All clearing will be supervised by suitably qualified and experienced fauna spotter-catchers.

6.1.4 Post-construction rehabilitation measures

For the bulk of the Projects temporary disturbance footprint, proposed rehabilitation will be undertaken by spreading topsoil and allowing natural regeneration of existing ground covering vegetation. Active rehabilitation will be undertaken in nominated watercourses and associated riparian zones by planting of tubestock, direct seeding and hydromulching. The pipeline corridor will be rehabilitated to its pre-clearance state with the exception of the following:

– 4 m permanent gravel access road for the length of the pipeline
– 10 m zone of influence above the pipeline, where only a ground layer stratum is proposed

Rehabilitation will occur progressively, in areas no longer required for construction activities, and prior to demobilisation from the site. The primary objective is to return temporary disturbance areas as close as practicable to pre-disturbance conditions.

A commitment to rehabilitation has been outlined for the following areas:

– Areas within 10 m, 25 m and 50 m of vegetated watercourses (where the pipeline intersects these watercourses)
– Areas within 400 m of a water source (excluding Sunwater irrigation channels)
– All other areas within the pipeline alignment disturbed by construction works
– Avoidance of removing large and moderate *E. platyphylla* hollows (where possible) in disturbance areas outside of the 21.5 m wide permanent easement corridor.

6.1.4.1 Rehabilitation measures proposed at vegetated watercourse crossings

For areas within 10 m, 25 m and 50 m of watercourses mapped under the *Vegetation Management Act 1999* (vegetation management watercourses/ riparian protection zones), the construction corridor will be reduced to 20 m wide and will be rehabilitated by way of hydromulching with a mixture of black-throated finch food grass species, with the exception of the 4 m gravel access road. In addition, *E. platyphylla* tubestock will be planted outside of scour protection areas (bed and banks or watercourses) within the construction corridor, with the exception of the 4 m gravel access road and pipeline 10m zone of influence. Rehabilitation of this area is shown in Figure 6.2.

6.1.4.2 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 sheathtail bat.

In areas within 400 m of a water source, 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) as shown in Figure 6.3.

6.1.4.3 Rehabilitation measures proposed for all other disturbed areas as part of the pipeline alignment

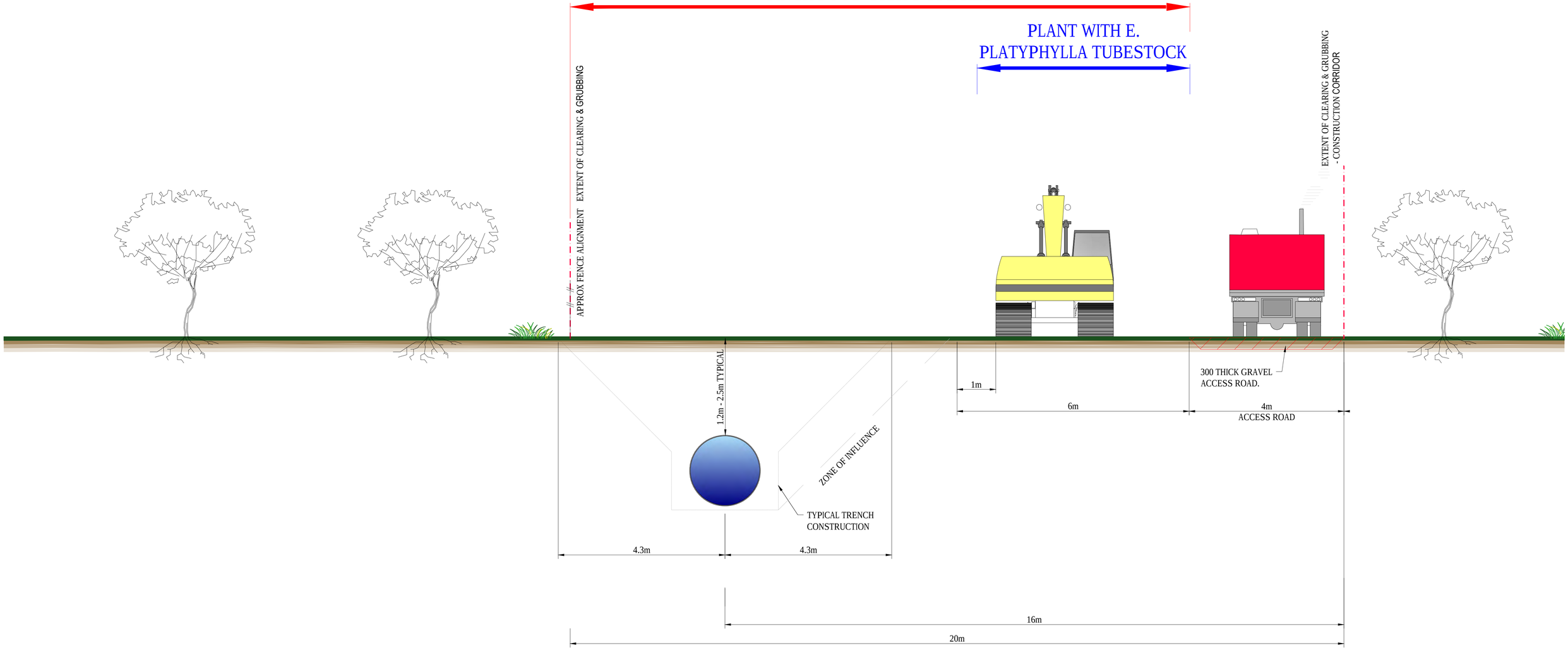
For all other disturbed areas, rehabilitation will be through the respreading of topsoil to allow natural regeneration of the existing ground covering vegetation. This will apply across the extent of the pipeline alignment. No *E. platyphylla* tubestock will be specifically planted within this zone. Rehabilitation of this area is shown in Figure 6.4.

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

For disturbance areas containing *E. platyphylla* trees with large and moderate sized hollows, the construction Contractor will try and avoid clearing these trees wherever 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 *E. platyphylla* trees containing large and moderate sized hollows have to be removed, the construction Contractor is to salvage and reinstate the hollows on mature *E.platyphylla* trees adjacent to the pipeline. Planting of *E. platyphylla* tubestock will then be undertaken in specific areas within the outer edges of the pipeline alignment (outside of the 21.5 m wide public utility easement corridor) to achieve like for like replacement of potential roosting habitat. The proposed avoidance areas are shown in Figure 6.5.

REHABILITATION WITHIN 10m, 25m & 50m OF WATERCOURSES



TYPICAL CROSS SECTION

SCALE 1:50

0 500 1000 1500 2000 2500mm

SCALE 1:50 AT ORIGINAL SIZE

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
PIPELINE CONSTRUCTION CORRIDOR

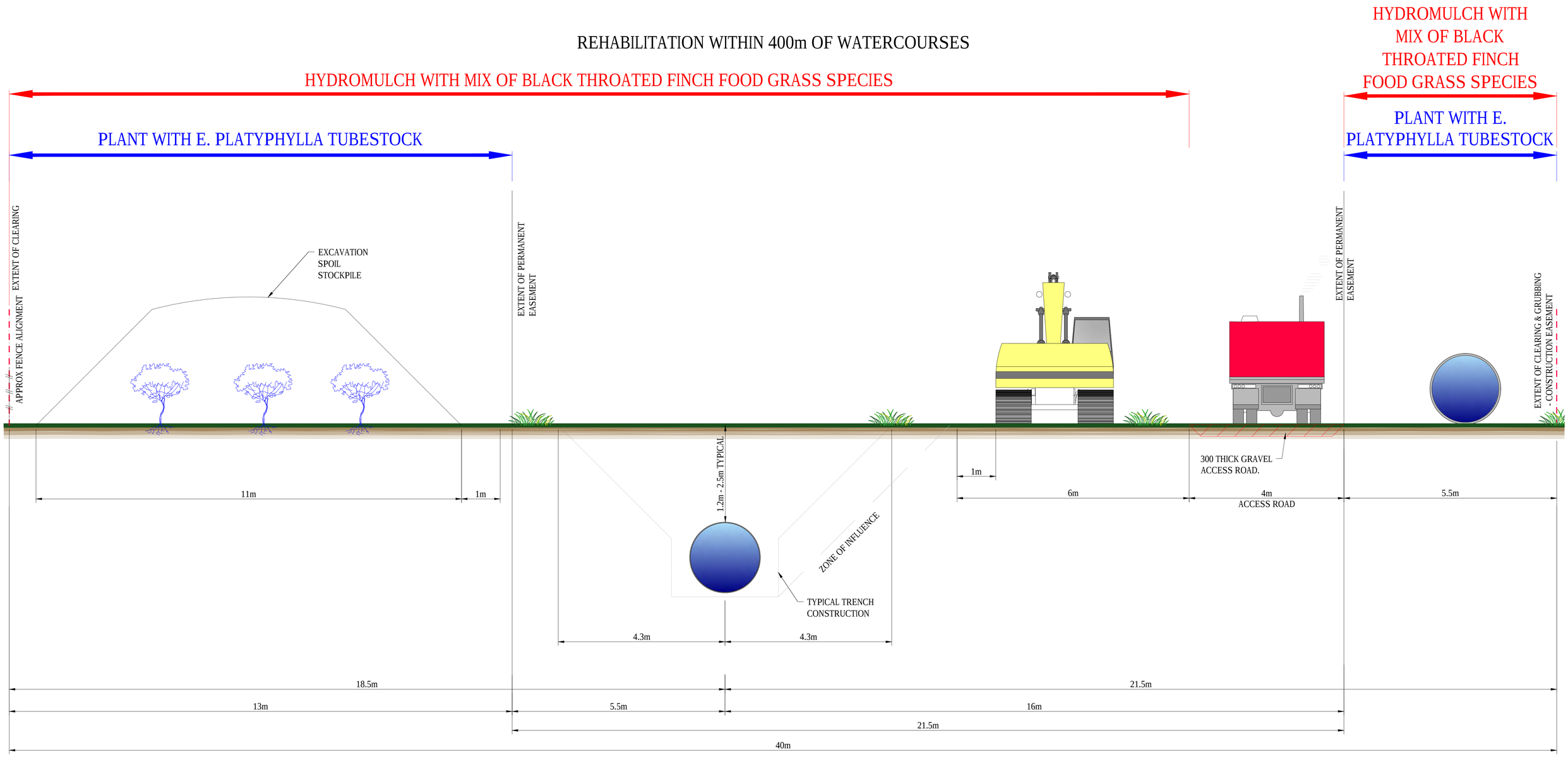
REHABILITATION MEASURES WITHIN 10m, 25m & 50m OF WATERCOURSES

Job Number	12537606
Revision	A
Date	12/2021

Figure 6.2

Plot Date: 7 December 2021 - 8:42 AM Plotted by: Marcello Macdonald Cad File No: N:\AU\Townsville\Projects\42\12537606\CADD\Drawings\FIGURES\12537606-FIG110.dwg

REHABILITATION WITHIN 400m OF WATERCOURSES



TYPICAL CROSS SECTION

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SCALE 1:50 AT ORIGINAL SIZE

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
PIPELINE CONSTRUCTION CORRIDOR

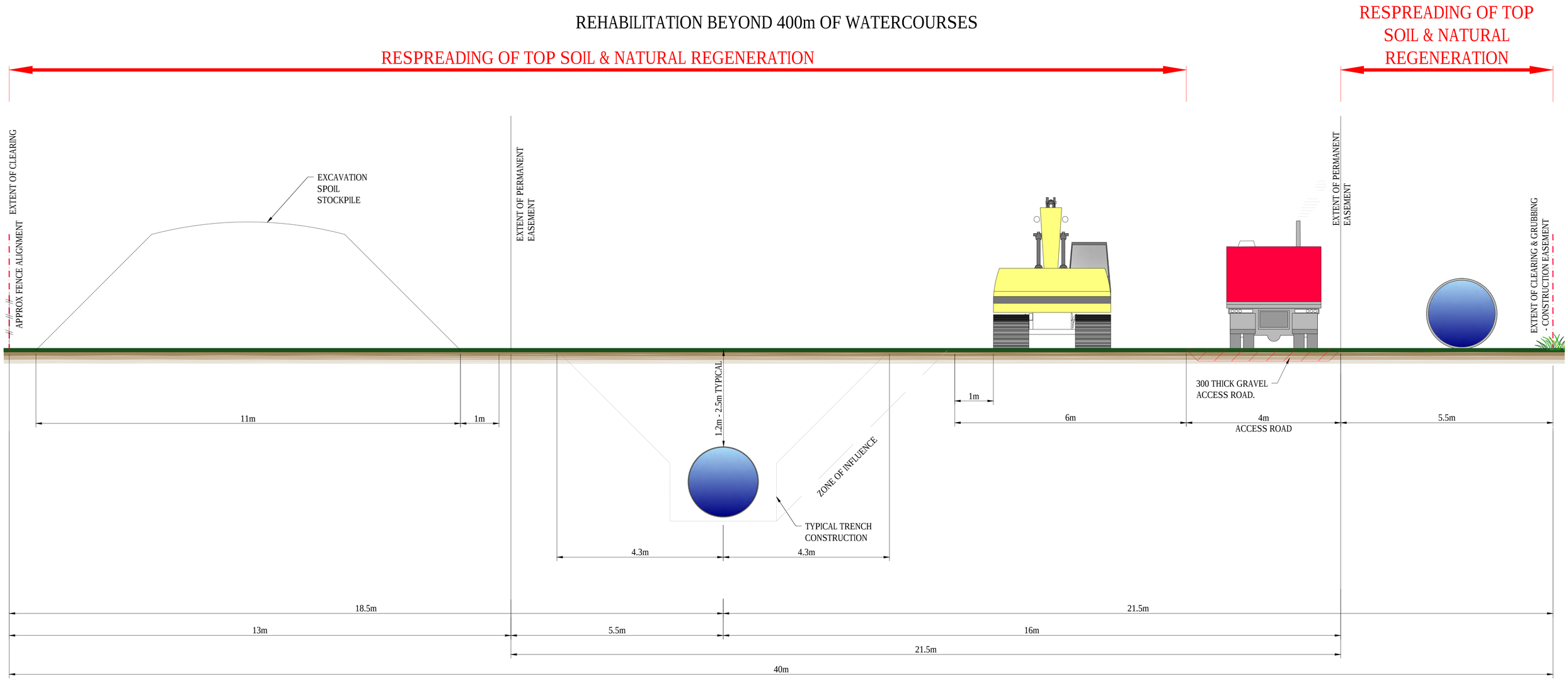
REHABILITATION MEASURES WITHIN 400m OF WATERCOURSES

Job Number 12537606
Revision A
Date 12/2021

Figure 6.3

Plot Date: 6 December 2021 - 2:42 PM Plotted by: Marcello Macdonald Cad File No: N:\AU\Townsville\Projects\42\12537606\CADD\Drawings\FIGURES\12537606-FIG110.dwg

REHABILITATION BEYOND 400m OF WATERCOURSES



TYPICAL CROSS SECTION

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SCALE 1:50 AT ORIGINAL SIZE

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
PIPELINE CONSTRUCTION CORRIDOR

REHABILITATION MEASURES OUTSIDE WATERCOURSE ZONES

Job Number 12537606
Revision A
Date 12/2021

Figure 6.4

Plot Date: 7 December 2021 - 8:42 AM Plotted by: Marcello Macdonald Cad File No: N:\AU\Townsville\Projects\42\12537606\CADD\Drawings\FIGURES\12537606-FIG111.dwg

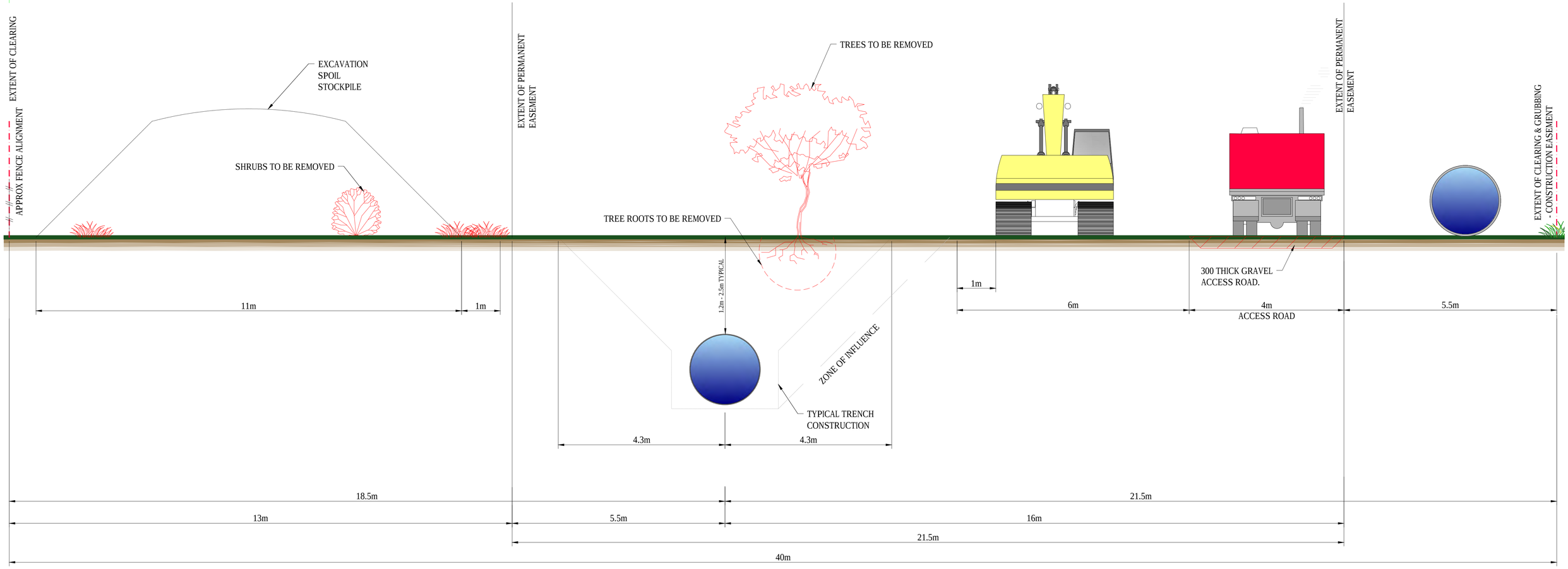
AVOIDANCE AND IMPACT OF E.PLATYPHYLLA HOLLOWS

TEMPORARY IMPACT WITH AVOIDANCE OF LARGE & MODERATE E. PLATYPHYLLA HOLLOWS POSSIBLE

TEMPORARY IMPACT WITH NO AVOIDANCE MEASURES POSSIBLE

PERMANENT IMPACT

TEMPORARY IMPACT WITH AVOIDANCE OF LARGE & MODERATE E. PLATYPHYLLA HOLLOWS POSSIBLE



TYPICAL CROSS SECTION

SCALE 1:50

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SCALE 1:50 AT ORIGINAL SIZE

TOWNSVILLE CITY COUNCIL
HAUGHTON PIPELINE STAGE 2
PIPELINE CONSTRUCTION CORRIDOR

AVOIDANCE AND IMPACT OF E.PLATYPHYLLA HOLLOWS

Job Number 12537606
Revision A
Date 12/2021

Figure 6.5

Plot Date: 7 December 2021 - 8:42 AM Plotted by: Marcello Macdonald Cad File No: N:\AU\Townsville\Projects\42\12537606\CADD\Drawings\FIGURES\12537606-FIG112.dwg

6.2 Contingency planning

In the event of an unexpected injury to a NC Act listed animal during clearing and construction, the contingency measures outlined in Table 6.3 will apply as a minimum.

Table 6.3 Contingency measures to be enacted in the event of impact to animal breeding places

Objective	Action	Responsibility
Conservation significant fauna identified within the Project footprint during construction	The DES Register of Animal Breeding Places Template is required to be completed for location referencing and reporting. Any conservation significant fauna observed during monitoring events are to be submitted to DES within six months of interactions.	Construction contractor / fauna spotter-catcher
	All conservation significant fauna will be given the opportunity to move out of the Project footprint on their own accord. Where the conservation significant fauna is unable to move out of the Project footprint on its own accord, the terrestrial fauna specialist will be required to remove the individual using the appropriate handling technique for the species. Only the terrestrial fauna specialist will handle protected terrestrial fauna. The terrestrial fauna specialist shall inspect the individual for injury and signs of stress and, where uninjured, undertake relocation of the individual to suitable habitat (in accordance with the methodology below).	Construction contractor / fauna spotter-catcher
Relocation of conservation significant fauna within the Project footprint	Where conservation significant fauna are collected within the Project footprint and the individual has been assessed by the fauna spotter-catcher and is in good health or has a minor injury and the animal is otherwise alert and active, the animal is to be released outside of the construction footprint in habitat suitable for the species. For terrestrial fauna species, the individual will be released into suitable habitat a safe distance away from the Project footprint to reduce the stress on the animal. The fauna spotter-catcher will assess whether the habitat is suitable for the individual species. When assessing an areas suitability, consideration will be given to the extent of the vegetation patch, presence of critical habitat requirements and habitat connectivity when selecting a relocation site for terrestrial species.	Construction contractor / fauna spotter-catcher
Eggs found within the Project footprint	Where a nest with bird eggs or chicks is found within the Project footprint, the nest shall be removed by the fauna spotter-catcher and safely transported to one of the below mentioned veterinary clinics or licensed wildlife rescue organisations.	Construction contractor / fauna spotter-catcher
Displaced young found within the Project footprint	Any displaced young of conservation significant fauna species found during the Project will be delivered to a qualified wildlife carer. TCC and DES are to be notified	Construction contractor / fauna spotter-catcher
Fauna sickness, injury or mortality	In the event that a conservation significant species is suffering injuries of a serious nature, the individual/s are to be transported to the nearest veterinary clinic or licensed wildlife rescue organisation as detailed below. The fauna spotter-catcher will be required to maintain records of all protected fauna and injuries using DES's animal breeding place register.	Construction contractor / fauna spotter-catcher
Accidental clearing of fauna habitat for conservation significant species outside of the Project footprint	Report incident immediately to TCC. DES shall be advised and an incident report prepared detailing: – Extent of clearing – Habitat types – Potential impacts to conservation significant fauna and their habitat	Construction contractor / fauna spotter-catcher

6.3 Veterinary and wildlife carer contacts

The following local veterinarian resources will be used to care for any wildlife injury during the construction process:

Tropical Vets 184 Queen St, Ayr QLD 4807
Phone: 07 4783 2055

FNQ Wildlife Rescue
24/7 Phone: 07 4053 4467

6.4 Legislative requirements of the SMP

The Project will comply with the legislative requirements, as outlined in Section 3 of the Species Management Program (SMP) for tampering with animal breeding places (Low risk of impacts) (DES 2020) and with the notification requirements outlined in Section 5.2.2 of the Species Management Program Information Sheet (DES 2020b). This includes the following key requirements:

– High Risk SMP key requirements:
  - Submission of Animal Breeding Place Report to the DES
  - Submission of Impact Management Plan to the DES
  - Interference with animal breeding places may only commence after written approval has been received from the DES
  - Pre-clearance survey are required prior to commencement of works to identify breeding places
  - Recording of breeding places for species listed under the NC Act in an electronic Animal Breeding Place Register to be maintained throughout construction and submitted to the DES within 6 months of the interactions with the High Risk of impacts species through the Project construction phase
  - Submission of the complete electronic Animal Breeding Place Register to the DES within 10 business days of the expiry of the High Risk SMP.
– Low Risk SMP key requirements:
  - Pre-clearance surveys are required prior to the commencement of works to identify breeding places
  - Recording of breeding places in an electronic Animal Breeding Place Register to be maintained throughout construction and submitted to the DES within 12 months of the interactions with the Low Risk of impacts species through the Project construction phase
  - Submission of the complete electronic Animal Breeding Place Register to the DES within 10 business days of the expiry of the High Risk SMP.

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Appendices

Appendix A

Desktop results

Australian Government

Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

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

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

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

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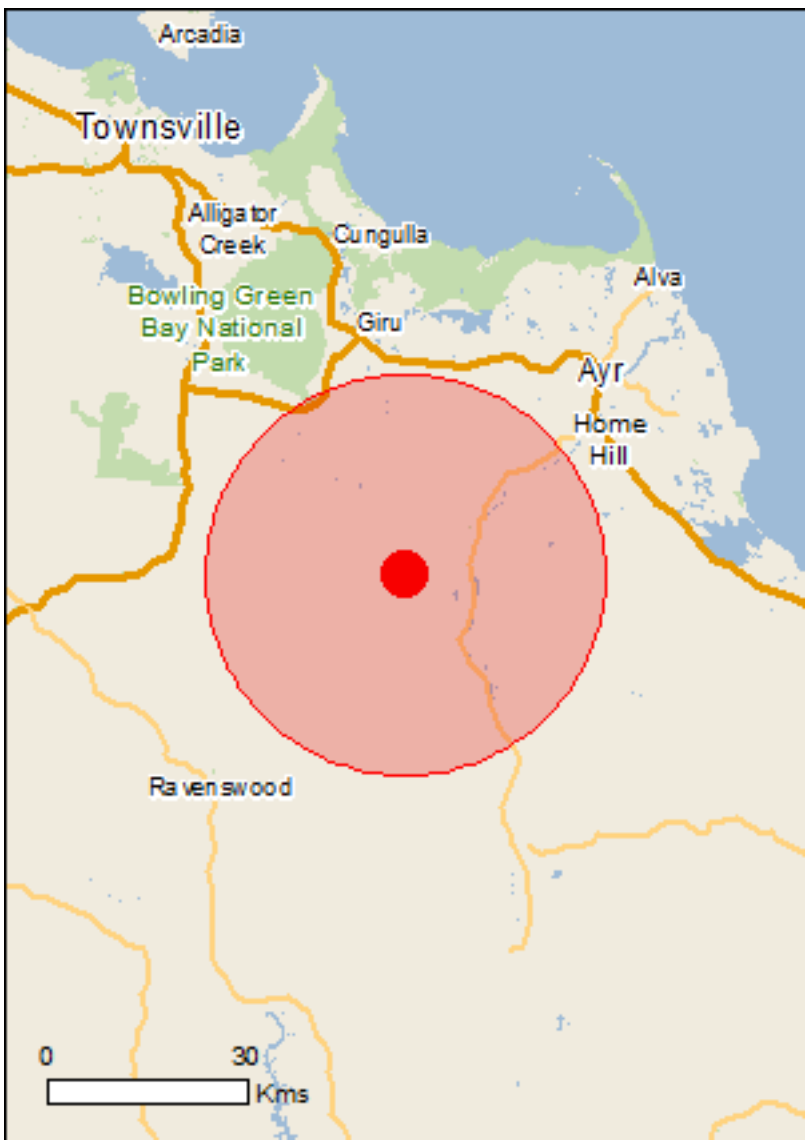
Summary

Details

- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat

Acknowledgements



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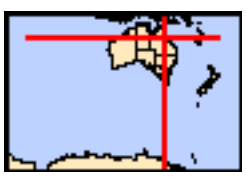

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	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
		habitat likely to occur within area
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 Sheathtail 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 Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
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	[Resource Information]
Name	State
Barrattas Channels Aggregation	QLD

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

Acknowledgements

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

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

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

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

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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

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufonidae	*Rhinella marina*	cane toad	Y			12
animals	amphibians	Hylidae	*Litoria bicolor*	northern sedgefrog		C		1
animals	amphibians	Hylidae	*Litoria fallax*	eastern sedgefrog		C		1
animals	amphibians	Hylidae	*Litoria inermis*	bumpy rocketfrog		C		2
animals	amphibians	Hylidae	*Litoria latopalmata*	broad palmed rocketfrog		C		2
animals	amphibians	Hylidae	*Litoria rubella*	ruddy treefrog		C		1
animals	amphibians	Limnodynastidae	*Limnodynastes convexiusculus*	marbled frog		C		1
animals	birds	Acanthizidae	*Gerygone olivacea*	white-throated gerygone		C		17
animals	birds	Acanthizidae	*Gerygone palpebrosa*	fairy gerygone		C		3
animals	birds	Acanthizidae	*Smicrornis brevirostris*	weebill		C		13
animals	birds	Accipitridae	*Accipiter fasciatus*	brown goshawk		C		7
animals	birds	Accipitridae	*Accipiter novaehollandiae*	grey goshawk		C		1
animals	birds	Accipitridae	*Aquila audax*	wedge-tailed eagle		C		11
animals	birds	Accipitridae	*Aviceda subcristata*	Pacific baza		C		8
animals	birds	Accipitridae	*Circus approximans*	swamp harrier		C		6
animals	birds	Accipitridae	*Circus assimilis*	spotted harrier		C		6
animals	birds	Accipitridae	*Elanus axillaris*	black-shouldered kite		C		7
animals	birds	Accipitridae	*Haliaeetus leucogaster*	white-bellied sea-eagle		C		19
animals	birds	Accipitridae	*Haliastur indus*	brahminy kite		C		3
animals	birds	Accipitridae	*Haliastur sphenurus*	whistling kite		C		45
animals	birds	Accipitridae	*Lophoictinia isura*	square-tailed kite		C		3
animals	birds	Accipitridae	*Milvus migrans*	black kite		C		61
animals	birds	Accipitridae	*Pandion cristatus*	eastern osprey		SL		1
animals	birds	Acrocephalidae	*Acrocephalus australis*	Australian reed-warbler		C		7
animals	birds	Aegothelidae	*Aegotheles cristatus*	Australian owlet-nightjar		C		1
animals	birds	Alcedinidae	*Ceyx azureus*	azure kingfisher		C		4
animals	birds	Alcedinidae	*Ceyx pusillus*	little kingfisher		C		1
animals	birds	Anatidae	*Anas gracilis*	grey teal		C		8
animals	birds	Anatidae	*Anas superciliosa*	Pacific black duck		C		39
animals	birds	Anatidae	*Aythya australis*	hardhead		C		18
animals	birds	Anatidae	*Chenonetta jubata*	Australian wood duck		C		6
animals	birds	Anatidae	*Cygnus atratus*	black swan		C		19
animals	birds	Anatidae	*Dendrocygna arcuata*	wandering whistling-duck		C		18
animals	birds	Anatidae	*Dendrocygna eytoni*	plumed whistling-duck		C		17/3
animals	birds	Anatidae	*Nettapus coromandelianus*	cotton pygmy-goose		C		12
animals	birds	Anatidae	*Nettapus pulchellus*	green pygmy-goose		C		11
animals	birds	Anhingidae	*Anhinga novaehollandiae*	Australasian darter		C		45
animals	birds	Anseranatidae	*Anseranas semipalmata*	magpie goose		C		42
animals	birds	Apodidae	*Aerodramus terraereginae*	Australian swiftlet		C		2
animals	birds	Apodidae	*Apus pacificus*	fork-tailed swift		SL		2
animals	birds	Apodidae	*Hirundapus caudacutus*	white-throated needletail		V	V	1
animals	birds	Ardeidae	*Ardea alba modesta*	eastern great egret		C		36
animals	birds	Ardeidae	*Ardea intermedia*	intermediate egret		C		24
animals	birds	Ardeidae	*Ardea pacifica*	white-necked heron		C		14
animals	birds	Ardeidae	*Ardea sumatrana*	great-billed heron		C		2
animals	birds	Ardeidae	*Bubulcus ibis*	cattle egret		C		10

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Ardeidae	*Egretta garzetta*	little egret		C		9
animals	birds	Ardeidae	*Egretta novaehollandiae*	white-faced heron		C		27
animals	birds	Ardeidae	*Egretta picata*	pied heron		C		1
animals	birds	Ardeidae	*Ixobrychus dubius*	Australian little bittern		C		1
animals	birds	Ardeidae	*Ixobrychus flavicollis*	black bittern		C		4
animals	birds	Ardeidae	*Nycticorax caledonicus*	nankeen night-heron		C		8
animals	birds	Artamidae	*Artamus cinereus*	black-faced woodswallow		C		15
animals	birds	Artamidae	*Artamus leucorynchus*	white-breasted woodswallow		C		49
animals	birds	Artamidae	*Artamus minor*	little woodswallow		C		1
animals	birds	Artamidae	*Artamus personatus*	masked woodswallow		C		1
animals	birds	Artamidae	*Artamus superciliosus*	white-browed woodswallow		C		2
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird		C		45
animals	birds	Artamidae	*Cracticus torquatus*	grey butcherbird		C		6
animals	birds	Artamidae	*Gymnorhina tibicen*	Australian magpie		C		58
animals	birds	Artamidae	*Strepera graculina*	pied currawong		C		13
animals	birds	Burhinidae	*Burhinus grallarius*	bush stone-curlew		C		7
animals	birds	Cacatuidae	*Cacatua galerita*	sulphur-crested cockatoo		C		31
animals	birds	Cacatuidae	*Calyptorhynchus banksii*	red-tailed black-cockatoo		C		51
animals	birds	Cacatuidae	*Eolophus roseicapilla*	galah		C		4
animals	birds	Cacatuidae	*Nymphicus hollandicus*	cockatiel		C		3
animals	birds	Campephagidae	*Coracina maxima*	ground cuckoo-shrike		C		1
animals	birds	Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		C		48
animals	birds	Campephagidae	*Coracina papuensis*	white-bellied cuckoo-shrike		C		70
animals	birds	Campephagidae	*Coracina tenuirostris*	cicadabird		C		2
animals	birds	Campephagidae	*Lalage leucomela*	varied triller		C		6
animals	birds	Campephagidae	*Lalage tricolor*	white-winged triller		C		27
animals	birds	Caprimulgidae	*Caprimulgus macrurus*	large-tailed nightjar		C		1
animals	birds	Casuariidae	*Dromaius novaehollandiae*	emu		C		1
animals	birds	Charadriidae	*Charadrius ruficapillus*	red-capped plover		C		1
animals	birds	Charadriidae	*Elseyornis melanops*	black-fronted dotterel		C		5
animals	birds	Charadriidae	*Vanellus miles*	masked lapwing		C		35
animals	birds	Ciconiidae	*Ephippiorhynchus asiaticus*	black-necked stork		C		14
animals	birds	Cisticolidae	*Cisticola exilis*	golden-headed cisticola		C		10
animals	birds	Cisticolidae	*Cisticola juncidis laveryi*	zitting cisticola		C		2
animals	birds	Columbidae	*Columba livia*	rock dove	Y			5
animals	birds	Columbidae	*Ducula bicolor*	pied imperial-pigeon		C		2
animals	birds	Columbidae	*Geopelia cuneata*	diamond dove		C		8
animals	birds	Columbidae	*Geopelia humeralis*	bar-shouldered dove		C		23
animals	birds	Columbidae	*Geopelia striata*	peaceful dove		C		88
animals	birds	Columbidae	*Geophaps scripta*	squatter pigeon		C		11
animals	birds	Columbidae	*Geophaps scripta scripta*	squatter pigeon (southern subspecies)		V	V	2
animals	birds	Columbidae	*Lopholaimus antarcticus*	topknot pigeon		C		4
animals	birds	Columbidae	*Macropygia amboinensis*	brown cuckoo-dove		C		2
animals	birds	Columbidae	*Ocyphaps lophotes*	crested pigeon		C		39
animals	birds	Columbidae	*Phaps chalcoptera*	common bronzewing		C		1
animals	birds	Columbidae	*Streptopelia chinensis*	spotted dove	Y			2

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Coraciidae	*Eurystomus orientalis*	dollarbird		C		21
animals	birds	Corcoracidae	*Corcorax melanorhamphos*	white-winged chough		C		5
animals	birds	Corcoracidae	*Struthidea cinerea*	apostlebird		C		17
animals	birds	Corvidae	*Corvus coronoides*	Australian raven		C		29
animals	birds	Corvidae	*Corvus orru*	Torresian crow		C		30
animals	birds	Cuculidae	*Cacomantis flabelliformis*	fan-tailed cuckoo		C		6
animals	birds	Cuculidae	*Cacomantis pallidus*	pallid cuckoo		C		20
animals	birds	Cuculidae	*Cacomantis variolosus*	brush cuckoo		C		34/1
animals	birds	Cuculidae	*Centropus phasianinus*	pheasant coucal		C		44
animals	birds	Cuculidae	*Chalcites basalis*	Horsfield's bronze-cuckoo		C		11
animals	birds	Cuculidae	*Chalcites lucidus*	shining bronze-cuckoo		C		2
animals	birds	Cuculidae	*Chalcites minutillus*	little bronze-cuckoo		C		11
animals	birds	Cuculidae	*Chalcites minutillus russatus*	Gould's bronze-cuckoo		C		4
animals	birds	Cuculidae	*Eudynamys orientalis*	eastern koel		C		12
animals	birds	Cuculidae	*Scythrops novaehollandiae*	channel-billed cuckoo		C		14
animals	birds	Dicruridae	*Dicrurus bracteatus*	spangled drongo		C		45
animals	birds	Estrildidae	*Lonchura castaneothorax*	chestnut-breasted mannikin		C		341
animals	birds	Estrildidae	*Lonchura punctulata*	nutmeg mannikin	Y			8
animals	birds	Estrildidae	*Neochmia modesta*	plum-headed finch		C		12
animals	birds	Estrildidae	*Neochmia phaeton*	crimson finch		C		10
animals	birds	Estrildidae	*Neochmia temporalis*	red-browed finch		C		12
animals	birds	Estrildidae	*Poephila cincta cincta*	black-throated finch (white-rumped subspecies)		E	E	15
animals	birds	Estrildidae	*Taeniopygia bichenovii*	double-barred finch		C		63
animals	birds	Estrildidae	*Taeniopygia guttata*	zebra finch		C		7
animals	birds	Eurostopodidae	*Eurostopodus argus*	spotted nightjar		C		1
animals	birds	Falconidae	*Falco berigora*	brown falcon		C		13
animals	birds	Falconidae	*Falco cenchroides*	nankeen kestrel		C		10
animals	birds	Falconidae	*Falco longipennis*	Australian hobby		C		7
animals	birds	Falconidae	*Falco peregrinus*	peregrine falcon		C		5
animals	birds	Falconidae	*Falco subniger*	black falcon		C		1
animals	birds	Gruidae	*Antigone rubicunda*	brolga		C		13
animals	birds	Halcyonidae	*Dacelo leachii*	blue-winged kookaburra		C		60
animals	birds	Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra		C		33
animals	birds	Halcyonidae	*Todiramphus macleayii*	forest kingfisher		C		60
animals	birds	Halcyonidae	*Todiramphus pyrrhopygius*	red-backed kingfisher		C		3
animals	birds	Halcyonidae	*Todiramphus sanctus*	sacred kingfisher		C		31
animals	birds	Hirundinidae	*Hirundo neoxena*	welcome swallow		C		14
animals	birds	Hirundinidae	*Petrochelidon ariel*	fairy martin		C		22
animals	birds	Hirundinidae	*Petrochelidon nigricans*	tree martin		C		23
animals	birds	Jacanidae	*Irediparra gallinacea*	comb-crested jacana		C		26
animals	birds	Laridae	*Chlidonias hybrida*	whiskered tern		C		2
animals	birds	Laridae	*Gelochelidon nilotica*	gull-billed tern		SL		2
animals	birds	Laridae	*Hydroprogne caspia*	Caspian tern		SL		5
animals	birds	Maluridae	*Malurus melanocephalus*	red-backed fairy-wren		C		75
animals	birds	Megaluridae	*Cincloramphus mathewsi*	rufous songlark		C		21

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animals	birds	Megaluridae	*Megalurus timoriensis*	tawny grassbird		C		22
animals	birds	Megapodiidae	*Alectura lathami*	Australian brush-turkey		C		6
animals	birds	Meliphagidae	*Caligavis chrysops*	yellow-faced honeyeater		C		1
animals	birds	Meliphagidae	*Conopophila rufogularis*	rufous-throated honeyeater		C		14
animals	birds	Meliphagidae	*Entomyzon cyanotis*	blue-faced honeyeater		C		52/1
animals	birds	Meliphagidae	*Epthianura tricolor*	crimson chat		C		1
animals	birds	Meliphagidae	*Gavicalis virescens*	singing honeyeater		C		1
animals	birds	Meliphagidae	*Lichmera indistincta*	brown honeyeater		C		47
animals	birds	Meliphagidae	*Manorina flavigula*	yellow-throated miner		C		25
animals	birds	Meliphagidae	*Manorina melanocephala*	noisy miner		C		5
animals	birds	Meliphagidae	*Meliphaga lewinii*	Lewin's honeyeater		C		5
animals	birds	Meliphagidae	*Meliphaga notata*	yellow-spotted honeyeater		C		3
animals	birds	Meliphagidae	*Melithreptus albogularis*	white-throated honeyeater		C		56
animals	birds	Meliphagidae	*Melithreptus gularis*	black-chinned honeyeater		C		10
animals	birds	Meliphagidae	*Myzomela obscura*	dusky honeyeater		C		5
animals	birds	Meliphagidae	*Myzomela sanguinolenta*	scarlet honeyeater		C		5
animals	birds	Meliphagidae	*Philemon buceroides*	helmeted friarbird		C		7
animals	birds	Meliphagidae	*Philemon citreogularis*	little friarbird		C		60
animals	birds	Meliphagidae	*Philemon corniculatus*	noisy friarbird		C		23
animals	birds	Meliphagidae	*Ramsayornis fasciatus*	bar-breasted honeyeater		C		3
animals	birds	Meliphagidae	*Ramsayornis modestus*	brown-backed honeyeater		C		21
animals	birds	Meliphagidae	*Stomiopera flava*	yellow honeyeater		C		91
animals	birds	Meliphagidae	*Stomiopera unicolor*	white-gaped honeyeater		C		6
animals	birds	Meropidae	*Merops ornatus*	rainbow bee-eater		C		66
animals	birds	Monarchidae	*Grallina cyanoleuca*	magpie-lark		C		80
animals	birds	Monarchidae	*Monarcha melanopsis*	black-faced monarch		SL		3
animals	birds	Monarchidae	*Myiagra cyanoleuca*	satin flycatcher		SL		1
animals	birds	Monarchidae	*Myiagra inquieta*	restless flycatcher		C		12
animals	birds	Monarchidae	*Myiagra rubecula*	leaden flycatcher		C		64
animals	birds	Monarchidae	*Symposiachrus trivirgatus*	spectacled monarch		SL		3
animals	birds	Motacillidae	*Anthus novaeseelandiae*	Australasian pipit		C		5
animals	birds	Nectariniidae	*Cinnyris jugularis*	olive-backed sunbird		C		32
animals	birds	Nectariniidae	*Dicaeum hirundinaceum*	mistletoebird		C		18
animals	birds	Neosittidae	*Daphoenositta chrysoptera*	varied sittella		C		2
animals	birds	Oriolidae	*Oriolus sagittatus*	olive-backed oriole		C		23
animals	birds	Oriolidae	*Sphecotheres vieilloti*	Australasian figbird		C		24
animals	birds	Otididae	*Ardeotis australis*	Australian bustard		C		10
animals	birds	Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush		C		1
animals	birds	Pachycephalidae	*Colluricincla megarhyncha*	little shrike-thrush		C		12
animals	birds	Pachycephalidae	*Pachycephala pectoralis*	golden whistler		C		1
animals	birds	Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		C		89
animals	birds	Pardalotidae	*Pardalotus striatus*	striated pardalote		C		51
animals	birds	Passeridae	*Passer domesticus*	house sparrow	Y			6
animals	birds	Pelecanidae	*Pelecanus conspicillatus*	Australian pelican		C		17
animals	birds	Petroicidae	*Melanodryas cucullata*	hooded robin		C		1
animals	birds	Petroicidae	*Microeca fascinans*	jacky winter		C		10

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animals	birds	Petroicidae	*Microeca flavigaster*	lemon-bellied flycatcher		C		49
animals	birds	Petroicidae	*Petroica goodenovii*	red-capped robin		C		2
animals	birds	Petroicidae	*Poecilodryas superciliosa*	white-browed robin		C		1
animals	birds	Phalacrocoracidae	*Microcarbo melanoleucos*	little pied cormorant		C		35
animals	birds	Phalacrocoracidae	*Phalacrocorax carbo*	great cormorant		C		12
animals	birds	Phalacrocoracidae	*Phalacrocorax sulcirostris*	little black cormorant		C		31
animals	birds	Phalacrocoracidae	*Phalacrocorax varius*	pied cormorant		C		3
animals	birds	Phasianidae	*Coturnix ypsilophora*	brown quail		C		11
animals	birds	Pittidae	*Pitta versicolor*	noisy pitta		C		1
animals	birds	Podargidae	*Podargus strigoides*	tawny frogmouth		C		5
animals	birds	Podicipedidae	*Podiceps cristatus*	great crested grebe		C		8
animals	birds	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian grebe		C		20
animals	birds	Pomatostomidae	*Pomatostomus temporalis*	grey-crowned babbler		C		8
animals	birds	Psittacidae	*Aprosmictus erythropterus*	red-winged parrot		C		26
animals	birds	Psittacidae	*Melopsittacus undulatus*	budgerigar		C		2
animals	birds	Psittacidae	*Platycercus adscitus*	pale-headed rosella		C		58
animals	birds	Psittacidae	*Trichoglossus chlorolepidotus*	scaly-breasted lorikeet		C		25
animals	birds	Psittacidae	*Trichoglossus moluccanus*	rainbow lorikeet		C		43
animals	birds	Ptilonorhynchidae	*Ptilonorhynchus maculatus*	spotted bowerbird		C		1
animals	birds	Ptilonorhynchidae	*Ptilonorhynchus nuchalis*	great bowerbird		C		29
animals	birds	Rallidae	*Amaurornis cinerea*	white-browed crake		C		3
animals	birds	Rallidae	*Amaurornis moluccana*	pale-vented bush-hen		C		7
animals	birds	Rallidae	*Fulica atra*	Eurasian coot		C		5
animals	birds	Rallidae	*Gallinula tenebrosa*	dusky moorhen		C		5
animals	birds	Rallidae	*Gallirallus philippensis*	buff-banded rail		C		6
animals	birds	Rallidae	*Porphyrio melanotus*	purple swamphen		C		2
animals	birds	Rallidae	*Porzana fluminea*	Australian spotted crake		C		1
animals	birds	Rallidae	*Porzana pusilla*	Baillon's crake		C		1
animals	birds	Rallidae	*Porzana tabuensis*	spotless crake		C		1
animals	birds	Recurvirostridae	*Himantopus himantopus*	black-winged stilt		C		4
animals	birds	Recurvirostridae	*Recurvirostra novaehollandiae*	red-necked avocet		C		1
animals	birds	Rhipiduridae	*Rhipidura albiscapa*	grey fantail		C		72
animals	birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		C		76
animals	birds	Rhipiduridae	*Rhipidura rufifrons*	rufous fantail		SL		2
animals	birds	Rhipiduridae	*Rhipidura rufiventris*	northern fantail		C		1
animals	birds	Scolopacidae	*Gallinago hardwickii*	Latham's snipe		SL		1
animals	birds	Strigidae	*Ninox boobook*	southern boobook		C		1
animals	birds	Strigidae	*Ninox connivens*	barking owl		C		8
animals	birds	Strigidae	*Ninox rufa queenslandica*	rufous owl (southern subspecies)		C		1
animals	birds	Sturnidae	*Aplonis metallica*	metallic starling		C		1
animals	birds	Threskiornithidae	*Platalea flavipes*	yellow-billed spoonbill		C		18
animals	birds	Threskiornithidae	*Platalea regia*	royal spoonbill		C		17
animals	birds	Threskiornithidae	*Plegadis falcinellus*	glossy ibis		SL		4
animals	birds	Threskiornithidae	*Threskiornis molucca*	Australian white ibis		C		34
animals	birds	Threskiornithidae	*Threskiornis spinicollis*	straw-necked ibis		C		39
animals	birds	Timaliidae	*Zosterops lateralis*	silvereye		C		2

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animals	birds	Turnicidae	*Turnix maculosus*	red-backed button-quail		C		4
animals	birds	Turnicidae	*Turnix pyrrhothorax*	red-chested button-quail		C		2
animals	birds	Turnicidae	*Turnix varius*	painted button-quail		C		1
animals	birds	Tytonidae	*Tyto delicatula*	eastern barn owl		C		2
animals	mammals	Cervidae	*Axis axis*	chital	Y			1
animals	mammals	Dasyuridae	*Dasyurus hallucatus*	northern quoll		C	E	2
animals	mammals	Leporidae	*Lepus europaeus*	European brown hare	Y			1
animals	mammals	Macropodidae	*Macropus giganteus*	eastern grey kangaroo		C		2
animals	mammals	Macropodidae	*Notamacropus agilis*	agile wallaby		C		2
animals	mammals	Macropodidae	*Petrogale assimilis*	allied rock-wallaby		C		5/5
animals	mammals	Macropodidae	*Petrogale inornata*	unadorned rock-wallaby		C		3/3
animals	mammals	Miniopteridae	*Miniopterus australis*	little bent-wing bat		C		1
animals	mammals	Miniopteridae	*Miniopterus schreibersii oceanensis*	eastern bent-wing bat		C		1
animals	mammals	Peramelidae	*Isoodon macrourus*	northern brown bandicoot		C		2/2
animals	mammals	Phascolarctidae	*Phascolarctos cinereus*	koala		V	V	1
animals	mammals	Pteropodidae	*Pteropus alecto*	black flying-fox		C		2/1
animals	mammals	Pteropodidae	*Pteropus scapulatus*	little red flying-fox		C		1
animals	mammals	Suidae	*Sus scrofa*	pig	Y			6
animals	mammals	Vespertilionidae	*Myotis macropus*	large-footed myotis		C		1
animals	ray-finned fishes	Ambassidae	*Ambassis agassizii*	Agassiz's glassfish				1
animals	ray-finned fishes	Ambassidae	*Ambassis agrammus*	sailfin glassfish				11
animals	ray-finned fishes	Ambassidae	*Ambassis species*	northwest glassfish				2
animals	ray-finned fishes	Anguillidae	*Anguilla reinhardtii*	longfin eel				40
animals	ray-finned fishes	Apogonidae	*Glossamia aprion*	mouth almighty				45
animals	ray-finned fishes	Ariidae	*Neoarius graeffei*	blue catfish				7
animals	ray-finned fishes	Atherinidae	*Craterocephalus stercusmuscarum*	flyspecked hardyhead				400
animals	ray-finned fishes	Belonidae	*Strongylura krefftii*	freshwater longtom				47
animals	ray-finned fishes	Centropomidae	*Lates calcarifer*	barramundi				188
animals	ray-finned fishes	Cichlidae	*Oreochromis mossambica*	Mozambique mouthbrooder	Y			4
animals	ray-finned fishes	Clupeidae	*Nematalosa erebi*	bony bream				518
animals	ray-finned fishes	Eleotridae	*Hypseleotris compressa*	empire gudgeon				67
animals	ray-finned fishes	Eleotridae	*Oxyeleotris lineolata*	sleepy cod				218
animals	ray-finned fishes	Gobiidae	*Awaous acritosus*	roman-nose goby				1
animals	ray-finned fishes	Hemiramphidae	*Arrhamphus sclerolepis*	snubnose garfish				7
animals	ray-finned fishes	Megalopidae	*Megalops cyprinoides*	oxeye herring				36
animals	ray-finned fishes	Melanotaeniidae	*Melanotaenia splendida splendida*	eastern rainbowfish				84
animals	ray-finned fishes	Mugilidae	*Mugil cephalus*	sea mullet				1
animals	ray-finned fishes	Osteoglossidae	*Scleropages jardinii*	northern saratoga				1
animals	ray-finned fishes	Plotosidae	*Neosilurus ater*	black catfish				35
animals	ray-finned fishes	Plotosidae	*Neosilurus hyrtlii*	Hyrtl's catfish				1
animals	ray-finned fishes	Poeciliidae	*Gambusia holbrooki*	mosquitofish	Y			1
animals	ray-finned fishes	Scatophagidae	*Scatophagus argus*	spotted scat				2
animals	ray-finned fishes	Terapontidae	*Amniataba percoides*	barred grunter				36
animals	ray-finned fishes	Terapontidae	*Hephaestus fuliginosus*	sooty grunter				22
animals	ray-finned fishes	Terapontidae	*Leiopotherapon unicolor*	spangled perch				6
animals	ray-finned fishes	Terapontidae	*Scortum parviceps*	smallhead grunter				3

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animals	ray-finned fishes	Toxotidae	*Toxotes chatareus*	sevenspot archerfish				20
animals	reptiles	Agamidae	*Diporiphora australis*	tommy roundhead		C		2/1
animals	reptiles	Boidae	*Antaresia maculosa*	spotted python		C		1/1
animals	reptiles	Carphodactylidae	*Nephrurus asper*	spiny knob-tailed gecko		C		1
animals	reptiles	Chelidae	*Chelodina canni*	Cann's longneck turtle		C		1
animals	reptiles	Chelidae	*Elseya irwini*	Irwin's turtle		C		1
animals	reptiles	Chelidae	*Emydura macquarii krefftii*	Krefft's river turtle		C		1
animals	reptiles	Colubridae	*Dendrelaphis punctulatus*	green tree snake		C		2
animals	reptiles	Colubridae	*Tropidonophis mairii*	freshwater snake		C		1
animals	reptiles	Diplodactylidae	*Oedura castelnaui*	northern velvet gecko		C		1
animals	reptiles	Elapidae	*Antaioserpens albiceps*	north-eastern plain-nosed burrowing snake		C		1/1
animals	reptiles	Elapidae	*Demansia torquata*	collared whipsnake		C		1
animals	reptiles	Elapidae	*Furina diadema*	red-naped snake		C		1
animals	reptiles	Elapidae	*Pseudonaja textilis*	eastern brown snake		C		1
animals	reptiles	Elapidae	*Vermicella annulata*	bandy-bandy		C		1/1
animals	reptiles	Gekkonidae	*Gehyra dubia*	dubious dtella		C		2/1
animals	reptiles	Gekkonidae	*Heteronotia binoei*	Bynoe's gecko		C		4
animals	reptiles	Pygopodidae	*Delma tincta*	excitable delma		C		1/1
animals	reptiles	Pygopodidae	*Lialis burtonis*	Burton's legless lizard		C		2/2
animals	reptiles	Scincidae	*Carlia jarnoldae*	lined rainbow-skink		C		1
animals	reptiles	Scincidae	*Carlia rubigo*	orange-flanked rainbow skink		C		2
animals	reptiles	Scincidae	*Carlia schmeltzii*	robust rainbow-skink		C		1
animals	reptiles	Scincidae	*Cryptoblepharus adamsi*	Adams' snake-eyed skink		C		1
animals	reptiles	Scincidae	*Cryptoblepharus pulcher pulcher*	elegant snake-eyed skink		C		1
animals	reptiles	Scincidae	*Cryptoblepharus sp.*			C		1
animals	reptiles	Scincidae	*Ctenotus spaldingi*	straight-browed ctenotus		C		1
animals	reptiles	Scincidae	*Glaphyromorphus punctulatus*	fine-spotted mulch-skink		C		4/4
animals	reptiles	Scincidae	*Lampropholis delicata*	dark-flecked garden sunskink		C		3/3
animals	reptiles	Scincidae	*Morethia taeniopleura*	fire-tailed skink		C		2
animals	reptiles	Scincidae	*Pygmaeascincus timlowi*	dwarf litter-skink		C		1
animals	reptiles	Typhlopidae	*Anilios affinis*	small-headed blind snake		C		1
animals	reptiles	Varanidae	*Varanus storri*	Storr's monitor		C		2
plants	land plants	Acanthaceae	*Asystasia gangetica subsp. gangetica*		Y			1/1
plants	land plants	Acanthaceae	*Hygrophila angustifolia*			C		1/1
plants	land plants	Acanthaceae	*Hypoestes floribunda var. floribunda*			C		1/1
plants	land plants	Acanthaceae	*Nelsonia campestris*			C		1/1
plants	land plants	Acanthaceae	*Rostellularia adscendens subsp. adscendens*			C		1/1
plants	land plants	Acanthaceae	*Ruellia tuberosa*		Y			1/1
plants	land plants	Acanthaceae	*Thunbergia fragrans*		Y			4/4
plants	land plants	Acanthaceae	*Thunbergia grandiflora*	sky flower	Y			1/1
plants	land plants	Alismataceae	*Caldesia oligococca*			C		1/1
plants	land plants	Amaranthaceae	*Alternanthera angustifolia*			C		1/1
plants	land plants	Amaranthaceae	*Alternanthera denticulata var. micrantha*			C		4/4
plants	land plants	Amaranthaceae	*Alternanthera ficoidea*		Y			2/2
plants	land plants	Amaranthaceae	*Alternanthera nana*	hairy joyweed		C		1/1

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plants	land plants	Amaranthaceae	*Alternanthera nodiflora*	joyweed		C		1/1
plants	land plants	Amaranthaceae	*Amaranthus spinosus*	needle burr	Y			2/2
plants	land plants	Amaranthaceae	*Deeringia amaranthoides*	redberry		C		3/3
plants	land plants	Amaranthaceae	*Guilleminea densa*	small matweed	Y			1/1
plants	land plants	Anacardiaceae	*Pleiogynium timorense*	Burdekin plum		C		1/1
plants	land plants	Apocynaceae	*Alyxia spicata*			C		1/1
plants	land plants	Apocynaceae	*Catharanthus roseus*	pink periwinkle	Y			1/1
plants	land plants	Apocynaceae	*Cryptostegia grandiflora*	rubber vine	Y			7/2
plants	land plants	Apocynaceae	*Nerium oleander*	oleander	Y			1/1
plants	land plants	Apocynaceae	*Parsonsia lanceolata*	northern silkpod		C		1/1
plants	land plants	Apocynaceae	*Vincetoxicum erectum*			C		5/5
plants	land plants	Apocynaceae	*Wrightia saligna*			C		1/1
plants	land plants	Araceae	*Lemna aequinoctialis*	common duckweed		C		1/1
plants	land plants	Asteraceae	*Acanthospermum hispidum*	star burr	Y			1/1
plants	land plants	Asteraceae	*Acmella grandiflora var. brachyglossa*			C		1/1
plants	land plants	Asteraceae	*Blumea saxatilis*			C		1/1
plants	land plants	Asteraceae	*Camptacra barbata*			C		1/1
plants	land plants	Asteraceae	*Centipeda borealis*			C		2/2
plants	land plants	Asteraceae	*Chrysocephalum apiculatum*	yellow buttons		C		2/2
plants	land plants	Asteraceae	*Coronidium lanuginosum*			C		1/1
plants	land plants	Asteraceae	*Cyanthillium cinereum*			C		1/1
plants	land plants	Asteraceae	*Eclipta prostrata*	white eclipta	Y			3/3
plants	land plants	Asteraceae	*Gynura drymophila var. drymophila*			C		1/1
plants	land plants	Asteraceae	*Parthenium hysterophorus*	parthenium weed	Y			1/1
plants	land plants	Asteraceae	*Peripleura scabra*			C		2/2
plants	land plants	Asteraceae	*Pseudognaphalium luteoalbum*	Jersey cudweed		C		1/1
plants	land plants	Asteraceae	*Pterocaulon serrulatum var. serrulatum*			C		2/2
plants	land plants	Asteraceae	*Sphaeranthus indicus*			C		1/1
plants	land plants	Asteraceae	*Synedrella nodiflora*		Y			1/1
plants	land plants	Asteraceae	*Xanthium occidentale*		Y			1/1
plants	land plants	Asteraceae	*Xerochrysum bracteatum*	golden everlasting daisy		C		1/1
plants	land plants	Asteraceae	*Xerochrysum bracteatum subsp. (Mount Elliot A.R.Bean 3593)*			C		1/1
plants	land plants	Bignoniaceae	*Dolichandrone alternifolia*			C		1/1
plants	land plants	Bignoniaceae	*Pandorea pandorana*	wonga vine		C		1/1
plants	land plants	Bombacaceae	*Lagunaria queenslandica*			C		2/2
plants	land plants	Boraginaceae	*Cordia dichotoma*			C		1/1
plants	land plants	Boraginaceae	*Ehretia grahamii*			C		1/1
plants	land plants	Boraginaceae	*Ehretia membranifolia*	weeping koda		C		1/1
plants	land plants	Boraginaceae	*Heliotropium ovalifolium*			C		2/2
plants	land plants	Byttneriaceae	*Hannafordia shanesii*			C		1/1
plants	land plants	Caesalpiniaceae	*Chamaecrista absus var. absus*			C		2/2
plants	land plants	Caesalpiniaceae	*Lysiphyllum hookeri*	Queensland ebony		C		1/1
plants	land plants	Caesalpiniaceae	*Parkinsonia aculeata*	parkinsonia	Y			2/2
plants	land plants	Caesalpiniaceae	*Senna gaudichaudii*			C		1/1
plants	land plants	Campanulaceae	*Lobelia quadrangularis*			C		1/1

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plants	land plants	Campanulaceae	*Wahlenbergia caryophylloides*			C		1/1
plants	land plants	Capparaceae	*Capparis canescens*			C		1/1
plants	land plants	Caryophyllaceae	*Polycarpaea spirostylis subsp. spirostylis*			C		1/1
plants	land plants	Casuarinaceae	*Casuarina cunninghamiana subsp. cunninghamiana*			C		1/1
plants	land plants	Celastraceae	*Denhamia cunninghamii*			C		2/2
plants	land plants	Celastraceae	*Denhamia oleaster*			C		1/1
plants	land plants	Celastraceae	*Elaeodendron melanocarpum*			C		1/1
plants	land plants	Chenopodiaceae	*Chenopodium album*	fat-hen	Y			2/2
plants	land plants	Chenopodiaceae	*Dysphania glomulifera subsp. glomulifera*			C		1/1
plants	land plants	Cleomaceae	*Arivela viscosa*			C		1/1
plants	land plants	Cleomaceae	*Tarenaya aculeata*		Y			1/1
plants	land plants	Clusiaceae	*Hypericum gramineum*			C		1/1
plants	land plants	Cochlospermaceae	*Cochlospermum gillivraei*			C		2/2
plants	land plants	Combretaceae	*Terminalia sericocarpa*	damson		C		1/1
plants	land plants	Convolvulaceae	*Argyreia nervosa*		Y			2/2
plants	land plants	Convolvulaceae	*Distimake quinquefolius*		Y			2/2
plants	land plants	Convolvulaceae	*Evolvulus nummularius*		Y			1/1
plants	land plants	Convolvulaceae	*Ipomoea abrupta*			C		1/1
plants	land plants	Convolvulaceae	*Ipomoea aquatica*			C		1/1
plants	land plants	Convolvulaceae	*Ipomoea eriocarpa*			C		1/1
plants	land plants	Convolvulaceae	*Ipomoea funicularis*			C		1/1
plants	land plants	Convolvulaceae	*Jacquemontia paniculata*			C		1/1
plants	land plants	Convolvulaceae	*Operculina turpethum*			C		1/1
plants	land plants	Convolvulaceae	*Xenostegia tridentata*			C		1/1
plants	land plants	Cornaceae	*Alangium polyosmoides subsp. tomentosum*			C		1/1
plants	land plants	Cucurbitaceae	*Cucumis anguria var. anguria*	West Indian gherkin	Y			1/1
plants	land plants	Cucurbitaceae	*Diplocyclos palmatus subsp. affinis*			C		1/1
plants	land plants	Cucurbitaceae	*Luffa aegyptiaca*			C		1/1
plants	land plants	Cyperaceae	*Cyperus bulbosus*			C		1/1
plants	land plants	Cyperaceae	*Cyperus concinnus*			C		1/1
plants	land plants	Cyperaceae	*Cyperus distans*			C		1/1
plants	land plants	Cyperaceae	*Cyperus iria*			C		1/1
plants	land plants	Cyperaceae	*Cyperus nervulosus*			C		1/1
plants	land plants	Cyperaceae	*Cyperus perangustus*			C		1/1
plants	land plants	Cyperaceae	*Cyperus platystylis*			C		1/1
plants	land plants	Cyperaceae	*Cyperus procerus*			C		1/1
plants	land plants	Cyperaceae	*Cyperus scariosus*			C		1/1
plants	land plants	Cyperaceae	*Eleocharis geniculata*			C		1/1
plants	land plants	Cyperaceae	*Fimbristylis bisumbellata*			C		1/1
plants	land plants	Cyperaceae	*Fimbristylis dichotoma*	common fringe-rush		C		1/1
plants	land plants	Cyperaceae	*Fimbristylis littoralis*			C		1/1
plants	land plants	Cyperaceae	*Fimbristylis sieberiana*			C		1/1
plants	land plants	Cyperaceae	*Gahnia aspera*			C		1/1
plants	land plants	Cyperaceae	*Schoenus falcatus*			C		1/1
plants	land plants	Cyperaceae	*Scleria sphacelata*			C		2/2
plants	land plants	Droseraceae	*Drosera finlaysoniana*			C		1/1

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plants	land plants	Ebenaceae	*Diospyros geminata*	scaly ebony		C		1/1
plants	land plants	Ebenaceae	*Diospyros humilis*	small-leaved ebony		C		1/1
plants	land plants	Ebenaceae	*Diospyros laurina*			C		1/1
plants	land plants	Euphorbiaceae	*Acalypha eremorum*	soft acalypha		C		2/2
plants	land plants	Euphorbiaceae	*Claoxylon tenerifolium subsp. tenerifolium*			C		1/1
plants	land plants	Euphorbiaceae	*Croton*					1/1
plants	land plants	Euphorbiaceae	*Croton arnhemicus*			C		1/1
plants	land plants	Euphorbiaceae	*Croton phebalioides*	narrow-leaved croton		C		1/1
plants	land plants	Euphorbiaceae	*Euphorbia bifida*			C		1/1
plants	land plants	Euphorbiaceae	*Jatropha gossypiifolia*	bellyache bush	Y			2/2
plants	land plants	Euphorbiaceae	*Mallotus philippensis*	red kamala		C		2/2
plants	land plants	Euphorbiaceae	*Ricinus communis*	castor oil bush	Y			5/1
plants	land plants	Fabaceae	*Abrus precatorius subsp. precatorius*			C		1/1
plants	land plants	Fabaceae	*Aeschynomene americana var. glandulosa*		Y			1/1
plants	land plants	Fabaceae	*Aeschynomene indica*	budda pea		C		1/1
plants	land plants	Fabaceae	*Aeschynomene villosa*		Y			1/1
plants	land plants	Fabaceae	*Alysicarpus bupleurifolius*	sweet alys	Y			1/1
plants	land plants	Fabaceae	*Alysicarpus ovalifolius*		Y			1/1
plants	land plants	Fabaceae	*Alysicarpus vaginalis*		Y			1/1
plants	land plants	Fabaceae	*Canavalia papuana*	wild jack bean		C		1/1
plants	land plants	Fabaceae	*Centrosema molle*		Y			1/1
plants	land plants	Fabaceae	*Crotalaria aridicola subsp. aridicola*			C		1/1
plants	land plants	Fabaceae	*Crotalaria goreensis*	gambia pea	Y			1/1
plants	land plants	Fabaceae	*Crotalaria laburnifolia*		Y			1/1
plants	land plants	Fabaceae	*Crotalaria medicaginea var. medicaginea*			C		1/1
plants	land plants	Fabaceae	*Crotalaria mitchellii subsp. mitchellii*			C		1/1
plants	land plants	Fabaceae	*Crotalaria montana var. exserta*			C		1/1
plants	land plants	Fabaceae	*Crotalaria pallida var. obovata*		Y			3/3
plants	land plants	Fabaceae	*Crotalaria quinquefolia*			C		1/1
plants	land plants	Fabaceae	*Crotalaria retusa var. retusa*		Y			1/1
plants	land plants	Fabaceae	*Crotalaria sessiliflora var. anthylloides*			C		1/1
plants	land plants	Fabaceae	*Crotalaria verrucosa*			C		1/1
plants	land plants	Fabaceae	*Cullen badocanum*			C		3/3
plants	land plants	Fabaceae	*Desmodium scorpiurus*		Y			1/1
plants	land plants	Fabaceae	*Flemingia lineata*			C		1/1
plants	land plants	Fabaceae	*Galactia*					1/1
plants	land plants	Fabaceae	*Galactia tenuiflora var. lucida*			C		2/2
plants	land plants	Fabaceae	*Glycine*					1/1
plants	land plants	Fabaceae	*Hovea longipes*	brush hovea		C		1/1
plants	land plants	Fabaceae	*Indigofera*					1/1
plants	land plants	Fabaceae	*Indigofera linifolia*			C		1/1
plants	land plants	Fabaceae	*Indigofera pratensis*			C		1/1
plants	land plants	Fabaceae	*Indigofera tryonii*			C		1/1
plants	land plants	Fabaceae	*Macroptilium lathyroides*		Y			1/1
plants	land plants	Fabaceae	*Millettia pinnata*			C		1/1
plants	land plants	Fabaceae	*Mucuna gigantea*	burny bean		C		1/1

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plants	land plants	Fabaceae	*Tephrosia*					1/1
plants	land plants	Fabaceae	*Tephrosia brachyodon var. longifolia*			C		2/2
plants	land plants	Fabaceae	*Tephrosia filipes subsp. filipes*			C		1/1
plants	land plants	Fabaceae	*Tephrosia macrostachya*			C		1/1
plants	land plants	Fabaceae	*Uraria lagopodioides*			C		1/1
plants	land plants	Fabaceae	*Vigna radiata var. sublobata*			C		1/1
plants	land plants	Fabaceae	*Vigna sp. (Greta Creek R.J.Lawn+ AQ532201)*			C		3/3
plants	land plants	Fabaceae	*Vigna sp. (Station Creek R.J.Lawn CQ3284)*			C		2/2
plants	land plants	Fabaceae	*Zornia muelleriana subsp. muelleriana*			C		1/1
plants	land plants	Fabaceae	*Zornia muriculata subsp. angustata*			C		3/3
plants	land plants	Goodeniaceae	*Goodenia pilosa*			C		1/1
plants	land plants	Goodeniaceae	*Goodenia rosulata*			C		1/1
plants	land plants	Haloragaceae	*Gonocarpus acanthocarpus*			C		1/1
plants	land plants	Haloragaceae	*Myriophyllum verrucosum*	water milfoil		C		1/1
plants	land plants	Helicteraceae	*Helicteres semiglabra*			C		1/1
plants	land plants	Hemerocallidaceae	*Dianella caerulea*			C		2/2
plants	land plants	Hydrocharitaceae	*Hydrilla verticillata*	hydrilla		C		1/1
plants	land plants	Hydrocharitaceae	*Hydrocharis dubia*	frogbit	Y			1/1
plants	land plants	Hydrocharitaceae	*Ottelia alismoides*			C		1/1
plants	land plants	Hydrocharitaceae	*Ottelia ovalifolia subsp. ovalifolia*			C		1/1
plants	land plants	Lamiaceae	*Basilicum polystachyon*			C		2/2
plants	land plants	Lamiaceae	*Clerodendrum floribundum*			C		5/5
plants	land plants	Lamiaceae	*Coleus graveolens*			C		1/1
plants	land plants	Lamiaceae	*Coleus scutellarioides*			C		1/1
plants	land plants	Lamiaceae	*Leucas decemdentata*			C		1/1
plants	land plants	Lamiaceae	*Leucas lavandulifolia*		Y			1/1
plants	land plants	Lamiaceae	*Mesosphaerum suaveolens*		Y			1/1
plants	land plants	Lamiaceae	*Ocimum americanum*		Y			2/2
plants	land plants	Lamiaceae	*Pityrodia salviifolia*	pityrodia		C		1/1
plants	land plants	Lamiaceae	*Premna dallachyana*			C		1/1
plants	land plants	Lamiaceae	*Premna serratifolia*			C		1/1
plants	land plants	Lamiaceae	*Teucrium modestum*			C		2/2
plants	land plants	Lauraceae	*Cryptocarya triplinervis var. triplinervis*			C		2/2
plants	land plants	Lauraceae	*Litsea glutinosa*			C		2/2
plants	land plants	Laxmanniaceae	*Lomandra longifolia*			C		1/1
plants	land plants	Lentibulariaceae	*Utricularia aurea*	golden bladderwort		C		1/1
plants	land plants	Lentibulariaceae	*Utricularia stellaris*			C		1/1
plants	land plants	Loranthaceae	*Lysiana subfalcata*			C		1/1
plants	land plants	Lythraceae	*Ammannia multiflora*	jerry-jerry		C		1/1
plants	land plants	Malvaceae	*Abutilon auritum*	Chinese lantern		C		1/1
plants	land plants	Malvaceae	*Abutilon guineense*		Y			1/1
plants	land plants	Malvaceae	*Abutilon micropetalum*			C		1/1
plants	land plants	Malvaceae	*Hibiscus krichauffianus*			C		1/1
plants	land plants	Malvaceae	*Hibiscus panduriformis*			C		2/2
plants	land plants	Malvaceae	*Hibiscus vitifolius*			C		1/1
plants	land plants	Malvaceae	*Sida acuta*	spinyhead sida	Y			1/1

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plants	land plants	Malvaceae	*Sida hackettiana*			C		1/1
plants	land plants	Malvaceae	*Urena lobata*	urena weed	Y			1/1
plants	land plants	Marsileaceae	*Marsilea mutica*	shiny nardoo		C		1/1
plants	land plants	Martyniaceae	*Martynia annua*	small-fruited devil's claw	Y			2/2
plants	land plants	Menispermaceae	*Pachygone ovata*			C		1/1
plants	land plants	Mimosaceae	*Acacia hemsleyi*			C		1/1
plants	land plants	Mimosaceae	*Acacia jackesiana*			C		1/1
plants	land plants	Mimosaceae	*Acacia leptostachya*	Townsville wattle		C		1/1
plants	land plants	Mimosaceae	*Acacia tephrina*			C		2/2
plants	land plants	Mimosaceae	*Desmanthus leptophyllus*		Y			1/1
plants	land plants	Mimosaceae	*Leucaena leucocephala*		Y			3
plants	land plants	Mimosaceae	*Leucaena leucocephala subsp. leucocephala*		Y			1/1
plants	land plants	Mimosaceae	*Neptunia gracilis forma gracilis*			C		1/1
plants	land plants	Mimosaceae	*Neptunia major*			C		3/3
plants	land plants	Mimosaceae	*Neptunia monosperma*			C		1/1
plants	land plants	Mimosaceae	*Senegalia*					1/1
plants	land plants	Mimosaceae	*Vachellia farnesiana*		Y			1/1
plants	land plants	Molluginaceae	*Glinus lotoides*	hairy carpet weed		C		1/1
plants	land plants	Molluginaceae	*Glinus oppositifolius*			C		1/1
plants	land plants	Molluginaceae	*Mollugo verticillata*		Y			2/2
plants	land plants	Moraceae	*Ficus rubiginosa forma rubiginosa*			C		1/1
plants	land plants	Myrsinaceae	*Lysimachia ovalis*			C		2/2
plants	land plants	Myrtaceae	*Corymbia clarksoniana*			C		2/2
plants	land plants	Myrtaceae	*Corymbia dallachiana*			C		2/2
plants	land plants	Myrtaceae	*Corymbia lamprophylla*			C		1/1
plants	land plants	Myrtaceae	*Corymbia leichhardtii*	rustyjacket		C		1/1
plants	land plants	Myrtaceae	*Eucalyptus brownii*	Reid River box		C		1/1
plants	land plants	Myrtaceae	*Eucalyptus drepanophylla*			C		1/1
plants	land plants	Myrtaceae	*Eucalyptus persistens*			C		1/1
plants	land plants	Myrtaceae	*Eucalyptus platyphylla*	poplar gum		C		2/2
plants	land plants	Myrtaceae	*Eucalyptus raveretiana*	black ironbox		C	V	1/1
plants	land plants	Myrtaceae	*Eucalyptus shirleyi*			C		1/1
plants	land plants	Myrtaceae	*Eucalyptus xanthoclada*	yellow-branched ironbark		C		2/2
plants	land plants	Myrtaceae	*Gossia bidwillii*			C		4/4
plants	land plants	Myrtaceae	*Leptospermum anfractum*			C		1/1
plants	land plants	Myrtaceae	*Lophostemon grandiflorus subsp. riparius*			C		5/5
plants	land plants	Myrtaceae	*Melaleuca bracteata*			C		3/3
plants	land plants	Myrtaceae	*Melaleuca leucadendra*	broad-leaved tea-tree		C		1/1
plants	land plants	Myrtaceae	*Melaleuca nervosa*			C		4/4
plants	land plants	Myrtaceae	*Melaleuca viminalis*			C		1/1
plants	land plants	Myrtaceae	*Rhodomyrtus trineura subsp. trineura*			C		1/1
plants	land plants	Myrtaceae	*Syzygium cumini*		Y			1/1
plants	land plants	Najadaceae	*Najas tenuifolia*	water nymph		C		1/1
plants	land plants	Nelumbonaceae	*Nelumbo nucifera*	pink waterlily		C		2/2
plants	land plants	Nyctaginaceae	*Pisonia aculeata*	thorny pisonia		C		2/2
plants	land plants	Orchidaceae	*Cymbidium canaliculatum*			C		1/1

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plants	land plants	Papaveraceae	*Argemone ochroleuca subsp. ochroleuca*	Mexican poppy	Y			1/1
plants	land plants	Passifloraceae	*Passiflora foetida*		Y			1/1
plants	land plants	Passifloraceae	*Passiflora suberosa subsp. litoralis*		Y			1/1
plants	land plants	Phrymaceae	*Glossostigma diandrum*			C		1/1
plants	land plants	Phyllanthaceae	*Antidesma parvifolium*			C		1/1
plants	land plants	Phyllanthaceae	*Breynia oblongifolia*			C		2/2
plants	land plants	Phyllanthaceae	*Bridelia leichhardtii*			C		1/1
plants	land plants	Phyllanthaceae	*Flueggea virosa subsp. melanthesoides*			C		3/3
plants	land plants	Phyllanthaceae	*Phyllanthus carpentariae*			C		1/1
plants	land plants	Phyllanthaceae	*Phyllanthus maderaspatensis*			C		1/1
plants	land plants	Phyllanthaceae	*Phyllanthus reticulatus*			C		1/1
plants	land plants	Phyllanthaceae	*Poranthera microphylla*	small poranthera		C		1/1
plants	land plants	Picrodendraceae	*Dissiliaria indistincta*			C		1/1
plants	land plants	Picrodendraceae	*Petalostigma banksii*			C		1/1
plants	land plants	Pittosporaceae	*Bursaria incana*			C		1/1
plants	land plants	Plantaginaceae	*Bacopa floribunda*			C		2/2
plants	land plants	Plantaginaceae	*Mecardonia procumbens*		Y			1/1
plants	land plants	Plantaginaceae	*Scoparia dulcis*	scoparia	Y			2/2
plants	land plants	Poaceae	*Alloteropsis cimicina*			C		1/1
plants	land plants	Poaceae	*Alloteropsis semialata*	cockatoo grass		C		1/1
plants	land plants	Poaceae	*Aristida holathera var. holathera*			C		1/1
plants	land plants	Poaceae	*Arundinella setosa*			C		1/1
plants	land plants	Poaceae	*Bothriochloa bladhii subsp. bladhii*			C		2/2
plants	land plants	Poaceae	*Bothriochloa decipiens var. cloncurrensis*			C		1/1
plants	land plants	Poaceae	*Bothriochloa decipiens var. decipiens*			C		2/2
plants	land plants	Poaceae	*Cenchrus caliculatus*	hillside burrgrass		C		1/1
plants	land plants	Poaceae	*Cenchrus purpureus*		Y			1/1
plants	land plants	Poaceae	*Chionachne cyathopoda*	river grass		C		2/2
plants	land plants	Poaceae	*Chionachne hubbardiana*			C		1/1
plants	land plants	Poaceae	*Chloris inflata*	purpletop chloris	Y			1/1
plants	land plants	Poaceae	*Chloris pectinata*	comb chloris		C		1/1
plants	land plants	Poaceae	*Dactyloctenium radulans*	button grass		C		1/1
plants	land plants	Poaceae	*Dichanthium annulatum*	sheda grass	Y			1/1
plants	land plants	Poaceae	*Dichanthium fecundum*	curly bluegrass		C		3/3
plants	land plants	Poaceae	*Dichanthium sericeum subsp. polystachyum*			C		1/1
plants	land plants	Poaceae	*Dinebra ligulata*			C		1/1
plants	land plants	Poaceae	*Dinebra neesii*			C		2/2
plants	land plants	Poaceae	*Dinebra panicea var. brachiata*		Y			1/1
plants	land plants	Poaceae	*Echinochloa frumentacea*	Siberian millet	Y			1/1
plants	land plants	Poaceae	*Echinochloa turneriana*	channel millet		C		1/1
plants	land plants	Poaceae	*Elytrophorus spicatus*			C		1/1
plants	land plants	Poaceae	*Enneapogon lindleyanus*			C		1/1
plants	land plants	Poaceae	*Eragrostis elongata*			C		1/1
plants	land plants	Poaceae	*Eriochloa crebra*	spring grass		C		1/1
plants	land plants	Poaceae	*Eriochloa pseudoacrotricha*			C		1/1
plants	land plants	Poaceae	*Eulalia aurea*	silky browntop		C		1/1

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plants	land plants	Poaceae	*Heteropogon triticeus*	giant speargrass		C		1/1
plants	land plants	Poaceae	*Hymenachne amplexicaulis 'Olive'*		Y			2
plants	land plants	Poaceae	*Leersia hexandra*	swamp rice grass		C		1/1
plants	land plants	Poaceae	*Melinis repens*	red natal grass	Y			1/1
plants	land plants	Poaceae	*Oryza australiensis*			C		1/1
plants	land plants	Poaceae	*Oryza meridionalis*			C		1/1
plants	land plants	Poaceae	*Oryza sativa*		Y			1/1
plants	land plants	Poaceae	*Oxychloris scariosa*	winged chloris		C		1/1
plants	land plants	Poaceae	*Panicum decompositum var. decompositum*			C		1/1
plants	land plants	Poaceae	*Panicum laevinode*	pepper grass		C		1/1
plants	land plants	Poaceae	*Panicum trachyrhachis*			C		1/1
plants	land plants	Poaceae	*Panicum trichoides*			C		1/1
plants	land plants	Poaceae	*Rottboellia cochinchinensis*		Y			2/2
plants	land plants	Poaceae	*Setaria surgens*			C		1/1
plants	land plants	Poaceae	*Sorghum arundinaceum*	Rhodesian Sudan grass	Y			1/1
plants	land plants	Poaceae	*Sorghum bicolor*	forage sorghum	Y			5/5
plants	land plants	Poaceae	*Sorghum halepense*	Johnson grass	Y			2/2
plants	land plants	Poaceae	*Sorghum nitidum forma aristatum*			C		1/1
plants	land plants	Poaceae	*Sorghum x almum*		Y			2/2
plants	land plants	Poaceae	*Sporobolus actinocladus*	katoora grass		C		1/1
plants	land plants	Poaceae	*Sporobolus australasicus*			C		1/1
plants	land plants	Poaceae	*Sporobolus caroli*	fairy grass		C		1/1
plants	land plants	Poaceae	*Sporobolus jacquemontii*		Y			2/2
plants	land plants	Poaceae	*Themeda quadrivalvis*	grader grass	Y			4/1
plants	land plants	Poaceae	*Themeda triandra*	kangaroo grass		C		1/1
plants	land plants	Poaceae	*Urochloa subquadripara*		Y			1/1
plants	land plants	Poaceae	*Vacoparis laxiflorum*			C		1/1
plants	land plants	Polygonaceae	*Persicaria barbata*			C		1/1
plants	land plants	Polygonaceae	*Persicaria decipiens*	slender knotweed		C		1/1
plants	land plants	Polygonaceae	*Persicaria lapathifolia*	pale knotweed		C		2/2
plants	land plants	Polygonaceae	*Polygonum plebeium*	small knotweed		C		2/2
plants	land plants	Pontederiaceae	*Monochoria australasica*			C		1/1
plants	land plants	Pontederiaceae	*Monochoria cyanea*			C		1/1
plants	land plants	Proteaceae	*Grevillea glauca*	bushy's clothes peg		C		1/1
plants	land plants	Proteaceae	*Grevillea parallela*			C		1/1
plants	land plants	Proteaceae	*Grevillea striata*	beefwood		C		1/1
plants	land plants	Pteridaceae	*Adiantum atroviride*			C		1/1
plants	land plants	Pteridaceae	*Ceratopteris thalictroides*			C		1/1
plants	land plants	Pteridaceae	*Cheilanthes brownii*			C		2/2
plants	land plants	Pteridaceae	*Cheilanthes nudiuscula*			C		1/1
plants	land plants	Pteridaceae	*Cheilanthes pumilio*			C		1/1
plants	land plants	Pteridaceae	*Cheilanthes sieberi subsp. sieberi*			C		1/1
plants	land plants	Putranjivaceae	*Drypetes deplanchei*	grey boxwood		C		1/1
plants	land plants	Rhamnaceae	*Alphitonia excelsa*	soap tree		C		1/1
plants	land plants	Rhamnaceae	*Ziziphus mauritiana*	Indian jujube	Y			1/1
plants	land plants	Rubiaceae	*Dentella repens*	dentella		C		1/1

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plants	land plants	Rubiaceae	*Larsenaikia ochreata*			C		1/1
plants	land plants	Rubiaceae	*Nauclea orientalis*	Leichhardt tree		C		1/1
plants	land plants	Rubiaceae	*Pavetta australiensis var. australiensis*			C		1/1
plants	land plants	Rubiaceae	*Psychotria daphnoides var. daphnoides*			C		1/1
plants	land plants	Rubiaceae	*Scleromitrion galioides*			C		1/1
plants	land plants	Rubiaceae	*Spermacoce sp. (Lorim Point A.Morton AM1237)*			C		1/1
plants	land plants	Rubiaceae	*Timonius timon var. timon*			C		4/4
plants	land plants	Rutaceae	*Acronychia laevis*	glossy acronychia		C		1/1
plants	land plants	Salviniaceae	*Azolla pinnata*	ferny azolla		C		1/1
plants	land plants	Salviniaceae	*Azolla rubra*			C		1/1
plants	land plants	Salviniaceae	*Salvinia molesta*	salvinia	Y			1/1
plants	land plants	Santalaceae	*Exocarpos latifolius*			C		1/1
plants	land plants	Sapindaceae	*Alectryon connatus*	grey birds-eye		C		1/1
plants	land plants	Sapindaceae	*Arytera divaricata*	coogera		C		1/1
plants	land plants	Sapindaceae	*Atalaya multiflora*	broad-leaved whitewood		C		1/1
plants	land plants	Sapindaceae	*Cardiospermum halicacabum var. halicacabum*		Y			1/1
plants	land plants	Sapindaceae	*Cupaniopsis anacardioides*	tuckeroo		C		2/2
plants	land plants	Sapindaceae	*Harpullia hillii*			C		2/2
plants	land plants	Sapotaceae	*Amorphospermum antilogum*			C		1/1
plants	land plants	Sapotaceae	*Planchonella cotinifolia var. pubescens*			C		1/1
plants	land plants	Scrophulariaceae	*Myoporum acuminatum*	coastal boobialla		C		1/1
plants	land plants	Solanaceae	*Datura inoxia*		Y			1/1
plants	land plants	Solanaceae	*Nicotiana glauca*	tree tobacco	Y			1/1
plants	land plants	Solanaceae	*Solanum ellipticum*	potato bush		C		2/2
plants	land plants	Solanaceae	*Solanum sporadotrichum*			NT		1/1
plants	land plants	Solanaceae	*Solanum torvum*	devil's fig	Y			1/1
plants	land plants	Sparrmanniaceae	*Corchorus olitorius*	jute		C		1/1
plants	land plants	Sparrmanniaceae	*Grewia australis*			C		1/1
plants	land plants	Sparrmanniaceae	*Grewia graniticola*			C		1/1
plants	land plants	Sparrmanniaceae	*Grewia savannicola*			C		1/1
plants	land plants	Stackhousiaceae	*Stackhousia intermedia*			C		1/1
plants	land plants	Sterculiaceae	*Brachychiton*					1/1
plants	land plants	Stylidiaceae	*Stylidium rotundifolium*			C		1/1
plants	land plants	Thymelaeaceae	*Pimelea sericostachya*			C		1/1
plants	land plants	Turneraceae	*Turnera ulmifolia*		Y			3/3
plants	land plants	Vitaceae	*Cissus cardiophylla*			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 B

Criteria used to map breeding habitat for each conservation significant species

Species or Value	Mapping criteria
Black-throated finch (southern)	**Foraging habitat**: Remnant REs with a native grassy understorey within 3 km of permanent water including watercourses and stock dams. – 9.12.1 *Eucalyptus crebra* and/or *E. xanthoclada* and/or *E. drepanophylla* low open woodland on igneous rocks – 9.12.4 *Eucalyptus shirleyi* and/*or E. melanophloia* and/or *Corymbia peltata* and/or *Callitris intratropica* low open woodland on igneous rocks – 9.12.19 *Eucalyptus crebra* or *E. granitica +/- Corymbia citriodora subsp. citriodora +/- E. portuensis* mixed woodland on igneous hills – 9.12.22 *Eucalyptus drepanophylla, Corymbia clarksoniana* or *C. intermedia* and *C. dallachiana* woodland on steep rugged igneous ranges – 9.12.24 *Eucalyptus drepanophylla or E. crebra* and/or *E. xanthoclada* and *Corymbia peltata* woodland on igneous rocks – 11.3.4 *Eucalyptus tereticornis and/or Eucalyptus spp*. woodland on alluvial plains – 11.3.9 Eucal*yptus platyphylla, Corymbia spp.* woodland on alluvial plains – 11.3.10 *Eucalyptus brownii* woodland on alluvial plains – 11.3.12 *Melaleuca viridiflora, M. argentea +/- M. dealbata* woodland on alluvial plains – 11.3.13 *Grevillea striata* open woodland on coastal alluvial plains – 11.3.25 *Eucalyptus tereticornis or E. camaldulensis* woodland fringing drainage lines – 11.3.27 Freshwater wetlands – 11.3.30 *Eucalyptus crebra, Corymbia dallachiana* woodland on alluvial plains – 11.3.33 *Eremophila mitchellii* open woodland on alluvial plains – 11.3.35 *Eucalyptus platyphylla, Corymbia clarksoniana* woodland on alluvial plains – 11.11.1 *Eucalyptus crebra +/- Acacia rhodoxylon* woodland on old sedimentary rocks with varying degrees of metamorphism and folding – 11.11.15 *Eucalyptus crebra* woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics – 11.12.1 *Eucalyptus crebra* woodland on igneous rocks – 11.12.9 *Eucalyptus platyphylla* woodland on igneous rocks **Nesting habitat**: Remnant REs listed as essential habitat factors by DoR 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). – 9.12.1 *Eucalyptus crebra* and/or *E. xanthoclada* and/or *E. drepanophylla* low open woodland on igneous rocks – 9.12.4 *Eucalyptus shirleyi* and/*or E. melanophloia* and/or *Corymbia peltata* and/or *Callitris intratropica* low open woodland on igneous rocks – 9.12.19 *Eucalyptus crebra* or *E. granitica +/- Corymbia citriodora subsp. citriodora +/- E. portuensis* mixed woodland on igneous hills – 9.12.22 *Eucalyptus drepanophylla, Corymbia clarksoniana* or *C. intermedia* and *C. dallachiana* woodland on steep rugged igneous ranges – 9.12.24 *Eucalyptus drepanophylla or E. crebra* and/or *E. xanthoclada* and *Corymbia peltata* woodland on igneous rocks – 11.3.4 *Eucalyptus tereticornis and/or Eucalyptus spp*. woodland on alluvial plains – 11.3.9 Eucal*yptus platyphylla, Corymbia spp.* woodland on alluvial plains – 11.3.10 *Eucalyptus brownii* woodland on alluvial plains – 11.3.12 *Melaleuca viridiflora, M. argentea +/- M. dealbata* woodland on alluvial plains – 11.3.13 *Grevillea striata* open woodland on coastal alluvial plains – 11.3.25 *Eucalyptus tereticornis or E. camaldulensis* woodland fringing drainage lines – 11.3.27 Freshwater wetlands – 11.3.30 *Eucalyptus crebra, Corymbia dallachiana* woodland on alluvial plains – 11.3.33 *Eremophila mitchellii* open woodland on alluvial plains – 11.3.35 *Eucalyptus platyphylla, Corymbia clarksoniana* woodland on alluvial plains – 11.11.1 *Eucalyptus crebra +/- Acacia rhodoxylon* woodland on old sedimentary rocks with varying degrees of metamorphism and folding

Species or Value	Mapping criteria
	– 11.11.15 *Eucalyptus crebra* woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics – 11.12.1 *Eucalyptus crebra* woodland on igneous rocks – 11.12.9 *Eucalyptus platyphylla* woodland on igneous rocks
Squatter pigeon (southern)	**Foraging habitat: R**emnant and regrowth REs listed as essential habitat factor by DoR within 3 km of permanent or seasonal waterbodies (including watercourses, irrigation channels, stock dams and natural wetlands) on suitable soil (i.e. land zone 5 or 7 RE as included in the listing advice and also any land zone 10 and 11). – 11.11.1 *Eucalyptus crebra +/- Acacia rhodoxylon* woodland on old sedimentary rocks with varying degrees of metamorphism and folding – 11.11.15 *Eucalyptus crebra* woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics **Drinking and dispersal habitat: R**emnant or regrowth landzone 3 REs listed as an essential habitat by DoR or areas of non-remnant that occur within 100 m of foraging or breeding habitat. – 11.3.4 *Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains – 11.3.7 *Corymbia* spp. open woodland on alluvial plains – 11.3.9 *Eucalyptus platyphylla, Corymbia* spp. woodland on alluvial plains – 11.3.10 *Eucalyptus brownii* woodland on alluvial plains – 11.3.12 *Melaleuca viridiflora, M. argentea +/- M. dealbata* woodland on alluvial plains – 11.3.13 *Grevillea striata* open woodland on coastal alluvial plains – 11.3.25 *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines – 11.3.27 Freshwater wetlands **Breeding habitat:** Remnant or regrowth REs listed as an essential habitat factor by DoR and occurs on suitable soil (i.e. land zone 5 or 7 RE as included in the listing advice and also land zone 10 and 11) within 1 km of permanent or seasonal waterbodies (including watercourses, irrigation channels, stock dams and wetlands). – 11.11.1 *Eucalyptus crebra +/- Acacia rhodoxylon* woodland on old sedimentary rocks with varying degrees of metamorphism and folding – 11.11.15 *Eucalyptus crebra* woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics
Bare-rumped sheathtail bat	**Foraging habitat: R**emnant and regrowth REs that are listed as essential habitat factors by DoR – 11.3.4 *Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains – 11.3.9 *Eucalyptus platyphylla, Corymbia* spp. woodland on alluvial plains – 11.3.10 *Eucalyptus brownii* woodland on alluvial plains – 11.3.12 *Melaleuca viridiflora, M. argentea +/- M. dealbata* woodland on alluvial plains – 11.3.13 *Grevillea striata* open woodland on coastal alluvial plains – 11.3.25 *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines – 11.3.27 Freshwater wetlands – 11.3.30 *Eucalyptus crebra, Corymbia dallachiana* woodland on alluvial plains – 11.3.33 *Eremophila mitchellii* open woodland on alluvial plains – 11.3.35 *Eucalyptus platyphylla, Corymbia clarksoniana* woodland on alluvial plains – 11.11.1 *Eucalyptus crebra +/- Acacia rhodoxylon* woodland on old sedimentary rocks with varying degrees of metamorphism and folding – 11.11.15 *Eucalyptus crebra* woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics – 11.12.1 *Eucalyptus crebra* woodland on igneous rocks – 11.12.9 *Eucalyptus platyphylla* woodland on igneous rocks **Roosting places and habitat:** Moderate and large hollows in *E. platyphylla* were mapped as potential roost trees and small hollow-bearing *E. platyphylla* were mapped as future potential roost trees. All areas within 200 m of moderate and large roost trees (*E. platyphylla* only) were mapped as potential roosting habitat.

Species or Value	Mapping criteria
Eastern osprey	**Foraging habitat:** Area of Burdekin River and riparian fringe along the Burdekin river, no further back than the top bank and no side tributaries **Roosting habitat:** Area of riparian fringe along the Burdekin river, no further back than the top bank and no side tributaries
Short-beaked echidna	**Breeding habitat:** Remnant vegetation mapping, verified at 40 locations across the Project area. The species has the potential to breed in almost any remnant habitat area, where there is suitable ground-level complexity.
Colonial breeding microbats	**Roosting places:** All small, moderate and large *Eucalyptus* and *Corymbia* hollow-bearing trees were considered potential roosting sites for colonial breeding microbats.

Appendix C

Likelihood of occurrence

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
Birds					
Curlew sandpiper *Calidris ferruginea*	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).	**May occur** This species has not been historically recorded from the desktop search extent. Limited suitable habitat was observed within the Project area.
Red goshawk *Erythrotriorchis radiatus*	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).	**May occur** Suitable habitat is present within the Project area, but no known records are present within the desktop search extent. The closest record is approximately 83 km north-west of the Project area (ALA 2021).
Grey falcon *Falco hypoleucos*	V	V	PMST	The grey falcon occurs in arid and semi-arid Australia, where rainfall is less than 500 mm annually. The species has been observed hunting in treeless areas, tussock grasslands and open woodland. The species appears to be absent from areas east of the Great Dividing Range in Queensland (TSSC 2020).	**May occur** Limited suitable habitat is present within the Project area. No known records are present within the desktop search extent. The closest record is approximately 81 km north-west of the Project area (ALA 2021).
White-throated needletail *Hirundapus caudacutus*	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** The species has been historically recorded in the desktop search extent, approximately 4 km east of the Project area (ALA 2021). The species has potential to forage aerially across the Project area.
Star finch *Neochmia ruficauda ruficauda*	E	E	PMST	The star finch occurs in central Queensland including the Burdekin natural resource management region. The species occurs in damp grasslands, sedgelands or grassy woodlands near permanent water (DAWE 2021).	**May occur** The species has not been historically recorded in the desktop search extent. The closest records are approximately 81 km north-west and east. Limited suitable habitat was present in the north of the Project area.
Eastern curlew *Numenius madagascariensis*	CE, Mig	E	PMST	The eastern curlew primarily occur coastally and are rarely recorded inland. During the	**Unlikely to occur**

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
				non-breeding season in Australia, the species is commonly associated with sheltered coasts, mudflats and sandflats (DoE 2015a).	The species has not been historically recorded in the desktop search extent. The closest record is approximately 33 km west of the Project area. No suitable habitat was observed across the Project.
Black-throated finch (southern) *Poephila cincta cincta*	E	E	PMST, WO	The black-throated finch 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**
Australian painted snipe *Rostratula australis*	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).	**May occur** The species has not been historically recorded within the desktop search extent. Limited suitable habitat was observed in the Project area.
Buff-breasted button-quail *Turnix olivii*	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 amongst *Melaleuca, Acacia, Alphitonia* or *Tristania* in rainforest or open *Eucalyptus* woodland (DAWE 2021).	**Unlikely to occur** The species has not been historically recorded within the desktop search extent. No suitable habitat was observed in the Project area.
Masked owl *Tyto novaehollandiae kimberli*	V	V	PMST	The masked owl 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. No suitable habitat was observed in the Project area.
Squatter pigeon (southern) *Geophaps scripta scripta*	V	V	WO	The species occurs in open-forests to sparse, open-woodlands and scrub that are dominated by *Eucalyptus*, *Corymbia* and *Acacia* or *Callitris* species, remnant and regrowth within 3 km of water (DAWE 2021).	**Confirmed present**

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
Fork-tailed swift *Apus pacificus*	Mig	SL	PMST, WO	The species is almost exclusively aerial. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. They sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines (DAWE 2021).	**Likely to occur** The species has been historically recorded within the desktop search extent. The species has potential to forage aerially across the Project area.
Oriental cuckoo *Cuculus optatus*	Mig	SL	PMST	The species inhabits coastal regions across northern and eastern Australia, as well as offshore islands (DAWE 2020). Species utilises a range of vegetated habitats, including monsoon rainforests, wet sclerophyll forests, open woodlands and along the edges of forests (DAWE 2021).	**May occur** The species has not been historically recorded within the desktop search extent, however the species has been recorded approximately 4 km east of the Project area on Atlas of Living Australia. Suitable habitat was observed in the Project area.
Black-faced monarch *Monarcha melanopsis*	Mig	SL	PMST, WO	Species inhabits rainforest ecosystems that include semi-deciduous vine thickets, complex notophyll vine-forests, tropical rainforests, subtropical rainforests, mesophyll thicket/shrubland, warm and cool temperate rainforest, and dry rainforest (DAWE 2021).	**May occur** The species has been historically recorded within the desktop search extent. Marginally suitable habitat was observed in the Project area.
Spectacled monarch *Monarcha trivirgatus*	Mig	SL	PMST, WO	The species occurs in coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, New South Wales (BirdLife 2021a). Dense vegetation, mainly in rainforest but also in moist forest or wet sclerophyll and occasionally in other dense vegetation such as mangroves, drier forest and woodlands (DoE 2015b).	**May occur** The species has been historically recorded within the desktop search extent. Marginally suitable habitat was observed in the Project area.
Yellow wagtail	Mig	SL	PMST	The species is found in highly variable habitats, but typically found in open grassy	**May occur**

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
Motacilla flava				flats near water. Habitats include, open areas of low vegetation such as grasslands, pastures, sport fields and damp open areas (DAWE 2021).	The species has not been historically recorded within the desktop search extent. Suitable habitat was observed in the Project area.
Satin flycatcher *Myiagra cyanoleuca*	Mig	SL	PMST, WO	The species occurs in heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, typically near wetlands and watercourses (DAWE 2021).	**May occur** The species has been historically recorded within the desktop search extent. Limited habitat was observed in the Project area.
Rufous fantail *Rhipidura rufifrons*	Mig	SL	PMST, WO	Species inhabits wet sclerophyll forests, often in gullies dominated by eucalypts and usually within a dense shrubby understorey that often includes ferns (DAWE 2021).	**May to occur** The species has been historically recorded within the desktop search extent. Limited habitat was observed in the Project area.
Common sandpiper *Actitis hypoleucos*	Mig	SL	PMST	In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. The sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines (DAWE 2021).	**Unlikely to occur** The species has not been historically recorded within the desktop search extent. No suitable habitat was observed in the Project area.
Sharp-tailed sandpiper *Calidris acuminata*	Mig	SL	PMST	Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage (Cramp 1985; Higgins & Davies 1996). In Queensland, they are recorded in most regions, being widespread along much of the coast and are very sparsely scattered inland (DAWE 2021).	**Unlikely to occur** The species has not been historically recorded within the desktop search extent. No suitable habitat was observed in the Project area.
Pectoral sandpiper	Mig	SL	PMST	Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries,	**Unlikely to occur**

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
Calidris melanotos				bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. The species prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation (DAWE 2021).	The species has not been historically recorded within the desktop search extent. No suitable habitat was observed in the Project area.
Latham's snipe *Gallinago hardwickii*	Mig	SL	PMST, WO	The species inhabits permanent and ephemeral freshwater wetlands with low, dense vegetation (DAWE 2021). Species sometimes occurs in habitats that have saline or brackish water, such as saltmarshes, mangrove creeks, around bays and beaches (DAWE 2021).	**Unlikely to occur** The species has been historically recorded within the desktop search extent. No suitable habitat was observed in the Project area.
Osprey *Pandion haliaetus*	Mig	SL	PMST, WO	The species occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands (DAWE 2021). They are mostly found in coastal areas but occasionally travel inland along major rivers (DAWE 2021). They require extensive areas of open fresh, brackish or saline water for foraging (DAWE 2021).	**Likely to occur** The species has been historically recorded within the desktop search extent. Suitable habitat was observed in the Project area
Common greenshank *Tringa nebularia*	Mig	SL	PMST	The species is widespread in the Gulf country and from Cooktown to Cape York Peninsula, and is scattered elsewhere in Queensland. The species occurs in inland wetlands and sheltered coastal habitats typically with mudflats, saltmarsh, mangroves. The species is also associated with river estuaries, swamps, lakes, dams billabongs, rivers, creeks and inundated floodplains (DAWE 2021).	**May occur** The species has not been historically recorded within the desktop search extent. Limited suitable habitat was observed in the Project area.
Glossy ibis *Plegadis falcinellus*	Mig	SL	WO	The glossy ibis frequents much of the Australian mainland, but is most numerous in the north (Birdlife 2021b).The species occurs in freshwater marshes at the edge of lakes and rivers, lagoons and swamps. They occasionally occur coastally in estuaries, saltmarshes and lagoons (DAWE 2021).	**May occur** The species has been historically recorded within the desktop search extent. Marginal suitable habitat was observed in the Project area

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
Gull-billed tern *Gelochelidon nilotica*	Mig	SL	WO	The gull-billed tern occurs on all continents except Antarctica. The species inhabits shallow wetlands, including coastal or inland lakes, swamps and lagoons, as well as sheltered bays and estuaries (Birdlife 2021c).	**May occur** The species has been historically recorded within the desktop search extent. Marginal suitable habitat was observed in the Project area
Caspian tern *Hydroprogne caspia*	Mig	SL	WO	In Queensland, the Caspian tern is widespread in coastal regions in the Gulf of Carpentaria and along the eastern coast. Historical records of the species is scattered across central Queensland. The species occurs in sheltered coastal embayments and those with sandy or muddy margins. They occur on near-coastal or inland terrestrial wetlands including rivers, lakes, and creeks (DAWE 2021).	**May occur** The species has been historically recorded within the desktop search extent. Marginal suitable habitat was observed in the Project area
Mammals					
Northern quoll *Dasyurus hallucatus*	E	LC	PMST, WO	The northern quoll occurs north to Weipa, south to Maleny and west to Carnarvon Range 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** The species has been historically recorded within the desktop search extent. No suitable habitat was observed in the Project area.
Semon's leaf-nosed bat *Hipposideros semoni*	V	E	PMST	The Semon's leaf-nosed bat occurs in its northern distribution from Cape York to south of Cooktown, 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, (*Rhinolophus philippinensis)* (DAWE 2021).	**Unlikely to occur** 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).
Ghost bat *Macroderma gigas*	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	**May occur** The species has not been historically recorded within the desktop search extent. Suitable

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
				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).	foraging habitat was observed in the Project area.
Large-eared horseshoe bat *Rhinolophus robertsi*	V		PMST	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 & Kutt 2008 cited in TSSC 2016). The species is found in lowland rainforest, forest-lined creeks within open eucalypt forest, *Melaleuca* forest with rainforest understorey, open savannah woodland and tall riparian woodland (Churchill 2009; Pavey & Kutt 2008 cited in DAWE 2021a). 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 2021a).	**May occur** The species has not been historically recorded within the desktop search extent. Potentially suitable roosting habitat was observed in the Project area. The nearest historical record is 80 km north of Townsville in the Paluma mine.
Koala *Phascolarctos cinereus*	V	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 *Eucalyptus* species, and are also found in vegetation communities dominated by Melaleuca or Casuarina species (DAWE 2021).	**Likely to occur** The species has been historically recorded in the Project area. Essential habitat for the koala is mapped ~2 km west of the Project alignment. Suitable habitat was observed during the field survey.
Bare-rumped sheathtail bat *Saccolaimus saccolaimus nudicluniatus*	V	E	PMST	In Queensland, the species is known to occur from Ayr to the Iron Ranges (TSSC 2016). 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 *Eucalyptus* or *Corymbia* species intermingled with coastal lowland rainforest The species has been recorded using deep hollows for roosting and breeding (TSSC 2016).	**Likely to occur** The species has not been historically recorded In the Project area. Suitable habitat was observed during the field survey.

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
Water mouse *Xeromys myoides*	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, sedgelands, clay pans, heathlands and freshwater wetlands (TSSC 2021).	**Unlikely to occur** The species has not been historically recorded In the Project area. No suitable habitat was observed during the field survey.
Tachyglossus aculeatus Short-beaked echidna	-	SL		Thrive in a variety of habitats including open woodlands, savannah, agricultural areas, semi-arid, and arid regions. Both coastal and highland areas within a range of ecosystems in Australia from mild coastal regions to above snowline. Short-beaked echidnas have a broad altitudinal range from sea level to at least 1,675 meters. (Aplin, et al., 2008; Nicol and Anderson, 2007).	**May occur** The species has not been historically recorded in the Project area. Suitable habitat was observed during the field survey.
Reptiles					
Ornamental snake *Denisonia maculata*	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 *Acacia harpophylla, Acacia cambagei, Acacia argyrodendron* or *Eucalyptus coolabah* (DAWE 2021).	**Unlikely to occur** The species has not been historically recorded within the desktop search extent. No suitable habitat was observed in the Project area.
Yakka skink *Egernia rugosa*	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).	**May occur** The species has not been historically recorded within the desktop search extent. Marginally suitable habitat was observed in the Project area.
Mount Cooper striped skink *Lerista vittata*	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 (*E. crebra, E.*	**May occur** The species has not been historically recorded within the desktop search extent. Marginally

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
				melanophloia) and bloodwood (*C. clarksoniana, C. intermedia*) 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).	suitable habitat was observed in the Project area.
Saltwater crocodile *Crocodylus porosus*	Mig	V	PMST	In Queensland, the saltwater crocodile occurs from Gladstone through to Cape York, including in the Burdekin River catchment. In Queensland, the species is usually restricted to coastal waterways and floodplain wetlands. Populations may also be found hundreds of kilometres upstream (DAWE 2021).	**May occur** The species has not been historically recorded within the desktop search extent. No suitable habitat was observed in the Project area.
Plants					
Miniature moss-orchid *Bulbophyllum globuliforme*	V	NT	PMST	The miniature moss-orchid is a host-specific species, and only grows on the Hoop Pine (*Araucaria cunninghamii*), where it colonises the upper branches of mature trees (Jones 2006 cited DAWE 2021a). The Hoop Pine occurs in upland (usually 100-900 m above sea level) (Jones 2006 cited DAWE 2021a) subtropical rainforest communities that have a discontinuous distribution along the Australian east coast (NSW OEH 2012o, cited DAWE 2021a).	**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.
Bluegrass *Dichanthium setosum*	V	LC	PMST	*Dichanthium setosum* has been reported from inland NSW and Queensland. Recorded on heavy basaltic black soils and red-brown loams with clay subsoil. *Dichanthium setosum* is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture (DAWE 2021).	**May occur** The species has not been historically recorded within the desktop search extent. Suitable habitat was observed in the Project area.
Black ironbox	V	LC	PMST, WO	*Eucalyptus raveretiana* is found in the region between Ayr in the north to Rockhampton in	**Confirmed present adjacent to Project area**

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
Eucalyptus raveretiana				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 *M. leucadendra*, *M.a fluviatilis*, *E. tereticornis* and *C. tessellaris* (DAWE, 2021).	
Marsdenia brevifolia	V	V	PMST	*Marsdenia brevifolia* 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 *E. granitica*, *C. leichhardtii* and *E. acmenoides* (DAWE 2021).	**Unlikely to occur** The species has not been historically recorded within the desktop search extent. No suitable habitat was observed in the Project area.
Omphalea celata	V	V	PMST	Omph*alea celata* 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. No suitable habitat was observed in the Project area.
Tephrosia leveillei	V	LC	PMST	*Tephrosia leveillei* is known to occur in six locations in Queensland, including near Ravenswood. The species has been recorded in *Eucalyptus* and *Corymbia* woodland and tall open forest (DAWE 2021).	**May occur** The species has not been historically recorded within the desktop search extent. Suitable habitat was observed in the Project area.
Solanum sporadotrichum		NT	WO	*Solanum sporadotrichum* is an erect rhizomatous, perennial shrub growing 1.5 to 4 m high. The species is endemic to Queensland and occurs west of Townsville to Mount Wickham. The species grows in association with Semi-evergreen vine thicket TEC, notophyll rainforest, littoral rainforest, or in eucalypt open forest or woodland. Soils are moderately to very fertile (DES 2021).	**May occur** The species has been historically recorded within the desktop search extent. Marginally habitat was observed in the Project area.
Fish					

Species name	EPBC Act status	NC Act status	Source	Habitat requirements	Likelihood of occurrence
Freshwater sawfish *Pristis pristis*	V, Mig	-	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).	**May occur** The species has not been historically recorded within the desktop search extent. Suitable habitat was only observed adjacent to the Project area.

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