



Atlas Stage 3 Gas Project

Terrestrial and Aquatic Ecology Assessment Report

22 March 2024

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22 March 2024

Atlas Stage 3 Gas Project

Terrestrial and Aquatic Ecology Assessment Report



Amy Blacker
Ecologist



Matt Davis
Principal Ecologist



John Herron
Partner

Environmental Resources Management Australia Pty Ltd
Level 14 207 Kent Street
Sydney NSW 2000

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ACRONYMS AND ABBREVIATIONS

Name	Description
ALA	Atlas of Living Australia
APLNG	Australia Pacific LNG Pty Limited
ATP	Authority to Prospect
ATW	Access to Work
AU	Assessment Unit
Biosecurity Act	<i>Biosecurity Act 2014</i>
CE	Critically Endangered
DAF	Department of Agriculture and Fisheries
DAMS	Development Assessment Mapping System
DES	Department of Environment and Science
DEHP	Department of Environment and Heritage Protection
DEHWA	Department of Environment, Water, Heritage and the Arts
DIWA	Directory of Important Wetlands in Australia
DCCEEW	Department of Climate Change, Energy the Environment and Water
DoEE	Department of Environment and Energy
DoR	Department of Resources
DNRM	Department of Natural Resources and Mining
EA	Environmental Authority
EIS	Environmental Impact Statement
E/EN	Endangered
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESA	Environmentally Sensitive Areas
Fisheries Act	<i>Fisheries Act 1994</i>
GDE	Groundwater Dependent Ecosystem
HDD	Horizontal Directional Drill
HES	High Ecological Significance
HEV	High Ecological Value
LC	Least Concern
MSES	Matter of State Environmental Significance
NC Act	<i>Nature Conservation Act 1992</i>
NC	No Concern
OC	Of Concern
PA	<i>Planning Act 2016</i>
PL	Petroleum Lease
PMST	Protected Matters Search Tool
PPE	Personal Protective Equipment
PR	Planning Regulation 2017
RE	Regional Ecosystem
RPZ	Riparian Protection Zone

ACRONYMS AND ABBREVIATIONS

SDAP	State Development Assessment Provisions
SEVT	Semi-Evergreen Vine Thicket
SIG 1.1	Significant Impact Guidelines 1.1 - Matters of National Environmental Significance
SLC	Special Least Concern
SPA	<i>Sustainable Planning Act 2009</i>
SPRAT	Species Profile and Threats Database
SRI	Significant Residual Impact
SRI Guideline	<i>Queensland Environmental Offsets Policy – Significant Residual Impact Guideline 2014</i>
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
V/VU	Vulnerable
VM Act	<i>Vegetative Management Act 1999</i>
Water Act	<i>Water Act 2000</i>
WO	Wildlife Online
WoNS	Weeds of National Significance

EXECUTIVE SUMMARY

Environmental Resources Management Australia Pty Ltd (ERM) has been engaged by Senex Energy Pty Ltd (Senex) to document the terrestrial and aquatic ecological values to support the development of approvals documentation for the Atlas Stage 3 Gas Project (the Project, and the 'proposed action') in the Surat Basin in southern-central Queensland. This Ecological Assessment Report (EAR) will be used to support the preparation and submission of approval documentation.

The Project will involve up to 151 new gas wells and associated well site facilities; gas and water gathering systems for the producing wells; access tracks for operational purposes; brine and produced water storages; borrow pits; and ancillary supporting facilities. The Project Area is based upon Petroleum Lease (PL) 445, the northern part of PL 209, Authority to Prospect (ATP) 2059 (Petroleum Lease Application 1127) and parts of PL 1037.

The term 'Project Area' in this report is the Field Development Area (FDA) discussed in the Preliminary Documentation summary report. The disturbance footprint, where direct impacts will occur will be up to 530 ha.

The gas field will be progressively developed over a period of approximately 5 – 10 years. The average maximum production rate of the Project is expected to be approximately 60 terajoules per day, although variable potential production rates may be higher at times. Field development is planned to move generally from the north towards the south over the life of the Project.

This EAR documents the assessment of terrestrial and aquatic ecological values within the Project Area with a focus on the

impacts to MNES and matters of state environmental significance (MSES). The EAR documents potential risks to biodiversity values and approaches to minimise the risk through avoidance, mitigation, and management measures.

Both terrestrial and aquatic ecological values of the Project Area were assessed using information obtained from desktop sources and field surveys conducted by suitably qualified ecologists in accordance with relevant government guidelines. Desktop sources included available mapping products and species database records. The outcomes of the desktop assessment and field surveys were analysed to inform a likelihood of occurrence assessment relating to listed threatened species and ecological communities.

The Project Area is entirely within the Brigalow Belt Bioregion and occurs across a boundary between the Taroom Downs subregion in the north and Southern Downs subregion in the south. The northern components of the Project Area feature watercourses on floodplains, surrounded by undulating hills. Towards the southern areas of the Project Area the landscape features steeper slopes and outcropping towards the south-eastern boundary. Several watercourses (stream orders 2 - 5) intersect the Project Area, with named watercourses including Woleebbee Creek, Conloi Creek, Hellhole Creek and Wandoan Creek. Terrestrial and aquatic habitats demonstrated varying levels of degradation, including cattle grazing, clearing, erosion and invasive species and most aquatic habitats surveyed are of limited ecological value. Across all sample sites, aquatic macrophyte diversity was poor with the highest diversity recorded in a billabong adjacent to Wandoan Creek.

The main land use within the Project Area is grazing of stock for beef production. Some flood plain areas have been developed for centre-pivot agriculture. Most of the Project Area is cleared with 9.5% mapped as remnant vegetation and as such 90.5% of the Project is classified cleared areas with non-native pastures.

Potential impacts to MNES and MSES were assessed against the following guidelines:

- MSES: Queensland Environmental Offsets Policy – Significant Residual Impact Guideline (Department of Environment [DoE], 2014) (SRI Guideline); and

- MNES: Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (Department of Environment, Heritage, Water, and the Arts [DEHWA], 2013) (SIG 1.1).

MNES Ecological Findings

For MNES protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), two listed threatened ecological communities (TEC), six listed threatened species (five fauna, one flora) are known or likely to occur within the Project Area, 16 species (14 fauna, two flora) are considered potentially occurring, one migratory (but not threatened) species that is likely to occur and six migratory species are potentially occurring, due to direct field observations and habitat assessments within the Project Area or recent historical records.

The TECs are Brigalow (*Acacia harpophylla* dominant and co-dominant) and Poplar Box Grassy Woodland on Alluvial Plains.

The listed threatened species known or likely to occur in the Project Area include Ooline (*Cadellia pentastylis*), Koala (*Phascolarctos cinereus*) (combined populations of Qld, NSW, and the ACT), Greater Glider (central and southern) (*Petauroides volans*), South-eastern Glossy Black-cockatoo (*Calyptorhynchus lathami lathami*), Dulacca Woodland Snail (*Adclarkia dulacca*) and White-throated Needletail (*Hirundapus caudacutus*).

The listed threatened species that are considered potentially occurring in the Project Area include included Belson's Panic (*Homopholis belsonii*), and Slender Tylophora (*Vincetoxicum forsteri*), Australian Painted Snipe (*Rostratula australis*), Brown Treecreeper (south-eastern) (*Climacteris picumnus victoriae*), Collared Delma (*Delma torquata*), Corben's Long-eared Bat (*Nyctophilus corbeni*), Diamond Firetail (*Stagonopleura guttata*), Dunmall's Snake (*Furina dunmalli*), Five-clawed Worm-skink (*Anomalopus mackayi*), Grey Snake (*Hemiaspis damelii*), Northern Quoll (*Dasyurus hallucatus*), Painted Honeyeater (*Grantiella picta*), Southern Whiteface (*Aphelocephala leucopsis*), Southern Squatter Pigeon (*Geophaps scripta scripta*), Yakka Skink (*Egernia rugosa*), and Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*).

The listed migratory species included the White-throated Needletail (*Hirundapus caudacutus*) and Fork-tailed Swift (*Apus pacificus*).

Additionally, the Request for Information (RFI) listed several species to be included in the assessments; most of these species are considered unlikely to occur. These species include Bluegrass (*Dichanthium setosum*), *Calytrix guruhmundensis*, Curly-bark Wattle (*Acacia curranii*), and Brigalow Woodland Snail (*Adclarkia cameroni*).

MSES Ecological Findings

For MSES protected under the *Nature Conservation Act QLD 1992* (NC Act), the Project Area was found to contain Regulated Vegetation as well as NC Act listed threatened species protected wildlife habitat as follows:

- Regulated Vegetation that is Category B - Endangered and Of Concern Regional Ecosystems [RE];
- Regulated Vegetation that is Category C – high value regrowth;
- Regulated Vegetation that is Category R – Great Barrier Reef riverine vegetation;
- Regulated Vegetation that is Essential Habitat;
- Regulated Vegetation that is within the defined disturbance of a watercourse;
- Protected wildlife habitat for vulnerable, endangered, or special least concern listed flora and fauna species which included:
 - Dulacca Woodland Snail (*Adclarkia dulacca*);
 - Fork-tailed Swift (*Apus pacificus*);

- Golden-tailed Gecko (*Strophurus taenicauda*);
- Greater Glider (southern and central) (*Petauroides volans*);
- Koala (*Phascolarctos cinereus*);
- Ooline (*Cadellia pentastylis*);
- Pale Imperial Hairstreak (*Jalmenus eubulus*);
- Short-beaked Echidna (*Tachyglossus aculeatus*);
- South-eastern Glossy Black-cockatoo (*Calyptorhynchus lathami lathami*);
- White-throated Needletail (*Hirundapus caudacutus*).

Potential Impacts

Potential impacts, though proportionally small in relation to the Project Area, considered as part of the Project include the following:

- Clearing of native vegetation and habitat for threatened and migratory species and threatened ecological communities;
- Introduction and/or spread of weed species;
- Disturbance or displacement to fauna species from foraging or roosting habitat, or breeding places;
- Degradation of threatened species habitats or threatened ecological communities as a result of dust, erosion or accidental release of hazardous materials;
- Habitat fragmentation;
- Inhibiting the ability of ecological communities or species to adapt and survive predicted climate change effects (for example through impeding migration pathways or inhibiting access to refuge areas); and
- Fauna injury during construction activities and movement of machinery/vehicles.

KCB (2024) have determined that no impacts to Groundwater Dependent Ecosystems are likely as a result of the Project.

Mitigation and Management Measures

Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, except for Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). Prior to undertaking activities that have potential to result in significant disturbance to land, an ecological survey to confirm on-ground habitat values will be undertaken by a suitably qualified person.

Further mitigation measures that will be implemented to mitigate impacts resulting from the Project include:

- Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001];
- Atlas Stage 3 Gas Project Significant Species Management Plan;
- Implementing the Senex Queensland Fauna and Stock Management Procedure [SENEX-CORP-EN-PRC-021];
- Weed and pest management measures through the implementation of the Senex Biosecurity Management Plan Queensland Operations [SENEX-QLDS-EN-PLN-001] and Senex Queensland Weed Hygiene Procedure [SENEX-QLD-EN-PRC-023];

- Environmental Management Plan Atlas Stage 3 Gas Project [SENEX-ATLS-EN-PLN-015];
- Rehabilitation Plan Atlas Stage 3 Gas Project [SENEX-ATLS-EN-PLN-018];
- ATP 2059 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-013];
- PL 445 and PL 209 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-014];
- Atlas Stage 3 Water Monitoring and Management Plan [SENEX-ATLS-EN-PLN-017];
- Delineation of 'no-go' areas clearly indicated for avoidance;
- Restricting access tracks to only low-level traffic with restricted speed;
- Erosion and sediment control measures;
- Dust management; and
- Appropriate storage and handling of fuel, oil and chemicals and appropriate spill response equipment.

Significant Impact Assessment Outcomes

The significant impact assessments undertaken in accordance with SIG 1.1 assessed the potential impacts as well as the implemented mitigation and management measures, to determine whether the Project would result in any significant residual impacts to likely or known MNES.

MNES Significant Impact Assessment Outcomes:

Significant impact assessment outcomes for MNES TECs in the Project Area are as follows:

- Brigalow (*Acacia harpophylla* dominant and co-dominant) is present as 17 patches totalling 95.8 ha (<1%) of the Project Area, all of which will be avoided by the Project; and
- Poplar Box Grassy Woodland on Alluvial Plains is present as 10 patches totalling 32.3 ha (<0.4%) of the Project Area, all of which will be avoided by the Project.

The significant impact assessment outcomes for listed threatened and/or migratory MNES that have been assessed as known or likely to occur:

- Dulacca Woodland Snail (*Adclarkia dulacca*) totalling 666.3 ha of habitat within the Project Area, will be avoided through careful design of the Project such that any direct disturbance to habitat for the species will be avoided by the Project;
- South-eastern Glossy Black-cockatoo (*Calyptorhynchus lathami lathami*) totalling 1,003 ha of habitat within the Project Area, will be avoided through careful design of the Project such that any direct disturbance to habitat for the species will be avoided by the Project;
- Greater Glider (southern and central) (*Petauroides volans*) totalling 528 ha of habitat within the Project Area, will be avoided through careful design of the Project such that any direct disturbance to habitat for the species will be avoided by the Project;
- Koala (*Phascolarctos cinereus*) totalling 698.5 ha of foraging and breeding habitat within the Project Area, will be avoided through careful design of the Project such that no foraging and breeding habitat for the species will be cleared. A total of 9,072.6 ha of Koala dispersal habitat occurs within the Project Area and impact upon this habitat will be minimised through careful design of the Project such that any direct disturbance to habitat for the species will not exceed 530 ha and the ability for Koalas to disperse across the landscape will not be impeded; and
- Habitat for Ooline (*Cadellia pentastylis*) is made up of 118.7 ha of habitat consisting of relatively narrow remnant and regrowth patches in the far south of the Project Area, all of which will be avoided by the Project. Senex has committed to avoiding all individual plants (should any be found to occur within the proposed disturbance footprints). Additional targeted flora surveys will be conducted within and immediately surrounding (e.g., 30 m buffer) the disturbance footprint

during the pre-clearance surveys to ensure that if any individual plants are present, they will be avoided. The Project will also be preferentially located within previously cleared areas.

It is noted that the White-throated Needletail (*Hirundapus caudacutus*) is known to occur within the Project Area, however it is likely only to be an aerial flyover visitor due to the lack of suitable roosting areas in the Project Area. Therefore, no habitat will be directly or indirectly impacted for this species. Further, the White-throated Needletail along with the Fork-tailed Swift were identified as listed migratory species known and likely to occur respectively. As with the White-throated Needletail, the Fork-tailed Swift was concluded to be an aerial flyover visitor only and so both migratory species were concluded to not be at risk of a significant impact from the Project.

MSES Significant Impact Assessment Outcomes:

Based on the assessment conducted in this EAR, there was concluded to be no Significant Residual Impact (SRI) to MSES, based on an assessment against the SRI Guidelines, for the following reasons;

- Regulated Vegetation that is Category B – Regulated Vegetation that is Category B is present as 10 patches totalling 334.8 ha (<3.5%) of the Project Area, all of which will be avoided. Therefore no SRI will result;
- Regulated Vegetation that is Category C – Regulated Vegetation that is Category C is present as 4 patches (potentially of RE 11.9.5) totalling 38.4 ha (<0.4%) of the Project Area, all of which will be avoided. No SRI will result;
- Regulated Vegetation that is Category R – Regulated Vegetation that is Category R totals 595.4 ha (<6.2%) of the Project Area, all of which will be avoided. No SRI will result;
- Regulated Vegetation that is Essential Habitat – Regulated Vegetation that is Essential Habitat totals 96.3 ha (<1%) of the Project Area, all of which will be avoided. No SRI will result;
- Regulated Vegetation that is within the defined disturbance of a watercourse – all of which will be avoided. Thus, no SRI will result;
- Protected wildlife habitat for listed fauna – for species known or likely to occur, there will be no SRI because no potential habitat for each fauna species will be cleared, with the exception of Koala dispersal habitat and Short-beaked Echidna habitat. This represents a relatively small proportion of the total habitat available for each in the Project Area:
 - Dulacca Woodland Snail (*Adclarkia dulacca*) (666.3 ha habitat – 0 ha of total habitat will be disturbed);
 - Greater Glider (*Petauroides volans*) (528 ha habitat – 0 ha of total habitat will be disturbed);
 - Koala (*Phascolarctos cinereus*) (698.5 ha preferred breeding and foraging habitat and 9,072.6 ha general dispersal habitat – 0 ha of total preferred foraging and breeding habitat and up to 530 ha or 5.8% of total general dispersal habitat will be disturbed);
 - Pale Imperial Hairstreak (*Jalmenus eubulus*) (180.2 ha habitat – 0 ha of total habitat will be disturbed);
 - Short-beaked Echidna (*Tachyglossus aculeatus*) (9,772 ha habitat – up to 530 ha or 5.4% of total habitat will be disturbed);
 - South-eastern Glossy Black-cockatoo (*Calyptorhynchus lathami lathami*) (1,003 ha habitat – 0 ha of total habitat will be disturbed); and
 - White-throated Needletail (*Hirundapus caudacutus*) (no habitat mapped as aerial flyover visitor only to the Project Area).

Protected wildlife habitat for listed flora – for the only threatened flora species known or likely to occur in the Project Area, Ooline, there will be no SRI because there will be no direct disturbance within the 118.7 ha of mapped habitat. Additional targeted flora surveys will be conducted within and immediate

surrounding (e.g., 30 m buffer) the disturbance footprint as part of the preclearance surveys as part of the application of the Project's mitigation measures to ensure that if any individual Ooline plants are present they can be avoided. Additionally, as stated, the Project will be completely located within previously cleared areas.

Environmentally Sensitive Areas (ESA)

There are no Category A ESA within the Project Area. Category B ESA within the Project Area are ground-truthed endangered RE (Biodiversity Status), which consists of patches of the following Regional Ecosystems (RE): 11.3.17, 11.9.5, 11.9.5a and 11.9.10. Category C ESA within the Project Area include ground-truthed remnant and regrowth vegetation within government mapped areas of 'essential habitat' or 'essential regrowth habitat', and Of Concern RE (Biodiversity Status), which comprises the following REs: 11.3.2, 11.3.4, 11.3.25, 11.3.27f and 11.9.7. It is noted that there will be no clearing within any ESA as a result of the Project.

Concluding Remark

As the vast majority (90.5%) of the Project Area is cleared and managed for agricultural land uses, the Project will generally be able to avoid direct impacts to MNES and MSES species and naturally vegetated habitat areas. Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, except for Koala and Southern Squatter Pigeon dispersal habitat. The Project's mitigation measures, including Senex's Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001] will be used to guide infrastructure siting, minimise direct and indirect disturbances and ensure the Project's total direct disturbance footprint is limited to 0 ha impact to MNES and MSES habitats that are not already cleared.

As detailed in the MNES and MSES impact assessments provided in Appendix F and Appendix G respectively, the Project has been assessed against the relevant Commonwealth and State guidelines and it has been determined that, with the implementation of the proposed controls and mitigation measures, the Project is unlikely to result in any significant direct or indirect impacts to any MNES or MSES.

The Atlas Stage 3 Gas Project will be serviced by the Atlas to Reedy Creek (ARC) Pipeline which is the subject of a separate referral under the EPBC Act (EPBC 2023/09585). An assessment of cumulative impacts for both the ARC Pipeline and the Atlas Stage 3 Gas Project, determined that these projects would not result in a significant cumulative impact on any MNES.

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) has been engaged by Senex Energy Pty Ltd (Senex) to document the terrestrial and aquatic ecological values to support the development of approvals documentation for the Atlas Stage 3 Gas Project (the Project, and the 'proposed action') in the Surat Basin in southern-central Queensland. This report is herein referred to as the Ecology Assessment Report (EAR).

Senex, on behalf of its subsidiaries Senex Assets Pty Ltd and Senex Assets 2 Pty Ltd, proposes to develop, operate, decommission, and rehabilitate new coal seam gas wells and associated infrastructure on Petroleum Lease based upon PL 445, the northern part of PL 209, Authority to Prospect (ATP) 2059 [Petroleum Lease Application (PL(A)) 1127] and parts of PL 1037 in the central part of the Surat Basin, Queensland. The term 'Project Area' used hereafter refers to the area within which the Project will occur (although the mapped 'Project Area' excludes the area west of Woleebee Creek in PL 1037 in which a new brine storage will be sited close to the existing Atlas CSG Project water treatment facility). It is noted that this assessment has included consideration of the new brine storage proposed west of Woleebee Creek. The term 'Project Area' in this report equates to the 'Field Development Area' discussed in the Preliminary Documentation. The up to 530 ha area where direct impacts will occur within the Project Area, will be referred to as the disturbance footprint.

Ecology field surveys and assessment of ecological values were conducted by ecological specialists, with BOOBOOK Ecological Consulting Pty Ltd (BOOBOOK) and Attexo Group Pty Ltd (Attexo) completing the terrestrial component (BOOBOOK, 2022; Attexo, 2023) and Freshwater Ecology Consulting Pty Ltd (Freshwater Ecology) conducting the aquatic component (Freshwater Ecology, 2022).

The Project was referred to the Commonwealth Department of the Climate Change, Energy, Environment and Water (DCCEEW) on 17 November 2022. A request for further information (RFI) was made by DCCEEW to make a controlled action decision on 19 January 2023. Senex responded to this RFI on 27 April 2023. On 12 May 2023, DCCEEW issued a notice of suspension of the Referral Decision Timeframe Period to 19 May 2023. On 19 May 2023, the Project (the action) was deemed a controlled action, to be assessed by Preliminary Documentation (PD). On 6 June 2023, a RFI pursuant to the PD was issued.

This report has been updated to account for the matters of national environmental significance (MNES) listed threatened species and communities (Sections 18 & 18A of the EPBC Act) within the RFI for the PD. The RFI also requires Senex to 'be aware of any changes to the distribution of listed threatened species and ecological communities, and information available in the Species Profile and Threats (SPRAT) Database. Senex must ensure that a recent Protected Matters Search Tool (PMST) report has been generated and considered before finalising the draft PD.' Since this report is an attachment to the PD, this EAR has been updated to account for the species listed in the RFI for the PD, and those which have been listed on contemporary PMST searches that account for potential changes in likely and known species distributions and/or EPBC Act listing events.

1.1 Project Area Context

The Project Area consists of the ATP 2059 (PL(A) 1127), PL 445, PL 209 (northern portion) and PL 1037 (parts thereof) development blocks and includes parts of 28 cadastral land parcels comprising private and leasehold lands along with road reserves and easements. The approximately 9,772 hectare (ha) Project Area is within an established gas-producing region. The Project Area extends 10 to 25 km southwest of Wandoan and is accessed via Jackson-Wandoan Road, Gurulmundi Road, Giligulgul Road and local roads. The Project Area is within the boundary of Western Downs Regional Council, southern inland Queensland.

The Project Area is within the Brigalow Belt Bioregion and straddles a diffuse boundary between Subregion 25 (Taroom Downs) in the north and Subregion 26 (Southern Downs) in the south (Sattler and Williams 1999). ATP 2059 (PL(A) 1127) and PL 445 are entirely within Taroom Downs. The northern quarter of PL 209, south to the Woleebee Creek and Conloi Creek floodplains, is also within Taroom Downs, with the remainder in Southern Downs. The Project Area and context is presented on Figure 1-1 and Figure 1-2.

1.2 Purpose of the Ecological Assessment Report

The purpose of this EAR is to document the assessment of the terrestrial and aquatic ecological values within the Project Area, and in turn identify risks to biodiversity values as well as avoidance, mitigation, and management measures to minimise impacts to biodiversity values. This EAR will support the development of the design, construction and operation of the Project and the approval applications required under Queensland State legislation and the EPBC Act.

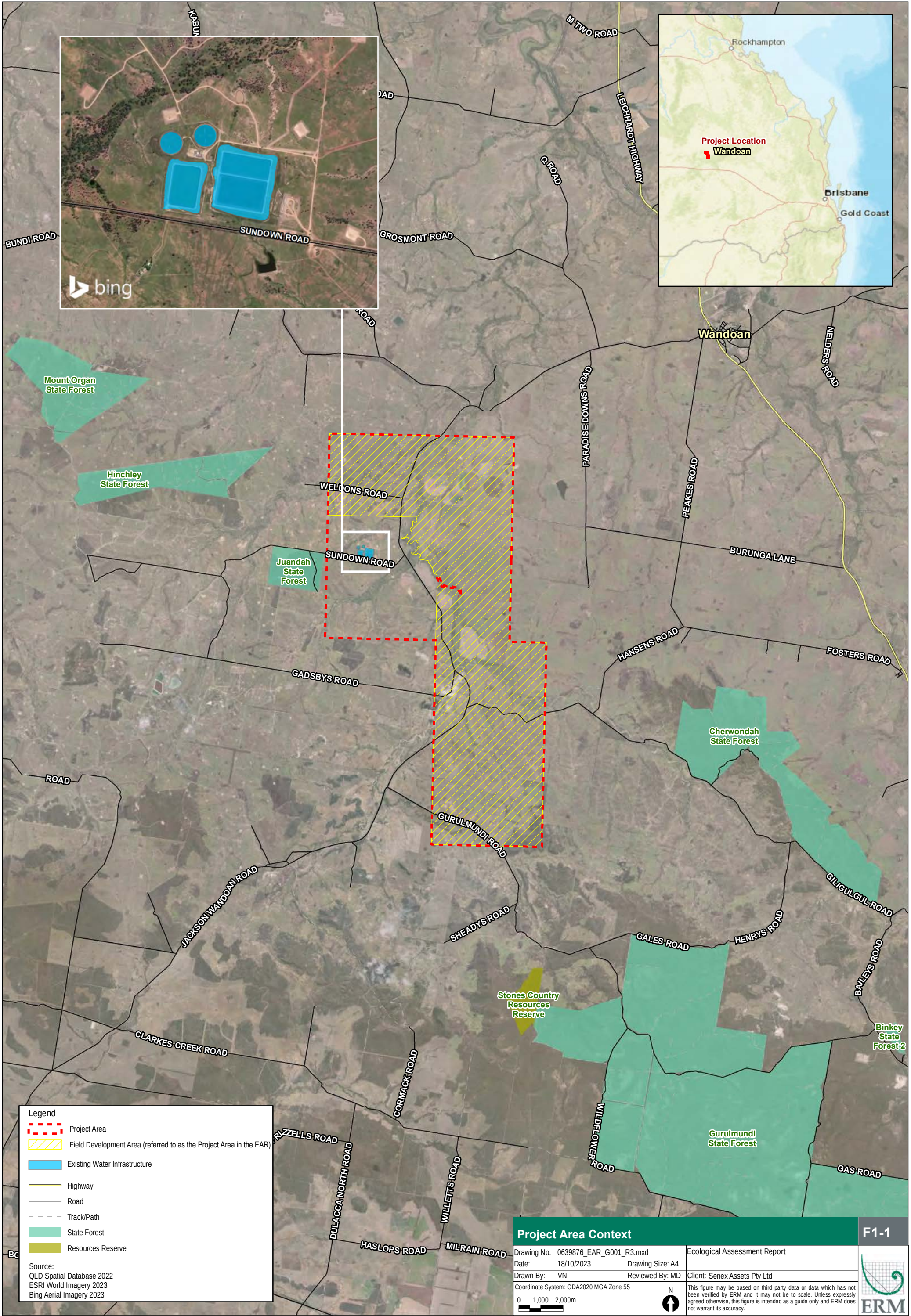
This EAR has been updated to account for listing events under the EPBC Act the subsequent PD RFI and up to the point of submission as an attachment to the draft PD to DCCEEW for adequacy review prior to publication for public comment.

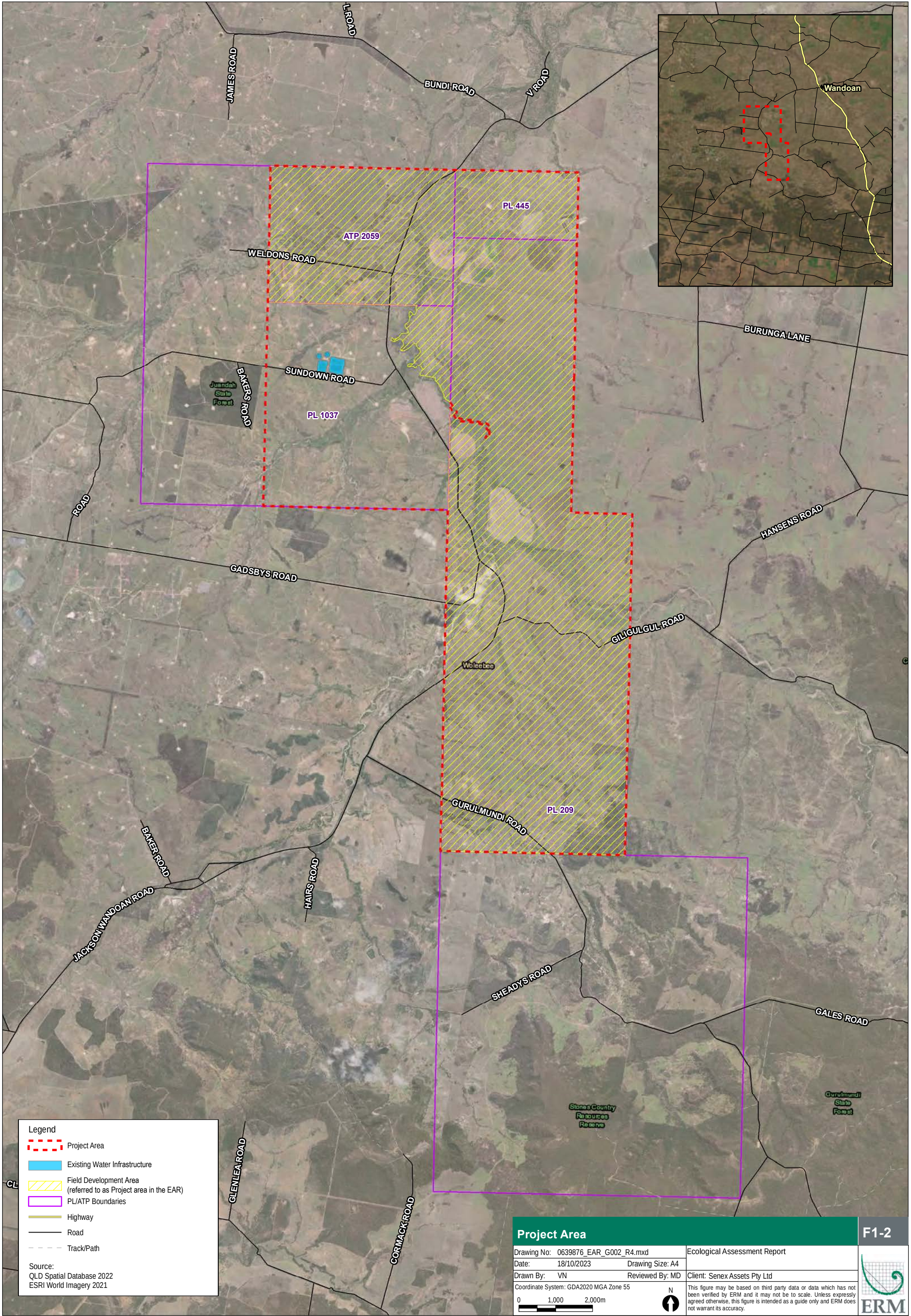
1.3 Objectives

The scope of the EAR includes the assessment of terrestrial and aquatic species and habitats associated with the Project Area, with particular focus on the following:

- Identify the potential presence of listed threatened communities and species and their associated habitat in the Project Area, based on desktop and field collected information pursuant to the conversation status and known or modelled distributions at the time of writing;
- Describe and map ecologically significant flora and fauna habitats, including MNES and Matters of State Environmental Significance (MSES), based on desktop and field verified information;
- Evaluate the ecological significance (values and constraints) of the Project Area;
- Assess the potential impacts of the Project on the ecological values in the Project Area, including specific conservation significant species that may be at risk from the Project; and
- Provide recommendations for avoidance, mitigation, and management of potential impacts to maintain the ecological values in the Project Area.

While the current assessment focuses on Project-specific impacts to MNES, consideration has also been given to cumulative impacts of the Atlas Stage 3 Gas Project (the Project) and the ARC Pipeline (the subject of a sperate referral under the EPBC Act).





1.4 Project Description

The Project (proposed action) will involve up to 151 gas wells and associated well site facilities; gas and water gathering systems for the producing wells; access tracks for operational purposes; brine and produced water storages; borrow pits; and ancillary supporting facilities.

The Project Area is based upon PL 445, the northern part of PL 209, ATP 2059 (PL(A) 1127) and parts of PL 1037 (including the part that is east of Woleebee Creek). Figure 1-2 shows the relative location of each tenement. The Project Area excludes the part of the Project Area where the yet unconfirmed site for a new up to 300 ML Atlas Stage 3 brine storage will be located west of Woleebee Creek within previously cleared parts of eastern PL 1037. This storage will be proximate to the existing water management facilities including the existing 100 ML of brine storage and planned additional ≤ 200 ML of brine storage for Atlas CSG Project which are not part of the Project (noting the Atlas CSG Project referral (EPBC 2018-8329) included allowance for up to 300 ML of brine storage). The proposed ≤ 300 ML Atlas Stage 3 brine storage is part of the Project, and it is accepted this storage will be located away from any significant environmental values. The new Atlas Stage 3 brine storage location in PL 1037 will be located within a cleared area that has been subject to earlier ecology assessments for Senex's existing Atlas CSG Project (EPBC 2018-8329) and final siting will be subject to Senex's Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001] (as detailed in Section 1.4.6) to ensure impacts to significant environmental values are avoided.

An application to convert ATP 2059 to a PL under the *Queensland Petroleum and Gas (Production and Safety) Act 2004* was lodged with the Queensland Government, PL(A) 1127. The term ATP 2059 in this report therefore includes any renewal, replacement, substitution, consolidation, subdivision, variation or extension of the ATP 2059 tenement. The EA for ATP 2059 currently permits standard exploration activities. When the PL(A)1127 over this area is granted, an EA will be issued for the production activities. This EA will be required prior to the commencement of production activities on the new PL(A)1127. PL 445 and PL 209 were purchased from Australia Pacific LNG Pty Limited (APLNG) in late 2021. The Environmental Authorities for these PLs were transferred to Senex in early 2022 as part of the purchase. Development of these PL areas by APLNG has received approval under the Commonwealth EPBC Act in 2011 as part of APLNG's approval over a larger area 'to develop, construct, operate and decommission the coal seam gas field component of the Australia Pacific LNG Project in the Walloons gas fields within the Surat Basin in south central Queensland' (EPBC 2009/4974). However, the EPBC Act does not provide for the partial transfer of a component of a larger project to a new proponent. As such, Senex has completed additional assessments and developed this EAR to support the EPBC Act and Queensland State approvals. It is noted that the scale of the project (e.g. density of wells) previously approved within PL 445 and the northern portion of PL 209 as part of APLNG's larger project remains the same or less intense. The gas resource in southern portion of PL 209 is deeper than in the north and within geological strata with greatly reduced permeability. The commercial viability of extracting gas from this area is uncertain and Senex currently has no plans to develop this area.

The gas field will be progressively developed over a period of approximately 5 – 10 years. The average maximum production rate of the Project is expected to be approximately 60 terajoules per day, although variable potential production rates may be higher at times. Field development is planned to move generally from the north towards the south over the life of the Project.

1.4.1 Production Wells

Wells will generally be spaced 500 – 750 m apart. The up to 151 planned wells will be designed, constructed, decommissioned, and rehabilitated in accordance with the Queensland Code of Practice for constructing and abandonment of petroleum wells and associated bores in Queensland (Department of Natural Resources, Mines and Energy (Version 2), 16 December 2019). The code outlines mandatory requirements and good practice to achieve long term well integrity and appropriately reduce the risk of environmental harm.

Well sites will generally be constructed in an area of approximately 80 m by 70 m allowing the initial drilling and completion of the well (installing surface facilities). The layout and size of well sites will vary depending on the size and type of drilling rig, the program for completion of the well and the surrounding environment. Typically, 0.6 ha is required although smaller areas may be utilised where topography and vegetation cover allow. In some cases, up to approximately 1 ha is required to accommodate site constraints. Wells pads are designed and located based on flood modelling to avoid areas of concentrated flow such as gullies and waterways. Some well pads may require cut batter and fill batter that will have a local or minor impact to runoff on sloping land.

Well construction will involve a drill rig and other equipment such as drill fluid pumps, storage and processing and storage for water supply, fuel, and chemicals. Following initial drilling and commissioning of the well, sites will be partially rehabilitated, leaving an area of approximately 60 m by 60 m allowing an adequate area for workover rig operations.

Options for the management of residual drilling material to be used for the Project include onsite and offsite options. Where onsite management options are proposed, this will be undertaken in accordance with state approvals which require for the assessment of quality, potential impacts and implementation of management measures.

Following the well drilling phase, the wells will be completed, and a pump installed to dewater the production reservoir. Separate connections will be provided at the well head for the gas and water streams. It is expected that produced water will be pumped to the surface by a downhole progressive cavity pump and connected from the wellhead tubing.

The standard well site facility will be fenced and generally consist of:

- A wellhead gas and water metering package;
- Gas and water separation equipment;
- Initially, natural gas power generation package to provide power for the electric motor driving the downhole pump (noting that it is possible that in future years wells may be powered by alternative sources including solar, hybrid and distributed power);
- Fuel and instrument gas scrubber to power the generator and supply gas to instruments;
- Sand/particulate filter separator for water and gas streams; and
- Surface pressure piping constructed of steel to the required specification and connection to gathering system.

It will generally take up to 6 months to dewater each production well sufficiently for gas to flow; approximately 18 months to reach peak production. Once depleted of gas, wells will be progressively decommissioned and rehabilitated throughout the Project life. Decommissioning of individual wells is not expected to occur until after the well has been producing for at least 15 years but could be much longer (anticipated to be decommissioned between 20 and 50 years). The targeted maximum production rate is estimated to be between 300 – 950 thousand standard cubic feet (Mscf) per well per day.

In total the disturbance footprint required during construction of the 151 wells will total up to approximately 100 ha and after construction will occupy up to approximately 60 ha. All the areas to be utilised have been previously cleared. At the completion of the project all well pads will be rehabilitated to the condition of the adjoining land. An example of the Project infrastructure is provided in Photograph 1.1 to Photograph 1.3.



Photograph 1-1: Right of way at pipe installation stage showing temporary disturbance



Photograph 1-2: Intersection of two rights of way post construction showing no impedance to fauna dispersal



Photograph 1-3: Typical coal seam gas well infrastructure showing small footprint and no barrier to fauna dispersal

1.4.2 Gathering System

Gas and water from the wellsite facilities will be transported via the gas and water gathering system. The buried gathering system will enable gas at low pressure and water to flow through separate buried High-Density Polyethylene (HDPE) pipelines, up to 650 mm outer diameter.

To install the gathering lines, 18 m wide right of way (RoW) will require some vegetation to be removed, a trench to be excavated, pipeline laid, the trench backfilled, and RoW reinstated (a 24 m wide RoW will be required during construction for approximately 15 km of major trunk lines). In accordance with the Environmental Authority (EA) the RoW will be reinstated and re-profiled to a level consistent with surrounding soils, original contours and established drainage lines so as not to impede surface water flows. Where possible, RoWs will be aligned with existing roads/tracks, fence or power lines or other linear infrastructure to minimise disturbance to native vegetation and overall impact on land users. In general, the RoWs will be rehabilitated except for a 6 m wide access tracks earthen access tracks which will be maintained along the RoW for ongoing operational access.

The gas gathering system will typically operate at 70 – 400 kilopascal gauge (kPag) (with a Maximum Allowable Operating Pressure of 615 kPag). The water gathering system will typically operate at 140 – 700 kPag (with a maximum operating pressure of approximately 1350 kPag).

Water will be transported to water processing facilities and gas to gas processing facilities through the gathering system.

The Project will avoid impacting riparian vegetation through design and will be applying the Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001]. The Project includes the following construction methodology for crossings of watercourses:

- Horizontal Directional Drill (HDD) gathering system crossings of Woleebee Creek within PL 1037 to avoid impacts to the watercourse;
- Several HDD are being considered for gathering system crossings of Woleebee Creek and other drainage features in PL 209; and

- Several HDD are being considered for gathering system crossings of Woleebee Creek, Wandoan Creek and other drainage features in ATP 2059.

HDD may be used to avoid impacts to watercourses and adjacent MNES habitat however there are a range of issues that limit its use more widely, including the nature of the subsurface soil and bedrock materials at a proposed crossing and the ecological values potentially impacted adjacent to the riparian crossing. The potential issues will be assessed on a site-by-site basis during the Project operations. In any case, Senex have committed to avoidance of all TECs and MNES habitat (with the exception of Koala and Southern Squatter Pigeon dispersal habitat which is all in previously cleared areas).

After post-construction rehabilitation, the disturbance footprint for the gas and water gathering system will utilise up to approximately 80 ha. At the completion of the Project, any areas not required to remain as access tracks for the use of the landholder, will be rehabilitated by re-contouring disturbed areas to match the surrounding land.

1.4.3 Water Management

Groundwater will be abstracted (pumped) from CSG production wells to depressurise the target production of coal seams. It is expected that the action will generate produced water up to a maximum rate of 6.5 ML per day.

The water management process for the produced water is expected to involve:

- New pre-engineered above ground tanks and/or purpose-built earthen dams with impervious liners and leakage detection/collection systems, which may be established on PL 209. However, to minimise impacts and improve operational efficiency, some of the water will be transferred to centrally located aggregation and brine storages that are already established for the Atlas CSG Project (EPBC 2018/8329) (these facilities are not part of the Project).
- The existing Water Treatment Facility (WTF) on PL 1037 established for the Atlas CSG Project (EPBC 2018/8329) (the WTF is not part of the Project) will treat water from the Project. Subject to water production rates and other field development characteristics, an additional WTF may also be constructed on PL 209. This additional WTF is part of the Project. If required an additional WTF is required, it will be sited using the Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001] to ensure that there will be no significant impact to any listed MNES threatened species or TEC. As part of the WTF site selection risk assessment process potential impacts to MNES surface water values will be evaluated.
- Brine from the water treatment process will be stored in a new brine storage dam (up to 300 ML) which will be developed on PL 1037 and is part of the Project. Additional brine storage (up to 300 ML) may also be required on PL 209 if a WTF is established there. Further brine treatment options including concentration via solar evaporation may be used and result in a concentrated slurry or solid salt product.

In total, approximately 30 ha of brine storage and approximately 30ha of water storage will be established on previously cleared land for the Project.

The brine and water storage will be located in areas that avoid floodplains, shallow groundwater systems and other environmentally sensitive locations. Site preparation will involve removal of topsoil, excavation and compaction of subsoil and placement of impermeable/low permeability layers with leak detection/collection systems. All storages infrastructures which is considered regulated structures under the EA for the Project will be required to meet the Manual for assessing consequence categories and hydraulic performance of structures (DES 2016). An application for one or more regulated structures must, where the location of the regulated structure is known, include a copy of the most recent consequence assessment undertaken for that regulated structure as per the Guideline for Structures which are dams or levees constructed as part of environmentally relevant activities (DES 2022).

For a dam to be considered a regulated dam, it must be determined to be in the 'significant' or 'high' consequence category, and a detailed dam design report must be submitted to Queensland Department of Environment, Science and Industry (DESI) following granting of the EA or as part of an EA Application. The following will apply with respect to any regulated dams required for the Project:

- Senex will design and construct dams in accordance with relevant legislation and Queensland standards and DESI guidelines;
- An independent third-party will be engaged to certify dams to ensure design, construction and hydraulic performance meet the design plan;
- Dams will be constructed under the supervision of a suitably qualified and experienced person and in accordance with the relevant DESI schedule of conditions relating to dam design, construction, inspection, and mandatory reporting requirements; and
- Senex will implement a seepage monitoring program for water storage dams, where required. The seepage monitoring program will identify infrastructure and procedures that are in place to detect loss of containment as early as possible.

Any low-hazard dams required for CSG water storage will be designed in accordance with accepted engineering standards. The dams will be designed with a floor and sides comprising material capable of containing the water for the life of the project.

1.4.4 Temporary Accommodation Facilities

It is expected that temporary accommodation facilities will be required for construction and drilling activities. These facilities would be assembled onsite using prefabricated modular units with basic amenities such as modular sewage treatment plants and water tanks. It is expected that the temporary accommodation facilities would occupy up to approximately 20 ha of previously cleared land.

1.4.5 Other Ancillary Facilities and Incidental Petroleum Activities

It is expected that the following additional facilities and activities will be required to support construction and operations:

- Laydown, stockpile, and site office areas (up to approximately 45 ha of previously cleared land);
- Borrow pits (up to approximately 11 ha of previously cleared land);
- Power/communication lines (overhead or underground);
- Plant and equipment service and maintenance facilities and workshops;
- Construction support, warehousing, and administration buildings;
- Fuel and chemical storage;
- Washdown facilities;
- Ancillary infrastructure such as communications infrastructure, water supply and holding tanks and dams and energy supply;
- Groundwater monitoring bores installed to ensure the early detection of potential groundwater impacts in the alluvium and underlying geological formations resulting from CSG production;
- Environmental monitoring equipment and management controls; and
- Ecological, topographic, cadastral, geological, geophysical, and geotechnical surveys.

1.4.6 Pre-construction/Pre-clearing Activities

Senex have developed the Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001] to guide site selection to ensure impacts upon environmental values are avoided and minimised.

The protocol includes the following steps:

- Desktop environmental constraints analysis;
- Site surveys including environmental and cultural heritage clearance surveys (where required, additional species-specific targeted field-based surveys are undertaken) – findings are documented within a standardised Biodiversity Values Report;
- Post-survey environmental constraints analysis (which includes location refinements to further avoid and minimise impacts to field validated values, identification of no-access areas, identify site specific mitigation measures and controls); and
- Environmental constraints reporting (confirming siting complies with relevant approvals including disturbance limits and secondary approvals, quantifying any unavoidable impacts and identifying required mitigation measures).

1.4.7 Clearing and Civil Works

Most of the Project Area has been subject to extensive disturbance with approximately 90.5% being cleared of remnant native vegetation. Of the maximum ground disturbance area of up to 530 ha (4.3%) for the entire action, Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, except for Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land).

Before the drill rig is mobilised to site, the drill site and access tracks are prepared through:

- Avoidance of timbered areas in nearly all cases. However, where individual trees/woody vegetation is present and unavoidable, it will be cleared within the well lease and access tracks and stored at the edge of disturbed areas for later use in rehabilitation. Recoverable timber hollows, larger rocks and other features will be stored for later microhabitat rehabilitation. Grasses and other ground covers will then be graded from the well pad footprint; and
- Topsoil removal using earthmoving equipment. This is stockpiled to one side of the lease and/or access track for later use in rehabilitation. Final earthmoving equipment preparations, such as site levelling are then completed.

Other civil works will be required for other infrastructure such as brine storage, water storage, temporary accommodation facilities, laydown areas, stockpile and site office areas, and other infrastructure.

All clearing and civils work will be undertaken in accordance with following management plans:

- Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [OPS-ATLS-EN-PLN-001];
- Atlas Stage 3 Gas Project Significant Species Management Plan;
- Implementing the Senex Queensland Fauna and Stock Management Procedure [SENEX-CORP-EN-PRC-021];
- Weed and pest management measures through the implementation of the Senex Biosecurity Management Plan Queensland Operations [SENEX-QLDS-EN-PLN-001] and Senex Queensland Weed Hygiene Procedure [SENEX-QLD-EN-PRC-023];
- Environmental Management Plan Atlas Stage 3 Gas Project [SENEX-ATLAS-EN-PLN-015];
- Rehabilitation Plan Atlas Stage 3 Gas Project [SENEX-ATLS-EN-PLN-018];

- ATP 2059 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-013];
- PL 445 and PL 209 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-014]; and
- Atlas Stage 3 Water Monitoring and Management Plan [SENEX-ATLS-EN-PLN-017].

1.4.8 Ongoing Maintenance and Operations

The gas field will be progressively developed over a period of between approximately 5 – 10 years. Once all wells are producing, activities will transition to maintenance and operation of the existing infrastructure. This will include visual inspection and maintenance of well, gathering and water infrastructure equipment. All wells will also be monitored remotely with field staff responding through well visits as changes to normal operations are detected.

The well bore itself will generally be serviced by a workover rig approximately every three years, although some wells are expected to require more frequent servicing depending on performance.

The gathering system and access tracks will also be regularly monitored by field staff as they undertake well inspections and maintenance works (e.g., re-grading). In the unlikely event maintenance of gathering systems (in the form of pipeline maintenance) is required, ground disturbance and partial trenching will be experienced.

Rehabilitated areas will also be regularly monitored and maintained in accordance with the Rehabilitation Plan Atlas Stage 3 Gas Project [SENEX-ATLS-EN-PLN-018] and the requirements of the EA.

All maintenance and operational work will be undertaken in accordance with following management plans:

- Environmental Management Plan Atlas Stage 3 Gas Project [SENEX-ATLAS-EN-PLN-015];
- Rehabilitation Plan Atlas Stage 3 Gas Project [SENEX-ATLS-EN-PLN-018];
- Atlas Stage 3 Gas Project Significant Species Management Plan;
- ATP 2059 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-013];
- PL 445 and PL 209 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-014]; and
- Atlas Stage 3 Water Monitoring and Management Plan [SENEX-ATLS-EN-PLN-017].

1.4.9 Decommissioning and Remediation

A maximum ground disturbance area of up to 530 ha (4.3%) for the Project is expected. Rehabilitation of some initial construction disturbances will commence early in the action and continue progressively so that a much smaller proportion will be occupied at any point in time. In almost all cases, surface infrastructure and temporary construction footprints will be located in previously cleared and disturbed areas.

Once operations have ceased, infrastructure will be decommissioned unless retention and transfer of ownership of assets is agreed with the landholder. Disturbed areas will be rehabilitated in accordance with the Rehabilitation Plan Atlas Stage 3 Gas Project [SENEX-ATLS-EN-PLN-018] and the requirements of the EA. Rehabilitation will be undertaken progressively as disturbed land is no longer required for operational purposes in accordance with the relevant EA. This will include reprofiling disturbed land to original contours, re-establishment of surface drainage lines, re-establishment of ground cover vegetation and ensuring the rehabilitated land is safe and stable. Where the landholder and regulatory authority agree in writing, infrastructure such as access tracks and dams may be retained onsite for landholder use.

2. LEGISLATION AND POLICY CONTEXT

This EAR has been undertaken with consideration of Commonwealth, State and Local regulatory frameworks and associated legislation. Table 2-1 summarises the relevant legislation and policies to this EAR.

Table 2-1: Key Legislation and Policies

Act/Policy	Administering Authority	Purpose
Commonwealth Legislation		
<i>Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)</i>	Department of Climate Change, Energy, Environment and Water (DCCEEW)	<p>This Act administers the protection of the environment within Australia – protecting MNES, which include:</p> <ul style="list-style-type: none"> ■ World heritage properties; ■ National heritage properties; ■ Wetlands of international importance; ■ Threatened species and ecological communities; ■ Migratory species; ■ Commonwealth marine areas; ■ The Great Barrier Reef Marine Park; ■ Nuclear Actions (include. Uranium mines); and ■ Water Resources.
EPBC Act Environmental Offsets Policy 2012	DCCEEW	<p>This Policy applies where a significant residual impact on an MNES is expected to occur as a result of the proposed development. The policy provides guidance on the role of offsets and when a proposed offset is considered suitable.</p>
State Legislation		
<i>Environmental Protection Act 1994</i>	Department of Environment, Science and Industry (DESI)	<p>EA applications for petroleum activities are assessed under this Act, which considers the impact of proposed projects to environmental values, including biodiversity values. Environmentally Sensitive Areas (ESA) are listed under the subordinate Environmental Protection Regulation 2008. ESAs include three categories i.e. A, B and C, reflecting the hierarchy of their importance to nature conservation. The EA Application Requirements for Petroleum Activities (Department of Environment and Heritage Protection [DEHP], 2013) provide for protection zones around these ESAs i.e.:</p> <ul style="list-style-type: none"> ■ Primary Protection Zone – an area within 200 m of the boundary of a Cat A, B or C ESA; and ■ Secondary Protection Zone – an area within 100 m of the boundary of a Cat A or B ESA. <p>The assessment identifies the biodiversity values and assesses the impact of the project on those values.</p>
<i>Nature Conservation Act 1992 (NC Act)</i>	DESI	<p>The Act and Regulations provides a framework for the creation and management of protected areas and protection of native species. It includes designation of threatened species status and provides for protected plant trigger areas.</p>

Act/Policy	Administering Authority	Purpose
<i>Vegetation Management Act 1999</i> (VM Act)	Department of Resources (DoR)	The VM Act is the regulatory framework for the management of vegetation using the Regional Ecosystem (RE) classification system. It regulates the broad scale clearing of vegetation, with the intent of conserving remnant vegetation, preventing the loss of biodiversity, maintaining ecological processes and allowing for sustainable use. There are clearing exemptions for some work activities.
<i>Biosecurity Act 2014</i> (and Regulation)	Department of Agriculture and Fisheries (DAF)	This Act provides for the management of biosecurity risks in Queensland. The Act provides measures to safeguard Queensland economy, environment, agricultural and tourism industries and way of life from pests, diseases and contaminants. Restricted matters are assigned a category (or categories) from 1 to 7, with each category placing restrictions on the dealings with the matter.
<i>Environmental Offsets Framework (Environmental Offsets Act 2014 and Regulation, Environmental Offsets Policy Version 1.7)</i>	DESI	An environmental offset condition may be imposed under various State assessment frameworks for an activity that will or is likely to have a significant residual impact on a prescribed environmental matter that is a MSES. There is a guideline to assist in determining whether or not a significant residual impact is likely.
<i>Petroleum and Gas (Production and Safety) Act 2004</i>	DoR	The purpose of the Queensland <i>Petroleum and Gas (Production and Safety) Act 2004</i> is to regulate the exploration, production, and safety aspects of petroleum and gas activities in the state of Queensland, Australia. The Act provides a legal framework for the responsible development and operation of the petroleum and gas industry while ensuring the protection of public safety, the environment, and the rights of landholders.
<i>Fisheries Act 1994</i> (Fisheries Act)	DAF	The Fisheries Act provides the principal legislative framework for the regulation around fishing activities and areas that are fish habitat within a given area. This outlines how activities are to be conducted given the importance of the habitat for fish. All waters are protected against degradation by direct or indirect impacts associated with development activities. Measures designed to protect fisheries resources include the declaration of fish habitat areas, protection of marine plants and designation of waterways for fish passage.
<i>Water Act 2000</i> (Water Act)	DoR	The Water Act provides the framework for the planning and sustainable use and management of groundwater and surface water in Queensland. It also sets up conditions and controls the activities that may impact upon water resources and quality. The Department of Resources Watercourse Identification Map identifies watercourses and drainage features mapped under the Water Act.

2.1 Convention on Conservation of Nature in the South Pacific (Apia Convention)

The Convention of Conservation of Nature in the South Pacific (Apia Convention) is a multilateral environmental agreement, which was signed in Apia, Samoa in 1976 and came into effect in June 1990. The purpose of the Apia convention is to commit the relevant Parties to take action for the conservation, utilisation and development of the natural resources of the South Pacific region through careful planning and management for the benefit of present and future generations.

In order to pursue the objective of the Convention the Parties:

- Undertake to create protected areas to safeguard representative samples of natural ecosystems, superlative scenery, striking geological formations and regions and objects of aesthetic, historic, cultural or scientific value;
- Commit to not alter national parks so as to reduce their area except after the fullest investigation; their resources are not to be subject to commercial exploitation; hunting and collection of species are to be prohibited and provision is to be made for visitors;
- Agree to maintain lists of indigenous fauna and flora in danger of extinction and to give such species as complete protection as possible; and
- Provision may be made as appropriate for customary use of areas and species in accordance with traditional cultural practices.

Senex considers the action is not inconsistent with the Convention of Conservation of Nature in the South Pacific. The action is not proposed in protected areas, conservation reserves or national parks. The project has assessed both the listed threatened species of national importance and those listed under the *Nature Conservation Act 1992* to determine what protection measures are necessary to safeguard them whilst undertaking the action, including migratory species which are likely or known to utilise the area. The project prohibits the hunting, killing, capture or collection of any indigenous flora and fauna and includes training for staff on the importance of listed threatened species and the management plans in place for their protection. Additionally, the proposed action was found to be unlikely to cause significant impacts to any listed threatened communities or species or listed migratory species. These findings and the ability of the proposed action to be developed with minimal impact upon the site's ecological communities, species and systems confirm that the proposed action will not be inconsistent with Australia's obligation under the Apia Convention.

2.2 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between multiple governments (including Australia, effective 1976) to ensure the international trade in wildlife does not threaten wild populations of flora and fauna. In total, there are approximately 30,000 flora species and 5,600 fauna species listed under CITES. In Australia, the CITES Management Authority is the DCCEEW. CITES primarily deals with the international trade of endangered and threatened species of wildlife and plants, aiming to prevent their exploitation for commercial purposes. Gas extraction involved with the Project, while it may have environmental impacts, is not directly related to the trade of such species.

The Commonwealth and Queensland regulatory framework is designed to ensure environmental sustainability, and the Project is therefore subject to strict environmental impact assessments and mitigation measures as evidenced in this report, the SMP and EMP. Through the Constraints Protocol, potential harm to local wildlife is minimised, thereby aligning with the principles of CITES. Through further assessments and proactive conservation efforts, the Project is expected to be in compliant with international conservation agreements and safeguards the region's unique biodiversity. The proposed action does not involve international or any other trade in wildlife and Senex supports the complete suite of domestic measures Australia has adopted for improved conservation and tighter restrictions on trade of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) listed species.

3. ASSESSMENT METHODOLOGY

3.1 Overview

This Section outlines the methodology implemented to collect data to describe the ecological values in the Project Area, inform avoidance measures, and assess likely impacts so that appropriate management and mitigation measures can be proposed. Overall, the assessment consisted of a desktop review to identify values that may be present, and which then helped to guide the development and implementation of a field survey and sampling program to describe on-ground conditions and to assess the known, likely, and potential occurrence of ecological values within the Project Area.

This EAR has used information gathered from the following sources:

- BOOBOOK Ecological Consulting Terrestrial Ecology Report (refer to Appendix C);
- Freshwater Ecology Aquatic Ecology Report (refer to Appendix D); and
- Attexo Group Threatened Flora Survey and Report (refer to Appendix E).

3.2 Desktop Review

Several desktop sources were reviewed to identify ecological values that may occur within the Project Area as listed in Table 3-1. A search area containing the Project Area and a 10 km buffer was used for the database searches. The Protected Matters Search Tool (PMST) and Wildlife Online (WO) results were cross-checked using Atlas of Living Australia (ALA) database locations of records in the context of the actual Project Area boundary.

This desktop review adheres to the requirements of the EPBC Act to undertake a desktop review of available information to identify species, that may be impacted by the Project. This desktop review, through the likelihood of occurrence analysis detailed in Section 3.4, and located in Appendix B provides information on species known, likely or with the potential to occur within the Project Area, based on species records, the availability of suitable habitat, breeding, roosting, denning and foraging sites for fauna, wetlands for waterbirds, and habitat for flora.

Desktop review for the first revision of this report was undertaken pursuant to the conservation status of species current at the time of writing. The report has been updated in accordance with the DCCEEW request for further information after the controlled action decision on 19 May 2023. The PMST has been checked weekly to account for any potential changes in likely or known species distributions, and any listing events under the EPBC Act that will result in consideration of any new conservation advices in relation to listing events.

Additional searches of species records (ALA, 2022; DES, 2022a) were made of well surveyed areas (Gurulmundi State Forest, Cherwondah State Forest) within the Western Downs Regional Council area and, separately, of records within Southern and Central Queensland of each threatened species considered as potentially occurring within the Project Area. These datasets provided a baseline for subsequent the field assessment.

Table 3-1: Databases Reviewed for Desktop Analysis

Information Source	Name	Data Description
DCCEEW	Protected Matters Search Tool (PMST)	The search tool provides predictive results of MNES based on mapping of known and potential species distribution, habitat, ecological communities, and wetlands. The outputs are based on modelling results and do not necessarily reflect known records of species or communities. The features highlighted by the search are considered further through a likelihood of occurrence assessment (see Appendix B). The PMST results can be found in Appendix A. Search area: 10 km buffer around the Project Area.
DoR	Regional Ecosystem (RE) Version 12.2 mapping	This product maps remnant vegetation communities across Queensland and identifies communities listed as endangered, of concern or least concern status.
DoR	Property Maps of Assessable Vegetation mapping (published 16 September 2021)	This product provides certified property scale maps indicating where landholders can clear regrowth in 'Category X' areas without further approval and areas where approval is required for clearing regulated vegetation. The PMAV provides a property scale regulated vegetation map which replaces the statewide regulated vegetation map published by DoR.
Queensland Government	MSES mapping	This product maps areas of MSES as defined under the QLD State Planning Policy.
DoR	Queensland Globe	A Google Earth based product that allows viewing of spatial data and imagery covering Queensland.
DESI	WO	A database that contains records of wildlife sightings including threatened flora and fauna species (protected under the NC Act) that have been provided to the agency by Government departments and external organisations. The WO results can be found with the PMST results, in Appendix A.
ala.org.au	ALA	Australia national biodiversity database (supported by the National Collaborative Research Infrastructure Strategy, CSIRO). Database contains records accessed through an interactive spatial portal. Threatened species are searched to identify known records in proximity to the Project Area.
Darling Downs Regional Council	Darling Downs Regional Plan 2013	The <i>Darling Downs Regional Plan 2013</i> provides information relating to biodiversity, and wetland and waterway corridors.

Information Source	Name	Data Description
DCCEEW	Species Profile and Threats Database (SPRAT)	The SPRAT profiles and associated conservation advice documents were consulted for the following reasons: They provide detailed information for the Likelihood of occurrence assessment on: <ul style="list-style-type: none"> ■ Species distribution; and ■ Habitat information including species-specific requirements. The conservation advice documents are particularly important for assessing Threatened Ecological Communities (TECs) found in field surveys, against the listed TEC guidelines.
BOOBOOK	Previous Ecological Surveys	Previous ecological surveys in the Senex Atlas gasfield were also considered as part of the analysis for the Project Area (BOOBOOK 2014, 2020, 2021a, 2021b, 2022a; ERM 2018).
Attexo	Previous Ecological Survey	Threatened flora surveys in the Senex Atlas gas field were also considered as part of the analysis for the Project Area (Attexo 2023).

A desktop review of publicly available databases including PMST and ALA, was conducted to identify the species occurrence records within either the Project Area, a 10 km buffer of the Project Area or the nearest record outside of the buffer. All flora and fauna species listed in the Likelihood of Occurrence table were included in this desktop review. The species were researched in the ALA database, with a 10 km buffer of the Project Area. Any species occurring within the Project Area, or the buffer area were listed, with spatial record identification provided in the respective figures. Where the species was not identified within the buffer area, this was noted and the nearest record to the Project Area was listed, irrespective of the date of record. The information gathered from this desktop review for all species included:

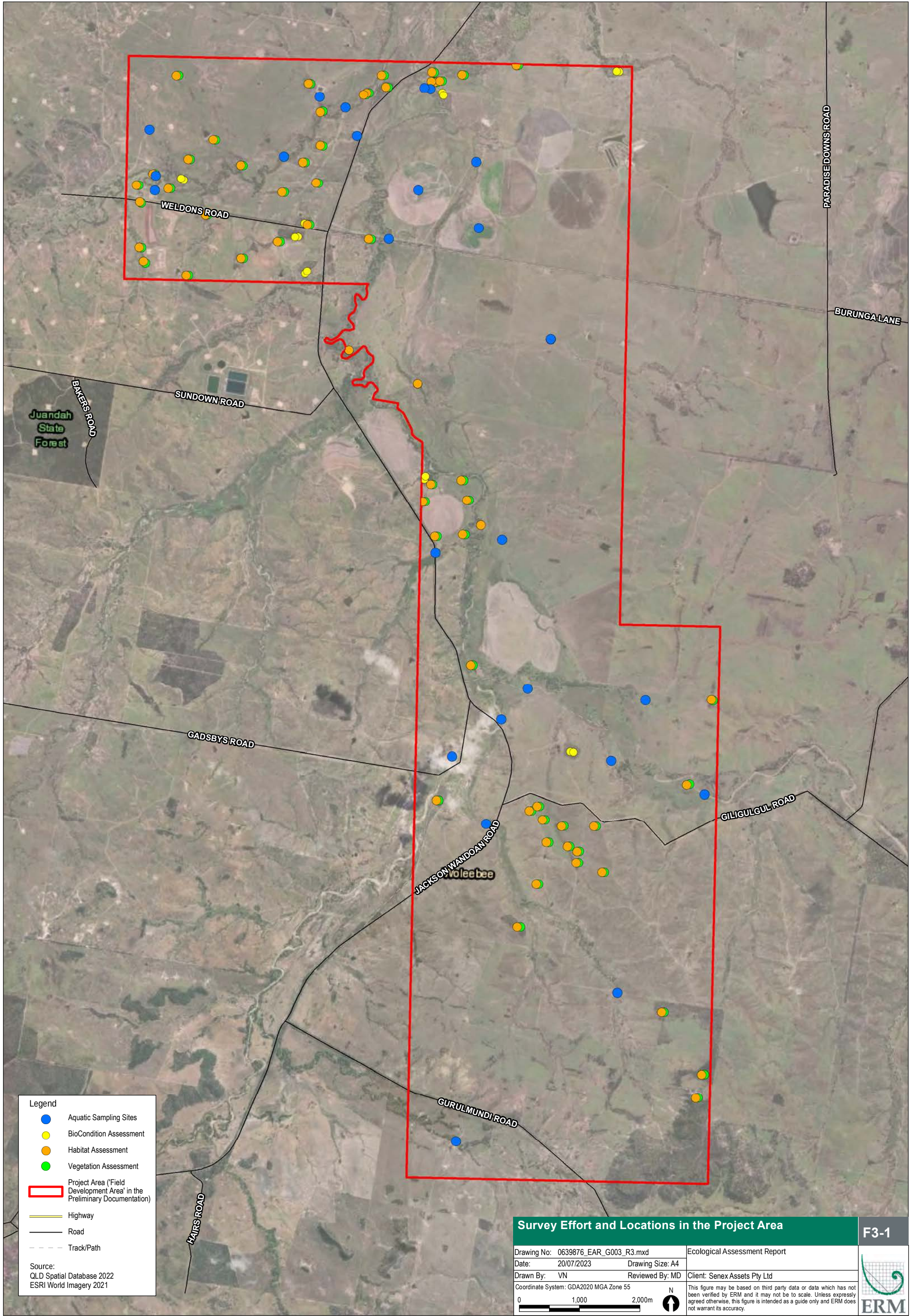
- The occurrence ID number;
- The date of the record;
- Distance from the Project Area, including direction; and
- A habitat description of where the record was found.

Records of threatened species in the broader region are identified in Appendix H.

3.3 Field Surveys

BOOBOOK Ecological Consulting undertook terrestrial field ecological surveys via targeted vehicle based and foot traverses of the Project Area, over the periods of 14 – 18th March 2022, 22 – 25th March 2022; 30 April – 5th May 2022, and 9 – 13th June 2022. Aquatic field ecological surveys were undertaken by Freshwater Ecology over an eight-day period (14 – 21st March 2022). Attexo Group undertook targeted Ooline and threatened flora surveys via vehicle based and foot traverses of the Project Area, over the periods 31st January – 3rd February 2023. The results from all terrestrial and aquatic surveys have been incorporated into this EAR. The locations of surveys undertaken over the survey periods are shown in Figure 3-1.

It is acknowledged that field surveys undertaken prior to listing events and/or SPRAT likely or known species distribution changes may not have necessarily accounted for, or targeted species that were not listed or considered likely to be present. Nonetheless general survey methodologies designed to detect the presence of species or groups of species correlating with certain habitat types are likely to detect any MNES/MSES animals or plants present within the survey areas. As such, a retrospective review has been undertaken to correlate field data with the contemporary status of relevant MNES species and communities.



Legend

- Aquatic Sampling Sites
- BioCondition Assessment
- Habitat Assessment
- Vegetation Assessment
- Project Area ('Field Development Area' in the Preliminary Documentation)
- Highway
- Road
- Track/Path

Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

Survey Effort and Locations in the Project Area		F3-1
Drawing No: 0639876_EAR_G003_R3.mxd		Ecological Assessment Report
Date: 20/07/2023	Drawing Size: A4	
Drawn By: VN	Reviewed By: MD	
Client: Senex Assets Pty Ltd		
Coordinate System: GDA2020 MGA Zone 55		
<div style="display: flex; align-items: center;"><div style="flex: 1;"><div style="width: 100px; height: 10px; background: linear-gradient(to right, black 49%, white 49%, white 51%, black 51%);"></div><div style="display: flex; justify-content: space-between; width: 100px;">01,0002,000m</div></div><div style="text-align: center; margin-left: 10px;"><div style="width: 0; height: 0; border-left: 5px solid transparent; border-right: 5px solid transparent; border-bottom: 8px solid black;"></div><div style="font-size: 8px;">N</div><div style="font-size: 12px;">↑</div></div></div>		<small>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</small>

3.3.1 Personnel

Terrestrial field ecological surveys were conducted by suitably qualified BOOBOOK personnel Michael Cunningham (Senior Ecologist), Courtney Andrew (Graduate Ecologist) and Rosamund Aisthorpe (Botanist). All aspects of the project including field survey and reporting were conducted under the supervision of Craig Eddie (Principal Ecologist). Aquatic field ecological surveys were conducted by suitably qualified Freshwater Ecology personnel, led by Dr Timothy Howell. Targeted threatened flora surveys were conducted and led by suitably qualified Attexo personnel Chris Beavon (Principal Ecologist) and Kye Chamberlain (Professional Ecologist) (CVs for all personnel are included as part of Appendix H).

3.3.2 Terrestrial Ecology Field Survey Methodology

3.3.2.1 Vegetation Assessments

Baseline botanical surveys were undertaken to describe dominant flora and vegetation community structure within the Project Area. Ground-truthing of the RE vegetation communities (DES, 2022g) within the Project Area was undertaken using the quaternary level of data collection as described by Neldner *et al.* (2022).

Vegetation community assessments were undertaken within 50 m x 20 m plots (0.1 ha) within representative locations within the Project Area. Vegetation community polygons were verified in accordance with Queensland RE description and Biodiversity Status as per the latest updates of the Regional Ecosystem Description Database (REDD) (DES, 2021) and TEC criteria (DAWE, 2022b; Threatened Species Scientific Committee [TSSC], 2013; 2019) (BOOBOOK, 2022). The locations of vegetation and habitat survey sites are displayed in Figure 3-1, which is also included in Appendix A of BOOBOOK (2022b), attached to this EAR as Appendix C.

RE polygons were assigned to remnant or non-remnant status as defined by the *Vegetation Management Act 1999* (VM Act) (Queensland Herbarium, 2021).

Remnant vegetation is considered to have a canopy cover of over 50% and a height over 70% of the benchmark criteria of minimally disturbed vegetation of a given RE.

Areas mapped as TEC follows the specified minimum size criteria for each listed vegetation community (TSSC 2013, 2019); for the Brigalow TEC the minimum size is 0.5 ha and for the Poplar Box TEC the minimum size is 5 ha (or 1 ha if in the highest quality condition, as defined by the EPBC Act Conservation Advice). The patch size used in the assessment against the minimum size criteria included all areas where a patch extended beyond the boundary of the Project Area. No minimum size has been specified for SEVT (McDonald, 2010) however for this EAR, no patches of this TEC were located in the Project Area.

Ground-truthed areas of advanced regrowth vegetation were assigned to the floristically equivalent RE for assessment of potential ESA status.

3.3.2.2 BioCondition Assessment

BioCondition assessments were used to evaluate ecological functionality of vegetation in the Project Area. These assessments applied the methodologies described by Eyre et al. (2015). This involved the following:

- Establishment of a 100 m x 50 m plot for measurements relating to canopy layer structure and diversity;
- 100 m transect to measure canopy cover;
- 50 m x 10 m subplot for measuring plant richness in shrub and ground layers;
- 50 m x 20 m subplot for measuring coarse woody debris; and
- Five 1 x 1 m quadrats to estimate ecological components of ground cover within the assessment area.

These values were used as indicators of ecosystem function relative to minimally disturbed benchmark sites (Queensland Herbarium, 2021). Eight BioCondition assessments were undertaken to determine ecological condition of the major vegetation types in the northern part of the Project Area. These BioCondition assessments were made within remnant and regrowth of each vegetation type present within the Project Area.

BioCondition assessments involved the collection of the following information:

- General habitat description and RE type;
- Median height for canopy, emergent and sub-canopy strata;
- Slope position/slope degree and slope aspect;
- Tree species richness (within 100 m x 50 m plot);
- Native plant species richness (within 50 m x 10 m plot);
- Non-native plant cover (within 50 m x 10 m plot);
- Total length of coarse woody debris (length >10 cm diameter and >0.5 m long within 50 m x 20 m plot);
- Number and average diameter at breast height (DBH) of large Eucalypt and non-eucalypt trees (within 100 m x 50 m plot);
- Recruitment of canopy species (within the 100 m x 50 m plot);
- Tree and shrub canopy cover (within 100 m transect);
- Ground cover within 1 m x 1 m plots (native perennial grass and organic litter cover in the ground layer); and
- Disturbances (severity, last event and observation type) (BOOBOOK, 2022).

Number of large trees – large tree DBH thresholds were used according to RE benchmarks, where benchmarks were not available >30 cm DBH for eucalypts and >20 cm DBH for non-eucalypt trees were used as the qualifying criteria.

BioCondition scores were calculated by comparing in situ values from each survey site, with the corresponding RE benchmark (Queensland Herbarium, 2021). Sub-scores were calculated for each site, scores close to 0 indicate sites that are ecologically 'dysfunctional' and scores closer to 1 indicate increasing functional integrity. BioCondition surveys and score calculations were done in accordance with Eyre *et al.* (2015)

3.3.2.3 Flora Species Survey

Targeted threatened species searches were undertaken for EPBC Act and NC Act listed (August 2022) threatened flora within the Project Area (refer to Section 3.3.4 for the survey adequacy). Additional targeted flora surveys for threatened flora species will be undertaken during the pre-clearance surveys where impact to habitat values for these species is unavoidable, as outlined in the Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001]. Survey effort completed to support this EAR included detailed habitat assessments, recording the condition and structure of all areas of vegetation across the site. This data has been used to assess the suitability of broad habitat types and vegetation communities to support listed threatened flora species and to map potential habitat for any that have been assessed as known, likely or potential to occur in the Project Area.

Where listed threatened species were found, the species, location and number of individuals were recorded. Many areas of vegetation beyond identified focus survey points were not visited but were mapped from viewpoints and imagery and assigned an appropriate level of confidence.

Significant weed species, Weeds of National Significance (WoNS) and *Biosecurity Act 2014* Restricted Matters, were also recorded as part of the assessment (BOOBOOK, 2022d).

Targeted threatened flora surveys were conducted from 31 January to 3 February 2023. Findings are included in Appendix E.

3.3.2.4 Fauna Species Survey

Targeted threatened species searches were undertaken for EPBC Act and NC Act listed (August 2022) threatened and/or migratory fauna within the Project Area. This involved both incidental and targeted searches in accordance with species specific survey guidelines. Incidental searches consisted of opportunistic active searches in suitable habitat while traversing the Project Area (BOOBOOK, 2022d). Targeted faunal survey techniques included timed active searches, recordings of bat calls using Anabat recorders, and spotlighting for arboreal mammals. Targeted species surveys involved the following:

- Anabat echolocation bat call detection was undertaken in two locations over two nights (8 trap nights), in the northern part of the Project Area, targeting suitable habitat for Corben's Long-eared Bat (*Nyctophilus corbeni*) (BOOBOOK, 2022d); and
- Spotlighting surveys were made in two sites, in riparian woodland along Wandoan Creek and in similar vegetation along Woleebee Creek, within the Project Area. Each spotlighting consisted of a two-hour, approximately 2 km meandering transect through habitat suitable for arboreal mammals covering all vegetation strata along the route (BOOBOOK, 2022d).

Refer to the survey adequacy assessment in Section 3.3.4. Additional active fauna searches for threatened species will be undertaken during the pre-clearance surveys, as outlined in the Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001].

3.3.2.5 Fauna Habitat Assessment

Data were collected for fauna habitat features to inform the likelihood of occurrence and significant impact assessments for EPBC Act and NC Act listed fauna species (BOOBOOK, 2022d). These data were collected within the same plots surveyed as part of the vegetation assessments, including proposed infrastructure areas within non-remnant vegetation.

The parameters measured during habitat assessments included:

- Context with regard to landscape features (connectivity, proximity to water);
- Condition (weeds, evidence of disturbance, invasive species);
- Breeding and roosting habitat features (hollows, nests, caves);

- Foraging sources (flowering tree species, termite mounds);
- Microhabitat presence (woody debris, leaf litter specifically important for small mammals and reptiles);
- Wetland presence (presence of aquatic vegetation, water depth); and
- Signs of threatened species (such as scats, scratches, and tracks).

These results of such habitat assessments, along with the vegetation community assessments were used to inform the habitat mapping for EPBC Act and NC Act listed threatened and/or migratory species within the Project Area.

3.3.2.6 Environmentally Sensitive Areas

Government mapped ESA include protected estates, such as State Forests and Resource Reserves, as well as ecological features, such as endangered and of concern vegetation communities, mapped essential habitat for threatened species and ground-truthed habitat for EVNT species listed under the NC Act.

Ecological ESA identified in the desktop assessment (DES, 2022d) were ground-truthed in the field to verify the existence and extent of these features. Ground-truthing of vegetation also identified additional areas of ESA (endangered and of concern vegetation communities).

3.3.3 Aquatic Ecology Field Survey Methodology

The aquatic ecology sampling was undertaken by Freshwater Ecology from the 14 – 21st of March 2022. Sampling was conducted under General Fisheries Permit No. 207913, scientific user permit for non-protected areas WISP18336317, and Animal Ethics Approval No. CA 2020/02/1352, held by Freshwater Ecology. A summary of the aquatic survey methods is presented in this EAR, with the full details of these sampling methods and locations provided in the aquatic ecology report in Appendix D.

Thirty-two sites assessed across the Project Area (Figure 3-1) and the sampling techniques used were in line with the *Monitoring and Sampling Manual: Environmental Protection (Water) Policy* (DES, 2018b). Assessments undertaken included:

- Aquatic habitat assessment (all 32 sites);
- In situ water quality assessment (24 sites);
- Macrophytes assessment (30 sites);
- Macroinvertebrate assessment (15 sites);
- Backpack electrofishing (13 sites);
- Fyke netting (large nets) (six sites); and
- Visual observation.

3.3.3.1 Aquatic habitat assessment

Aquatic habitat assessments were undertaken following the Australian River Assessment System (AusRivAS) protocols (DNRM, 2001). The assessments were undertaken by Dr Timothy Howell from Freshwater Ecology who is an AusRivAS accredited ecologist (CV attached as part of Appendix H). The habitat assessments included:

- Substrate composition;
- Flow, water depth and wetted width, noting if surface water was connected or comprised of one or more disconnected pools in the channel;
- Channel morphology;
- Physical habitat features, such as large woody debris, undercut banks and aquatic plants;

- Riparian vegetation cover and condition;
- Any notable disturbances including bank erosion, cattle access to waterway and barriers associated with nearby road crossings or dams; and
- Other on-site observations, such as presence of filamentous or benthic algae, surface scums, unusual sediment deposits, or fish kills.

Additional habitat inventory was completed at each site and included a general description of the environmental features and composition within, and immediately surrounding each site was undertaken at each monitoring location to assist in the interpretation of ecological data.

Aquatic habitat was assessed in accordance with *Queensland Australian River Assessment System (AUSRIVAS) Sampling and Processing Manual* (Department of Natural Resources and Mining [DNRM], 2001). Habitat bioassessment score datasheets (DNRM, 2001) were used to numerically score nine criteria, which were then allocated to one of four categories (excellent, good, moderate and poor). The sum of the numerical rating from each category produced an overall habitat condition assessment score (Table 3-2).

Table 3-2: Aquatic Habitat Bioassessment Scores

Habitat Category	Category Score Range			
	Excellent	Good	Fair	Poor
Bottom substrate/available cover	16–20	11–15	6–10	0–5
Embeddedness	16–20	11–15	6–10	0–5
Velocity/depth category	16–20	11–15	6–10	0–5
Channel alteration	12–15	8–11	4–7	0–3
Bottom scouring & deposition	12–15	8–11	4–7	0–3
Pool/riffle, run/bend ratio	12–15	8–11	4–7	0–3
Bank stability	9–10	6–8	3–5	0–2
Bank vegetative stability	9–10	6–8	3–5	0–2
Streamside cover	9–10	6–8	3–5	0–2
Total score for the Site	111–135	75–110	39–74	0–38

3.3.3.2 Surface water quality

In situ water quality data was recorded using multiparameter water quality meters. Calibrations were regularly checked in the field and all sample collections were completed in accordance with the *Monitoring and Sampling Manual: Environmental Protection (Water) Policy* (DES, 2018) and AS/NZ 5667.6:1998 Guidance on sampling of rivers and streams (AS/NZS 1998).

The parameters assessed are presented in Table 3-3. Water quality testing was undertaken in conjunction with macroinvertebrate sampling to assist with the interpretation of results.

Table 3-3: In Situ Water Quality Measurement Parameters

Parameter	Units	Measurement Precision
Water temperature	°C	± 0.1
pH	pH units	± 0.1
Dissolved oxygen	% Saturation	± 1
Electrical conductivity	µS/cm	± 1
Turbidity	NTU	± 0.1

3.3.3.3 Aquatic Flora

Macrophyte surveys were completed following fish and macroinvertebrate surveys. All macrophyte species at each sampling site were recorded. Species were identified using Stephens & Dowling (2002), Sainty & Jacobs (2003) and MacDonald & Haslam (2016). The relative site coverage of each macrophyte species was recorded (E – extensive, M – moderate, S – some and L – little).

Macrophyte species were categorised by growth form in accordance with definitions provided in Sainty and Jacobs (2003), as follows:

- Free floating – Species that are normally unattached and float on the surface but may become attached and rooted in drying mud when water levels drop.
- Floating attached – Species that are rooted in the substrate but normally have at least the mature leaves floating on the water surface.
- Submerged – Species rooted in the substrate or free-floating submerged.
- Emergent – Species rooted in the bank substrate with stems, flowers, and most of the mature leaves projecting above the water surface.

No free floating or submerged macrophytes were recorded.

3.3.3.4 Aquatic Macroinvertebrates

Freshwater macroinvertebrates were sampled in accordance with the Monitoring and Sampling Manual: Environmental Protection (Water) Policy (DES, 2018).

A 250-micron (µm) mesh dip net fitted to a triangular frame (250 mm x 250 mm x 250 mm) was used to collect samples by first disturbing the benthos and sweeping the net through the water. The sample was evenly distributed into sorting trays and field (live) picking was completed for each sample for a minimum of 30 minutes and a maximum of one hour. Picked macroinvertebrates preserved in a 70% methylated spirits solution.

In the laboratory, macroinvertebrates were sorted, identified to the family taxonomic level and relative abundance enumerated. Samples were identified to family level with the exception of lower phyla (e.g., porifera, nematoda), oligochaetes (freshwater worms) and acarina (freshwater mites). Chironomids were identified to sub-family level in accordance with standard AusRivAS protocols (DNRM, 2001).

Enumeration and identification of macroinvertebrate samples was conducted by Susan Jones, an experienced AusRivAS accredited taxonomist. Sorting, enumeration and data entry was cross-checked by a second ecologist for 10% of the samples.

3.3.3.5 Fish

Fish surveys were conducted at each monitoring location in line with the approach outlined in the *Monitoring and Sampling Manual: Environmental Protection (Water) Policy* (DES, 2018).

Backpack electrofishing was undertaken in waterways containing sufficient water. Sampling was carried out over a site reach spanning at least 100 m (where sufficient water was available), with care being taken to sample all macro and microhabitat types.

All electrofishing was undertaken in compliance with the Australian Code of Electrofishing Practice (NSW Fisheries, 1997) with the minimum power setting used to effectively attract and stun the fish.

Unbaited box trapping is a passive fish sampling technique that targets small bodied pelagic and benthic species. Five to 10 unbaited box traps were strategically placed at all sites for between 30 minutes and 2 hours.

3.3.3.6 Turtles

A number of sites were assessed as having sufficient water to potentially support turtles. Two fyke nets (one large and one small) were set overnight at each site sampled for turtles as well as two cathedral traps. The nets and traps were baited with tinned sardines with the cod end suspended above the water line with ropes to prevent drowning of air breathing animals. Nets were set in the late afternoon and were checked early the following morning.

3.3.3.7 Platypus

The habitat at each site was assessed for the suitability for supporting platypus. The criteria used to assess each site are shown in Table 3-4 and included water permanency, volume of water present, water quality, microhabitat diversity, submerged macrophytes, foraging habitat and burrowing habitat (Grant, 2007).

Table 3-4: Platypus Habitat Suitability Criteria

Suitability	Reason
Good	Sections dominated by deeper pools with steep undercut banks, overhanging vegetation and flowing water. Water is known, or likely, to be permanent. These areas are considered likely to be frequented by platypus.
Average	A mix of deeper pools and stretches of shallower water (<0.5 m). Some pools of water may be semi-permanent, possibly drying during severe drought. Undercut banks and overhanging vegetation is frequent, though water may be turbid. Platypus should not be excluded from these areas, though the likelihood that they could occur is lower than in 'good' habitat. These sections may not permanently support platypus through periods of prolonged drought.
Poor	Sections with shallow water; widely separated or no deep pools. Water flow is likely to be less frequent, possibly drying on a regular basis. Undercut banks and overhanging vegetation is infrequent. Poor sections are unlikely to permanently support platypus but may provide access between good and average quality habitat.

3.3.3.8 Frogs

Sampling of frogs was restricted to opportunistic visual encounter surveys and call surveys. These were undertaken during general aquatic ecology surveys. At each site suitable habitat searched for any frogs present. No frogs were heard calling, and no tadpoles were recorded.

3.3.4 Survey Adequacy Review

Desktop searches and subsequent baseline ecology surveys were performed prior to listing events and distribution changes for some species, which have now been accounted for in this report. A survey adequacy review has been undertaken for the completed surveys to date, as shown in Table 3-5. Additional ecological assessment surveys will be completed during pre-clearance surveys as described in the Senex Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001] to ensure no significant impacts to MNES occur.

Table 3-5: Fauna and Flora Survey Adequacy Assessment

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
Listed Threatened Birds						
Australian Painted Snipe (<i>Rostratula australis</i>)	E, EN	<p>Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA, 2017).</p> <p>Searches are recommended through suitable wetland or watercourse areas, with detected via sighting and flushing at dawn and dusk.</p> <p>Targeted stationary observations – 10 hours for 5 days.</p> <p>Land-based area searches or line transects – 10 hours for 3 days.</p>	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including bird nests, roosting sites, gilgai and potential foraging habitat.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>The Project Area contains small areas of foraging habitat within small ephemeral wetlands on drainage lines. No <i>Rostratula australis</i> were observed during the survey efforts. Surveys were conducted for all threatened birds at each habitat assessment point. The survey effort implemented partially met the guidelines for Australian Painted Snipe, as a census of all birds observed was completed at each habitat assessment point. However, no flushing surveys were conducted.</p> <p><i>The survey efforts partially meet the survey guidelines. This species was assessed as being potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied	Yes
Brown Treecreeper (south-eastern) (<i>Climacteris picumnus victorae</i>)	V, VU	<p>Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as</p>	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including bird nests,</p>	<p>57 habitat assessments were conducted in eucalypt forests and woodlands and surveys were conducted for all threatened birds at each habitat assessment point. No</p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p><i>threatened under the EPBC Act (DEWHA, 2017).</i></p> <p>There are no targeted survey guidelines for this species. Active searches or transects whilst recording any sightings and calls within suitable habitat is recommended. Suitable habitats include; open dry eucalypt forests and woodlands with some form of shrubby/ grassy or open understorey. Active searches for microhabitat features include; hollows within living or dead standing trees/ tree stumps.</p>	<p>roosting sites, hollow bearing logs, live trees and stags, leafy and woody litter and potential food plants.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area</p>	<p>individuals were observed during the survey efforts.</p> <p><i>As the species does not have targeted survey guidelines, and active searches were undertaken within suitable habitats whilst meandering the Project Area, the survey efforts are considered sufficient. This species was assessed as being potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	principle is being applied	
Diamond Firetail (<i>Stagonopleura guttata</i>)	V, VU	<p><i>Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA, 2017).</i></p> <p>There are no targeted survey guidelines for this species. Active searches or transects whilst recording any</p>	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including bird nests, roosting sites, grassy ground cover and potential food plants.</p>	<p>Four field surveys were conducted between March and June, with 57 habitat assessments conducted, including within eucalypt forests and woodlands. Surveys were conducted for all threatened birds at each habitat assessment point. No individuals were observed during the survey efforts.</p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		sightings and calls within suitable habitat is recommended. Suitable habitats include; grassy eucalypt, acacia, or casuarina woodlands, other suitable habitat include open forests, mallees or natural temperate grasslands. Active searches for microhabitat features include; globular structured nests within the shrubby understorey of woodland areas.	Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area	<i>As the species does not have targeted survey guidelines, and active searches were undertaken within suitable habitats whilst meandering the Project Area, the survey efforts are considered sufficient.</i> <i>This species was assessed as being potential to occur as per the Likelihood of Occurrence in Appendix B.</i>		
Painted Honeyeater (<i>Grantiella picta</i>)	V, VU	Targeted species survey guidelines: Painted honeyeater (<i>Grantiella picta</i>) (Rowland, J., 2012). Area searches (during breeding season being August – February) involve systematically searching for birds and signs of their presence (e.g., nesting habitat), as well as listening for their calls, throughout the Project Area (DEWHA, 2010). Surveys for this species should be conducted	57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including bird nests, roosting sites, grassy ground cover and potential food plants including Mistletoe. Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.	Four field surveys were conducted between March and June, outside of the optimal survey timeframes for the species (August – February). Surveys were conducted for all threatened birds at each habitat assessment point. The species was not recorded during field surveys. Surveys were conducted in eucalypt forest and woodlands, with particular focus on the presence and abundance of Mistletoe and other food trees. Mistletoes were recorded during field surveys however they	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>on foot and targeted foraging and breeding habitat, which includes woodlands where mistletoes are abundant, and, when they are in fruit (Watson, 2012).</p> <p>There is currently no published information on detection probabilities for painted honeyeater. However, the recommended level of effort below is based on published data from systematic surveys of the species (Oliver et al. 2003; Barea and Watson 2007). This suggest effort may be provided reasonable opportunities to detect painted honeyeater, during optimal survey conditions, if suitable habitat is present within the project Area.</p> <p>Important to note that detectability of this species in the breeding season differs from the non-breeding season. In the non-breeding season, birds show up in</p>		<p>were considered uncommon across the Project Area.</p> <p><i>The survey efforts partially meet the survey guidelines as surveys were conducted outside of the optimal survey timeframes.</i></p> <p><i>This species was assessed as being potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>		

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		random areas outside core habitat ranges (usually in association with fruiting mistletoes) either singly or in small groups. Area searches minimum effort is 4 hours over 4 days.				
South-eastern Glossy Black-cockatoo (<i>Calyptorhynchus lathami lathami</i>)	V, VU	Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA, 2017). There are no targeted survey guidelines for this species. Active searches or transects whilst recording any sightings and calls within suitable habitat is recommended. Suitable foraging habitat includes eucalypt woodlands with <i>Allocasuarina</i> spp. or <i>Casuarina</i> spp. seeds. Active searches for microhabitat features include large hollows in both living and dead eucalypt trees.	57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including hollows in hollow bearing trees (live and stags) and potential food plants. Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.	Surveys were conducted in eucalypt forest and woodlands, with particular focus on the presence and abundance food trees and hollow bearing trees (live and dead standing). Active searches for signs of recent feeding evidence in the form of chewed cones at each habitat assessment survey point that contained known food tree species. Food trees in the Project Area included Belah (<i>Casuarina cristata</i>) and Bull-oak (<i>Allocasuarina luehmannii</i>). Potential nest trees containing suitably sized hollows were observed in remnant eucalypt woodland and forests across the Project Area. The survey effort for active searches to locate evidence of foraging and nest trees was sufficient to meet the survey guidelines.	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>Most detectable during the first and last two hours of daylight.</p> <p>Minimum survey effort:</p> <ul style="list-style-type: none"> ■ 5 hours over one day of active searches or transects on foot in foraging habitat. ■ 20 hours over four days of active searches for signs of recent feeding and nests. 		<p>Surveys were also conducted for all threatened birds at each of the 57 habitat assessment points. Although not recorded during field surveys, the species has previously been recorded within 100 m of the Project Area.</p> <p><i>Diurnal bird surveys were not conducted during the field surveys.</i></p> <p><i>Active searches were undertaken throughout the extensive survey period, and 57 habitat assessments were conducted, with particular focus on detecting species habitat features. The survey efforts partially meet the survey guidelines for the Glossy Black-cockatoo (south-eastern), through meeting active search requirement for nest trees and evidence of feeding. The survey effort for targeted observations partially met requirements through the completion of bird surveys at each habitat assessment point, as well as recording of incidental observations during the survey period. This species was assessed as being likely to occur as per the Likelihood of Occurrence in Appendix B</i></p>		

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
Southern Whiteface (<i>Aphelocephala leucopsis</i>)	V, VU	<p>Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA, 2017).</p> <p>There are no targeted survey guidelines for this species. Active searches or transects whilst recording any sightings and calls within suitable habitat is recommended. Suitable habitats include; open woodlands and shrublands that have a grassy or shrubby understorey usually dominated by Acacia or Eucalypt spp. Active searches for microhabitat features include; tree hollows in either living or dead eucalypt or acacia trees.</p>	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including hollows in hollow bearing trees (live and stags), grassy ground cover and potential food plants.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>There are no targeted survey guidelines for the Southern Whiteface. Bird surveys were undertaken throughout the extensive survey period, and 57 habitat assessments were conducted, with particular focus on detecting species habitat features including hollow-bearing trees in eucalypt forests and woodlands.</p> <p>A census of all birds observed was completed at each habitat assessment point. The species was not recorded during field surveys.</p> <p><i>As the species does not have targeted survey guidelines, and active searches were undertaken within suitable habitats whilst meandering the Project Area, the survey efforts are considered sufficient.</i></p> <p><i>This species was assessed as being potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied	Yes
Southern Squatter Pigeon (<i>Geophaps scripta scripta</i>)	V, VU	<p>Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as</p>	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant</p>	<p>Surveys were conducted for Southern Squatter Pigeon throughout the Project Area in patches of grassy understorey of eucalypt woodlands,</p>	Yes, as surveys were adequate to determine the presence of potential habitat and	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p><i>threatened under the EPBC Act (DEWHA, 2017).</i></p> <p>Area searches or transect surveys in suitable habitat. Flushing surveys also likely to be useful.</p> <p>Area searches or transect surveys for 15 hours over 3 days in areas less than 50 ha. Flushing surveys for 10 hours over 3 days.</p>	<p>vegetation to detect habitat features including nests and grassy ground cover.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>grasslands adjacent to woodlands and shrublands and areas close to permanent bodies of water (most typically farm dams, watering holes and ephemeral waterways).</p> <p>Surveys for birds were conducted for all threatened birds at each habitat assessment point. The survey effort implemented partially met the guidelines for the Southern Squatter Pigeon, as a census of all birds observed was completed at each habitat assessment point, however no flushing surveys were conducted.</p> <p>The species was not recorded during survey efforts.</p> <p><i>As no flushing surveys were undertaken, the survey efforts partially meet the survey guidelines for Southern Squatter Pigeon through completion of bird surveys at each habitat assessment point. This species was conservatively assessed as having the potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	the precautionary principle is being applied	
White-throated Needletail (<i>Hirundapus caudacutus</i>)	V and Mi, VU	<i>Species Profile and Threats Database:</i>	57 x Habitat assessments within 50 m x 20 m (0.1 ha)	Incidental searches were conducted for all threatened birds, as well as bird	Yes, as surveys were adequate to determine	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p><i>Hirundapus caudacutus</i> – White throated needletail (DCCEEW, 2019).</p> <p>There are no targeted survey guidelines for this species however DCCEEW have advice of surveying efforts. The species occurs at great elevations, being primarily aerial, when flying at lower altitudes are readily detectable. Systematic surveys are difficult due to the species mobility and ability to cover immense distances in a day. Any surveys must be conducted between October and April in northern and eastern Australia, and between December and March in south-eastern Australia.</p>	<p>plots, including infrastructure areas and non-remnant vegetation to detect habitat features including hollows in hollow bearing trees (live and stags). Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>surveys at each of the 57 habitat assessment points. Systematic surveys are considered difficult as the species is almost exclusively aerial. Four field surveys were conducted between March and June, overlapping with the optimal survey timeframes for the White-throated Needletail.</p> <p>The White-throated Needletail was not observed during field investigations for the current Project, however, was observed within the Project Area during subsequent field surveys for Senex on 24 November 2022 (Cunningham, M pers. comm.). A flock of eight birds were observed flying low near Weldon's Road.</p> <p><i>There are no targeted survey guidelines, however, survey efforts are deemed sufficient for White-throated Needletail, through completion of bird surveys at each habitat assessment point. This species was assessed as being known to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	<p>the presence of potential habitat and the precautionary principle is being applied</p>	

Listed Migratory Species (Birds)

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
Common Sandpiper (<i>Actitis hypoleucos</i>)	Mi and Ma, SLC	<p>Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA, 2017).</p> <p>Observation using telescope from vantage points overlooking suitable foraging or roosting habitat at appropriate periods of the tidal cycle. Transect surveys by boat around offshore islands, lake shores, coastlines and rivers. Aerial surveys of foraging habitat in large or remote study areas at the appropriate period of the tidal cycle.</p> <p>Recommended survey timing is December to February (DEE, 2017).</p>	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including rock and grassy ground cover.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>The Project Area lacks preferred habitat for the species, alike coastal or wetland habitats. The Project Area does contain potential habitat in the form of farm dams, however during survey efforts no individuals were observed.</p> <p><i>There are no species-specific targeted survey guidelines, however, survey efforts are deemed only partially sufficient, via incidental searches and bird surveys completed at each of the 57 habitat assessments throughout the Project Area due to the timing of surveys being conducted in March, when the species may have started departing Australian foraging habitats. This species was assessed as being potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied	Yes
Fork-tailed Swift (<i>Apus pacificus</i>)	Mi and Ma, SLC	<p>Draft referral guidelines for 14 birds listed as migratory species under the EPBC Act (DoE, 2015).</p> <p>No survey guidelines specific to the Fork-tailed Swift –</p>	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation.</p>	<p>The species distribution is within the Project Area however, no individuals of the species were observed during the survey efforts. Incidental searches were conducted for all threatened birds.</p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>however, recommended to focus survey efforts from high vantage points.</p> <p>This species is found across a range of habitats (non-breeding habitats only), from inland plains to wooded areas. It is exclusively aerial.</p>	Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.	<p>Four field surveys were conducted between March and June, overlapping with the migratory timeframe (October to Mid-April) for the species.</p> <p>Surveys were conducted within areas of habitat that are suitable for the species, including woodlands. The species is more known to occur within coastal ecosystems such as heathlands, or riparian woodlands near coastal zones.</p> <p><i>There are no targeted survey guidelines, however, survey efforts are deemed sufficient for Fork-tailed Swift, via incidental searches and bird surveys completed at each of the 57 habitat assessments throughout the Project Area. This species was assessed as being likely to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	principle is being applied	
Latham's Snipe (<i>Gallinago hardwickii</i>)	Mi and Ma, SLC	<p><i>Draft referral guidelines for 14 birds listed as migratory species under the EPBC Act (DoE, 2015).</i></p> <p>The survey guidelines (Department of the</p>	57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat	The Project Area encompasses preferred foraging habitat for the species, albeit limited within ephemeral wetlands, drainage lines and farm dams.	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>Environment and Energy, 2017) recommend the following methods and survey effort for the Latham's snipe, bird surveys in suitable habitat:</p> <ul style="list-style-type: none"> ■ Surveys should be conducted during the day and consist of area searches or line transects in suitable habitat (i.e., wetland or other waterbodies and their surrounding vegetation (Department of the Environment and Energy, 2020). ■ Surveys should be conducted for Latham's snipe between October and February when the species arrives and depart in Australia. 	<p>features including grassy ground cover.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>Farm dams provide potential habitat; however, the survey efforts did not observe any individuals of the species.</p> <p>Surveys were conducted for all threatened birds at each habitat assessment point. The survey effort implemented partially met the guidelines, as a census of all birds observed was completed at each habitat assessment point.</p> <p>Four field surveys were conducted between March and June, outside of the optimal survey timeframe (October to February) for the species.</p> <p><i>As the field surveys were conducted outside of the optimal survey timeframe, the Survey efforts do not meet the survey guidelines for Latham's Snipe. This species was conservatively assessed as having the potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	<p>principle is being applied</p>	
Rufous Fantail (<i>Rhipidura rufifrons</i>)	Mi and Ma, SLC	<i>Draft referral guidelines for 14 birds listed as migratory species under the EPBC Act (DoE, 2015).</i>	57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure	The Project Area had limited suitable habitat typical of the species. Surveys were still conducted in areas that	Yes, as surveys were adequate to determine the presence of potential habitat and	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		No survey guidelines specific to the Rufous fantail – however it is recommended that surveys to be conducted in breeding habitat is an area survey, preferably a two-hectare survey in 20 minutes, over sufficient survey plots to estimate a density, and hence the population size across the proposed development area. Surveys should be undertaken in an appropriate season – spring or summer in southern Australia.	areas and non-remnant vegetation. Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.	presented woodland habitat; however, the species was not recorded. Bird surveys were conducted for all threatened birds at each of the 57 habitat assessment points. The survey effort implemented partially met the guidelines, as a census of all birds observed was completed at each habitat assessment point. <i>There are no targeted survey guidelines, however, survey efforts are deemed sufficient, via incidental searches and bird surveys completed at each of the 57 habitat assessments throughout the Project Area. This species was assessed as being potential to occur as per the Likelihood of Occurrence in Appendix B.</i>	the precautionary principle is being applied	
Satin Flycatcher (<i>Myiagra cyanoleuca</i>)	Mi and Ma, SLC	<i>Draft referral guidelines for 14 birds listed as migratory species under the EPBC Act (DoE, 2015).</i> The referral guideline for 14 birds listed as migratory species under the EPBC Act prescribes the following	57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation. Incidental searches were conducted during opportunistic active searches	There is limited potential habitat present in the form of remnant and non-remnant woodlands within the Project Area. Bird surveys were conducted for all threatened birds at each of the 57 habitat assessment points. The survey effort implemented partially met the guidelines, as a census of all	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>survey methods for the species:</p> <ul style="list-style-type: none"> ■ Bird surveys: 2 ha survey in 20 minutes over sufficient survey plots to estimate a density, and hence the population size across the Project Area; and ■ Standardised timed periods. Surveys must be conducted during when the species is on its northern passage between February and May. 	in suitable habitat whilst traversing the Project Area.	<p>birds observed was completed at each habitat assessment point. No individuals were observed during the field survey efforts.</p> <p>Four field surveys were conducted between March and June, within the optimal survey timeframe (February – May) for the species.</p> <p><i>The survey efforts partially meet the survey guidelines as targeted bird surveys were not undertaken, however incidental searches and bird surveys completed at each of the 57 habitat assessments throughout the Project Area partially meet guidelines. This species was conservatively assessed as having the potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>		
Sharp-tailed Sandpiper (<i>Calidris acuminata</i>)	Mi and Ma, SLC	<p><i>Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA, 2017).</i></p> <p>Observation using telescope from vantage points overlooking suitable foraging</p>	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation including grassy ground cover.</p> <p>Incidental searches were conducted during opportunistic active searches</p>	<p>Small areas of foraging habitat are present within small ephemeral wetlands, farm dams and eucalypt woodlands/open forests in riparian zones, which may provide temporary refuge for the species, within the Project Area.</p> <p>Bird surveys were conducted for all threatened birds at each of the 57</p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>or roosting habitat at appropriate periods of the tidal cycle.</p> <p>Transect surveys by boat around offshore islands, lake shores, coastlines and rivers.</p> <p>Aerial surveys of foraging habitat in large or remote study areas at the appropriate period of the tidal cycle.</p>	in suitable habitat whilst traversing the Project Area.	<p>habitat assessment points. The survey effort implemented partially met the guidelines, as a census of all birds observed was completed at each habitat assessment point. No individuals were observed during the field survey efforts.</p> <p><i>The survey efforts only partially meet the targeted survey guidelines, as recommended survey methods specified in the guideline were not undertaken during field surveys. However incidental searches and bird surveys completed at each of the 57 habitat assessments throughout the Project Area partially met guidelines This species was conservatively assessed as having the potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>		
Listed Threatened Mammals						
Corben's Long-eared Bat (<i>Nyctophilus corbeni</i>)	V, VU	<p>Survey guidelines for Australia's threatened bats (DEWHA).</p> <p>The eastern greater long-eared bat should be</p>	57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including hollows in hollow bearing trees (live	There is a small amount of potential foraging habitat present in the form of wooded areas in the south of the Project Area, with connectivity to woodland outside of the Project Area. Suitable habitat in the Project Area is associated with larger patches of	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>surveyed using capture techniques.</p> <ul style="list-style-type: none"> Passive acoustic detection – Bat detectors can be used to identify areas used by long-eared bats, even if they cannot be identified to species level. Acoustic detection can then be followed up with an appropriate level of trapping. <p>Trapping – Mist nets and harp traps should be placed in woodland, mallee and forest, given that the species forages below the tree canopy, often to ground level. Equipment should be placed both in open fly-ways and within cluttered vegetation.</p>	<p>and stags) and potential food plants.</p> <p>Spotlighting surveys in two locations, in riparian woodland along Wandoan Creek and Woleebee Creek, at one hour after sunset, for 2 hours over a 2 km meandering transect.</p> <p>Anabat recorders deployed overnight in two locations.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>remnant eucalypt and acacia woodlands.</p> <p>Although Anabat recorders were used during field surveys, it is not possible to reliably distinguish Corben's Long-eared Bat on calls, therefore trapping is required to detect Corben's Long-eared Bat.</p> <p>The species was not recorded during field surveys, and no <i>Nyctophilus spp.</i> were recorded on the Anabats deployed.</p> <p>Capture techniques, as specified in the guidelines, were not conducted during field surveys.</p> <p><i>The survey efforts do not meet the targeted survey guidelines for Corben's Long-eared Bat. This species was conservatively assessed as having the potential to occur as per the Likelihood of Occurrence in Appendix B</i></p>	<p>principle is being applied</p>	
Greater Glider (central and southern) (<i>Petauroides volans</i>)	E, EN	Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (DES, 2018).	Spotlighting surveys in two locations, in riparian woodland along Wandoan Creek and Woleebee Creek, at one hour after sunset, for	Potential foraging and denning habitat of tall, mature Eucalypt forests present within the Project Area, specifically along the riparian areas. The species was recorded during field	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>Requires two 30-person minute spotlight searches of 100 x 100 m survey site across multiple nights. This can include spotlighting up one side of the 100 x 100 m area and then spotlighting back the other side of the 100 x 100m area.</p> <p>Scat and sign search can coincide with the systematic diurnal active searches, within 50 x 50 m quadrates of the survey site.</p> <p>Survey Guidelines for Australia's Threatened Mammals (DSEWPC, 2011).</p> <p>Bright moonlight aids in detecting greater gliders.</p> <p>Spotlighting should be at least two 200 m transects per 5 ha sites. It is also recommended there be 100 m between survey transects.</p>	<p>2 hours over a 2 km meandering transect.</p> <p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including hollows in hollow bearing trees (live and stags) and potential food plants.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>surveys, in seven locations across the Project Area. These locations included in Queensland Blue Gum (<i>Eucalyptus tereticornis</i>) woodland in the north of the Project Area, in the remnant riparian corridors along Wandoan Creek and Woleebee Creek.</p> <p>Spotlighting surveys have been conducted during the right period in suitable habitat for the greater Glider (southern and central).</p> <p><i>The survey efforts partially meet the survey guidelines for Greater Glider (southern and central) as spotlighting searches need to be conducted in potential habitats within the southern portion of the Project Area. This This species was assessed as being known to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	principle is being applied	
Koala (<i>Phascolarctos cinereus</i>)	E, EN	Terrestrial Vertebrate Fauna Survey Guidelines	Spotlighting surveys in two locations, in riparian woodland along Wandoan	The species was not directly sighted during field surveys, however indirect evidence in the form of potential	Yes, as surveys were adequate to determine the presence of	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>for Queensland (DES, 2018).</p> <p>Requires two-person, 30-minute spotlight searches of 100 x 100 m survey site. This can include spotlighting up one side of the 100 x 100 m area and then spotlighting back the other side of the 100 x 100 m area.</p> <p>Scat and sign search can coincide with the systematic diurnal active searches, within 50 x 50 m quadrates of the survey site.</p> <p>EPBC Act referral guidelines for the vulnerable koala (DoE, 2014).</p> <p>Survey effort must be determined on a case-by-case basis.</p> <p>Direct observations:</p> <ul style="list-style-type: none"> Direct observation surveys should be undertaken between August and January for peak activity. 	<p>Creek and Woleebee Creek, at one hour after sunset, for 2 hours over a 2 km meandering transect.</p> <p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including potential food trees and riparian vegetation.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>scratch marks on trees were recorded in several locations across the Project Area.</p> <p>Spotlighting surveys have been conducted during the right period in suitable habitat for the Koala. A total of 57 habitat assessments were conducted across the Project Area, concluding both foraging and breeding habitat of Eucalypt forests, and preferred food trees including <i>E. tereticornis</i>, <i>E. populnea</i>, <i>E. crebra</i>, <i>E. longirostrata</i>, <i>E. melanophloia</i>, <i>E. exserta</i> and <i>Corymbia citriodora subsp.</i> are present within the Project Area.</p> <p>Four field surveys were conducted between March and June, outside the optimal survey timeframe (August to January) for the Koala.</p> <p>Diurnal searches, camera trapping detection dogs and call playback were not undertaken during field surveys.</p> <p><i>The survey efforts partially meet the survey guidelines for the Koala. This species was assessed as being likely to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	<p>potential habitat and the precautionary principle is being applied</p>	

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<ul style="list-style-type: none"> Strip transects which involve diurnal distance sampling and density searches. Nocturnal spotlighting for smaller sites to determine presence and density. Call Playback; The use of detection dogs; and Camera trapping in areas where fresh scats and/or scratching have been detected. <p>Indirect observations:</p> <ul style="list-style-type: none"> Scats – Spot Assessment Technique (SAT) which involves looking at food trees for presence of koala scats. Scats – Regularised Grid Based Spot Assessment Technique; Scats— Koala optimised Rapid Assessment Methodology; and 				

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<ul style="list-style-type: none"> Faecal standing crop assessment; and Scratchings. 				
Northern Quoll (<i>Dasyurus hallucatus</i>)	E, SLC	<p>Survey Guidelines for Australia's Threatened Mammals (DSEWPC, 2011).</p> <p>Cage trapping is the most effective method for detecting this species and is best conducted through May to August (10 cage traps for four consecutive nights spaced in an area of 5 hectares – replication necessary for larger areas). However, in large survey areas, Elliott trapping surveys are also recommended (25 Elliott traps for four consecutive nights).</p> <p>Additional or complementary techniques to survey for this species include daytime searches for potentially suitable habitat resources, such as areas associated</p>	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including rocky habitats, hollows in hollow bearing trees (live and stags) and logs, termite mounds, grassy ground cover and potential food plants.</p> <p>Spotlighting surveys in two locations, in riparian woodland along Wandoan Creek and Woleebee Creek, at one hour after sunset, for 2 hours over a 2 km meandering transect.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>Potential suitable rocky areas for breeding, denning and foraging habitat are limited to the far south-eastern corner of the Project Area in the plateau with eucalypt woodland/open forest habitat types.</p> <p>Spotlighting surveys were undertaken in two locations within the Project Area; however, the species was not recorded during field surveys.</p> <p>Trapping methods were not utilised during the field surveys.</p> <p><i>The survey efforts partially meet the survey guidelines for the Northern Quoll as trapping methods including camera trapping were not conducted due to areas of potential habitat along gullies, ridges containing potential habitat will not be impacted by the Project. This species was conservatively assessed as having the potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>with a gully or a ridge and potential den sites.</p> <p>Remote cameras in potentially suitable habitat are also recommended for sampling in remote areas.</p> <p>Hair tubes and spotlighting are also suggested as potential surveying methods for this species.</p> <p>EPBC Act referral guideline for the endangered northern quoll <i>Dasyurus hallucatus</i> (DoE, 2016).</p> <p>Recommended camera trapping is outlined as transects of ten baited remote motion sensor cameras spaced at least 100 m intervals for four nights is recommended. For linear habitat critical to the survival of the species (e.g., gorges, major drainage lines, breakaways less than 100 m wide), 1 camera per 100 linear metres is recommended. When using</p>				

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		remote cameras for targeted survey they must be deployed to enable estimates of population size, habitat use and importance.				
Short-beaked Echidna (<i>Tachyglossus aculeatus</i>)	-, SLC	<i>There are no species-specific guidelines for surveying of this species.</i> Searches should be conducted in habitat assessments and whilst trans versing the landscape.	Spotlighting surveys in two locations, in riparian woodland along Wandoan Creek and Woleebee Creek, at one hour after sunset, for 2 hours over a 2 km meandering transect. 57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including termite mounds, burrows and rock crevices. Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.	The Project Area pertains habitat features that are typical of the species. The species was not recorded during field surveys. <i>There are no targeted survey guidelines, however, survey efforts are deemed sufficient, via incidental and spotlighting searches, and 57 habitat assessments throughout the Project Area. This species was assessed as being likely to occur as per the Likelihood of Occurrence in Appendix B.</i>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied	Yes
Yellow-bellied Glider (south-eastern) (<i>Petaurus australis australis</i>)	V, VU	<i>Terrestrial Vertebrate Fauna Survey Guidelines</i>	Spotlighting surveys in two locations, in riparian woodland along Wandoan	There is potential foraging and denning habitat present in the form of wooded plateaus in the far south-	Yes, as surveys were adequate to determine the presence of	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>for Queensland (DES, 2018).</p> <p>Feeding mark searches on trees are an effective way to identify this species. This is because these gliders use their teeth to incise tree bark for feeding. A list of tree species the yellow-bellied glider prefers is found in the guidelines.</p> <p>Call playback is another method that can detect this species. This method involves conducting playback on two occasions over different nights in a survey area. This is then followed by a 5-minute listening period for un-elicited calls.</p>	<p>Creek and Woleebee Creek, at one hour after sunset, for 2 hours over a 2 km meandering transect.</p> <p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including hollows in hollow bearing trees (live and stags) and logs, and potential food trees.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>eastern corner of the Project Area, however no feed trees were recorded in the Project Area.</p> <p>Spotlighting searches were undertaken in two locations within the Project Area</p> <p>The species was not observed during field surveys, however suitable foraging habitat was located, and records within 10 km of the Project Area, meant the species is considered with potential to occur.</p> <p><i>The survey efforts partially meet the survey guidelines for the Yellow-bellied Glider (south-eastern) as call playback was not undertaken. This species was conservatively assessed as having the potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	<p>potential habitat and the precautionary principle is being applied</p>	
Listed Threatened Reptiles						
Collared Delma (<i>Delma torquata</i>)	V, VU	<p>Survey guidelines for Australia's threatened reptiles.</p> <p>Effective survey methods include:</p>	<p>Timed surveys for 20 minutes at selected habitat assessment locations.</p> <p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure</p>	<p>Suitable habitat with abundant litter, rocks and woody debris occurs in the large contiguous area of forest and woodland associated with the escarpment and plateau in the south-eastern corner of the Project Area.</p>	<p>Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary</p>	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<ul style="list-style-type: none"> One-off hand searches (including raking through leaf litter) in appropriate habitats; Turning rocks and logs / timber; and Pitfall trapping using six 4-10 L buckets and funnel traps along a 15 m fence during late spring to summer. <p>Draft referral guidelines for the nationally listed Brigalow Belt Reptiles.</p> <p>Effective survey methods include:</p> <ul style="list-style-type: none"> Tile grids – grids of 50 ties places at 5 m intervals in suitable habitats; Minimum of 2 gids per site less than 2 ha in size, one grid per 2 hectares for sites up to 40 ha and 20 grids per 2 hectares for sites greater than 40 ha. 	<p>areas and non-remnant vegetation to detect habitat features including burrows, leaf and woody litter, rock and grassy ground cover. Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>Trapping techniques were not used during field surveys.</p> <p>Four field surveys were conducted between March and June, outside the optimal survey timeframe (late spring to summer) for the Collared Delma.</p> <p><i>The survey efforts partially meet the survey guidelines for the Collared Delma as trapping methods were not conducted. This species was conservatively assessed as having the potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	<p>principle is being applied</p>	

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
Common Death Adder (<i>Acanthophis antarcticus</i>)	-, VU	<p>Targeted Species Survey Guidelines – Common Death Adder (DES, 2012).</p> <p>Effective survey methods include:</p> <ul style="list-style-type: none"> ■ Nocturnal vehicle transects – conducted on roads and tracks with limited vegetation and debris. Driving at a constant speed of ~10 km/hour with the driver and passengers scanning the road for animal movements / basking. Transects should be repeated multiple times. ■ ~500 km or all suitable roads surveyed multiple times, spread over at least 2 nights for 2 survey periods. ■ Pitfall and funnel trapping – In areas of thick leaf litter and/or low dense shrub cover, within suitable habitat. > 100 pitfall and 100 	<p>Timed surveys for 20 minutes at selected habitat assessment locations.</p> <p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including burrows, leaf and woody litter, rock and grassy ground cover.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>Vehicle transects and pitfall trapping techniques were not used during field surveys.</p> <p><i>The survey efforts partially meet the survey guidelines for the Common Death Adder. This species was conservatively assessed as having the potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied.	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		funnel trap nights per hectare.				
Dunmall's Snake (<i>Furina dunmalli</i>)	V, VU	<p>Survey guidelines for Australia's threatened reptiles.</p> <p>Draft referral guidelines for the nationally listed Brigalow Belt Reptiles.</p> <p>This species has no targeted survey guidelines. Recommended methods are active searching of sheltering sites (under large objects on the ground such as rocks, logs or human-made debris), pitfall trapping, or road driving at night (particularly after wet weather). However, all of these methods are likely to yield low returns. Photo vouchers should be forwarded to the state fauna authority and appropriate state museum for positive identification and databasing of the record. A scale clip preserved in ethanol would</p>	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including leaf and woody litter, rock and grassy ground cover.</p> <p>Spotlighting surveys in two locations, in riparian woodland along Wandoan Creek and Woleebee Creek, at one hour after sunset, for 2 hours over a 2 km meandering transect.</p> <p>Timed surveys for 20 minutes at selected habitat assessment locations.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>There is some suitable habitat with abundant litter, rocks and woody debris present in the south-eastern corner of the Project Area.</p> <p>Incidental searches were conducted during habitat assessments and whilst spotlighting through the Project Area. No individuals were spotted during the survey efforts.</p> <p>Vehicle transects and pitfall trapping techniques were not used during field surveys.</p> <p><i>The survey efforts partially meet the recommended survey guidelines for Dunmall's Snake. This species was conservatively assessed as having the potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied.	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		also be of use as a genetic sample.				
Five-clawed Worm-skink (<i>Anomalopus mackayi</i>)	V, EN	<p>Survey guidelines for Australia's threatened reptiles</p> <p>Burrowing species are usually recorded by turning objects under which they shelter, or in pitfall traps.</p> <p>The Five-clawed Worm-skink can be recorded by turning rocks or fallen timber on the ground, as well as raking the soil surface layer.</p> <p>Targeted searches for the species are completed using:</p> <ul style="list-style-type: none"> ■ A series of pitfall trap lines each comprising six 10 litre buckets spread along a 15-metre fence. However, the species is more likely to burrow between the soil and the bucket; and ■ Deploy artificial structures, including hay bales over a long period 	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including leaf and woody litter, rock and grassy ground cover.</p> <p>Spotlighting surveys in two locations, in riparian woodland along Wandoan Creek and Woleebee Creek, at one hour after sunset, for 2 hours over a 2 km meandering transect.</p> <p>Timed surveys for 20 minutes at selected habitat assessment locations.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>Areas of potential habitat are limited on the site, with an absence of native grasslands with deep, cracking clays.</p> <p>Incidental searches were conducted during habitat assessments and whilst spotlighting through the Project Area. No individuals were spotted during the survey efforts.</p> <p>Pitfall trapping techniques and deployment of artificial structures were not conducted during field surveys.</p> <p><i>The survey efforts partially meet the recommended survey guidelines for Five-clawed Worm-skink. This species was conservatively assessed as having the potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied.	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>(> 6 months) and periodically checking underneath.</p> <p>Draft referral guidelines for the nationally listed Brigalow Belt reptiles</p> <p>The Five-clawed Worm-skink is an elongate species of skink with very short fore and hindlimbs. It is only likely to be confused with the Two-clawed Worm-skink, <i>Anomalopus leuckartii</i>; the two species come into close contact along the western edge of the North-western Slopes of NSW. The Five-clawed Worm-skink can be distinguished by having three toes on the front foot, whereas <i>A. leuckartii</i> has two; however, determination of these characters can be difficult.</p> <p>Minimum survey effort:</p> <p>Sufficient time is required to thoroughly search the area by day and to spotlight by</p>				

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>night. The minimum survey effort required includes):</p> <ul style="list-style-type: none"> ■ A minimum of three survey days and nights; and ■ At least one replicate survey employing all the recommended techniques, if the species has not already been detected. 				
Golden-tailed Gecko (<i>Strophurus taenicauda</i>)	-, NT	<p>Habitat selection by two focal species; golden-tailed gecko and glossy black-cockatoo (Chris R. Pavey., et al 2016):</p> <p>The golden-tailed gecko is predominately arboreal. Individuals are most commonly found at night on the trunks and outer branches of trees but are also sometimes observed on the ground amongst leaf-litter or ground debris. It shelters during the day beneath loose bark in standing trees, particularly</p>	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including hollows, leaf and woody litter.</p> <p>Spotlighting surveys in two locations, in riparian woodland along Wandoan Creek and Woleebee Creek, at one hour after sunset, for 2 hours over a 2 km meandering transect.</p> <p>Timed surveys for 20 minutes at selected habitat assessment locations.</p>	<p>Searches were conducted during habitat assessments and whilst spotlighting through the Project Area. No individuals were spotted during the survey efforts.</p> <p><i>The survey effort is deemed adequate and meets guidelines for minimum effort searching for the species through 57 habitat assessments, two spotlighting locations (2 hours at each location), and incidental searches. This species was assessed as being likely to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	<p>Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied.</p>	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		under dead bark on small saplings, and in tree hollows. They have also been found in a cryptic, "stretched-out" posture on relatively exposed branches of shrubs by day.	Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.			
Grey Snake (<i>Hemiaspis damelii</i>)	E, EN	<p>Conservation Advice for <i>Hemiaspis damelii</i> (Grey Snake).</p> <p>Survey guidelines for Australia's threatened reptiles.</p> <p>Targeted species survey guidelines Grey Snake <i>Hemiaspis damelii</i></p> <p>Effective survey methods include:</p> <ul style="list-style-type: none"> Nocturnal vehicles transect – on roads and tracks with limited vegetation and debris, particularly on warm/humid nights. Transects are to be completed multiple times at a constant driving speed (10 km/hr) 	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including gilgai, leaf and woody litter and burrows.</p> <p>Spotlighting surveys in two locations, in riparian woodland along Wandoan Creek and Woleebee Creek, at one hour after sunset, for 2 hours over a 2 km meandering transect.</p> <p>Timed surveys for 20 minutes at selected habitat assessment locations.</p> <p>Incidental searches were conducted during opportunistic active searches</p>	<p>Brigalow and Belah are present within the north and far south-eastern parts of the Project Area. Ephemeral wetlands and creek lines are also present along with cracking clay soils in some areas.</p> <p>Despite 57 habitat assessments, timed surveys, spotlighting and incidental searches, the species was not recorded during field surveys.</p> <p>Nocturnal vehicle transects, diurnal searches, pitfall and funnel trapping were not conducted during the field survey.</p> <p><i>The survey efforts partially meet the recommended survey guidelines for the Grey Snake. This species was conservatively assessed as having the potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>with driver/passengers scanning the road for crossing or basking animals. Survey effort is adequate when surveying ~250 km (or all suitable roads multiple times) over two nights, with two surveys undertaken;</p> <ul style="list-style-type: none"> ■ Passive nocturnal search – searching areas around suitable cracking clay and gilgai habitat. Fallen logs, vegetation in and around water bodies, soil cracks and rocks are to be scanned within a 100 x 100 m plot, with 2 plots per 5 ha and surveying each plot for 60 minutes. Two 30 person-minute searches over two survey periods; ■ Active diurnal search – searches targeting shelters and microhabitat sites in or 	in suitable habitat whilst traversing the Project Area.			

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>adjacent to suitable habitat between mid-morning and mid-afternoon; and</p> <ul style="list-style-type: none"> Pitfall and funnel trapping – more than 50 pitfall and 50 funnel trap nights per hectare is required to adequately survey using pitfall and funnel trapping techniques. Trapping to be placed in or adjacent to clay or gilgai habitat, particularly following rainfall events. 				
Yakka Skink (<i>Egernia rugosa</i>)	V, VU	<p>Targeted species survey guidelines Yakka skink, <i>Egernia rugosa</i> (Ferguson, 2014).</p> <p>Survey guidelines for Australia's threatened reptiles.</p> <p>Draft referral guidelines for the nationally listed Brigalow Belt reptiles AND SPRAT profile</p>	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including leaf / woody litter, rock and rock outcrops.</p> <p>Spotlighting surveys in two locations, in riparian woodland along Wandoan Creek and Woleebee Creek,</p>	<p>Dry sclerophyll forests and vegetation within the Brigalow belt south bioregion is present within the Project Area. Suitable habitat with large logs, rocky outcrops and abundant woody debris occurs in woodland on and around the plateau in the south-eastern corner of the Project Area.</p> <p>Survey efforts involved searching for this species via spotlighting, 57 habitat assessments, timed surveys and incidental searches. However,</p>	<p>Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied.</p>	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>Searching microhabitats, such as carefully turning woody debris, rocks and artificial debris, raking the soil surface or leaf litter beneath trees and looking beneath peeling bark for reptiles or their sloughs.</p> <p>Recommended 20 minutes searching per hectare.</p> <p>Search 20% of suitable habitat when 50 ha or more (e.g., 10 ha per 50 ha); OR 40% when less than 50 ha present (e.g., 2 ha per 5 ha of suitable habitat).</p> <p>Recommended survey methods:</p> <ul style="list-style-type: none"> ■ Elliot trapping around burrows; ■ Spotlighting surveys by shining a torch down the burrows at night; ■ Distant observation with binoculars; ■ Searching for burrow systems and communal defecation sites is the 	<p>at one hour after sunset, for 2 hours over a 2 km meandering transect.</p> <p>Timed surveys for 20 minutes at selected habitat assessment locations.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>the species was not recorded during the field surveys.</p> <p>Nocturnal vehicle transects, diurnal searches, pitfall and funnel trapping were not conducted during the field survey.</p> <p>The survey effort was insufficient to cover the extent of suitable habitat within the Project Area (e.g., recommendation for 20 minute search per hectare for detection of Yakka Skink).</p> <p><i>The survey efforts partially meet the recommended survey guidelines for the Yakka Skink. This species was conservatively assessed as having the potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>		

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>most reliable method of detection.</p> <p>Sufficient time is required to thoroughly search the area by day and to spotlight by night. The minimum survey effort required includes:</p> <ul style="list-style-type: none"> ■ A minimum of three survey days and nights ■ At least one replicate survey employing all of the recommended techniques if the species has not already been detected. 				

Listed Threatened Invertebrates

Dulacca Woodland Snail (<i>Adclarkia dulacca</i>)	E, EN	<p>Conservation Advice for <i>Adclarkia dulacca</i>, <i>Dulacca Woodland Snail</i>.</p> <p>Consultation Document on Listing Eligibility and Conservation Actions <i>Adclarkia dulacca</i> (<i>Dulacca woodland snail</i>)</p> <p>Surveys should be conducted during summer months particularly those</p>	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation to detect habitat features including leaf and woody litter, and rocky outcrops.</p> <p>Incidental searches were conducted during opportunistic active searches</p>	<p>Four field surveys were conducted between March and June, aligning with the optimal survey time for the Dulacca Woodland Snail. Rainfall occurred during survey periods, restricting access to some locations. Targeted active searches for this species were planned however not completed due to abundant rainfall, restricting access to potential habitat at the time of planned surveys.</p>	<p>Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied.</p>	Yes
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Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>with storms and rain (October to March).</p> <p>Species is nocturnal and night surveys are preferable, however daylight searches can be equally effective.</p> <p>Minimum survey effort for the Dulacca Woodland Snail is two person hours targeting areas of preferred snail microhabitat. Survey effort should include turning logs and raking accumulated leaves in forest debris. The presence of dead shells, particularly juveniles and sub-adults indicate living adults in the area.</p>	in suitable habitat whilst traversing the Project Area.	<i>The survey efforts partially meet the recommended survey guidelines for the Dulacca Woodland Snail. This species was assessed as being likely to occur as per the Likelihood of Occurrence assessment in Appendix B.</i>		
Pale Imperial Hairstreak (Butterfly) (<i>Jalmenus eubulus</i>)	-, EN	<p><i>There are no species-specific guidelines for surveying of this species.</i></p> <p><i>A survey of the Pale Imperial Hairstreak butterfly <i>Jalmenus eubulus</i> in New South Wales (Taylor R., 2014).</i></p> <p>Searches should be conducted in habitat</p>	<p>57 x Habitat assessments within 50 m x 20 m (0.1 ha) plots, including infrastructure areas and non-remnant vegetation.</p> <p>Incidental searches were conducted during opportunistic active searches in suitable habitat whilst traversing the Project Area.</p>	<p>Project Area is within the distribution for the species. There is suitable habitat associated with Brigalow woodland within the Project Area.</p> <p>Incidental searches were conducted during habitat assessments throughout the Project Area. No individuals were recorded during the survey efforts.</p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied.	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		assessments and whilst trans versing the landscape. Surveys should be focused on Brigalow foliage from the ground level to 4 m in height. Optimal survey times are following heavy rains (typically during the late summer months).		<i>There are no targeted survey guidelines, however, survey efforts are deemed adequate, via incidental searches and 57 habitat assessments throughout the Project Area. This species was assessed as being likely to occur as per the Likelihood of Occurrence in Appendix B.</i>		
Listed Threatened Flora						
Belson's Panic (<i>Homopholis belsonii</i>)	V, EN	<p>Flora Survey Guidelines – Protected Plants NC Act (Flora Survey Guidelines) (DEHP, 2020)</p> <p>Meander surveys to be conducted when and where the species is present. This is based on undertaking surveys during flowering (if applicable) and where habitat is available.</p> <p>The search must be continued (timed) until no new plant species has been recorded for 30 minutes, or when the entire site/habitat has been surveyed.</p>	<p>Boobook field surveys:</p> <p>57 vegetation community assessments within 50 m x 20 m plots (0.1 ha) within representative locations in all identified RE and regrowth vegetation types within the Project Area.</p> <p>The following BioCondition assessments were conducted:</p> <ul style="list-style-type: none"> ■ A 100 m x 50 m plot for canopy cover layer structure and diversity; ■ A 100 m transect to measure canopy cover; 	<p>There are limited areas of potential habitat for this species in the form isolated patches of Poplar Box, Belah and Brigalow woodlands or open forests present within the Project Area.</p> <p>Despite surveys efforts, this species was not recorded at any time during the survey periods.</p> <p>Surveys were undertaken during appropriate flowering and seeding times for this species (February to May).</p> <p><i>No species-specific survey guidelines however, the meander surveys conducted as per the State Guidelines for Protected Plants are</i></p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied.	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		There are no specific survey guidelines for this species, however information such as its approved conservation advice was consulted before field surveys.	<ul style="list-style-type: none"> ■ A 50 m x 10 m subplot for measuring plant richness in shrub and ground layers; ■ A 50 m x 20 m subplot for measuring coarse woody debris; and ■ Five 1 x 1 m quadrats to estimate ecological components of ground cover within the assessment area. <p>57 habitat quality assessments that also aimed to identify presence/absence of listed flora species, and suitable habitat for listed flora species.</p> <p>Opportunistic searches during all field traverses across the Project Area.</p> <p><u>Attexo field surveys:</u></p> <p>Meandering transects at 100 – 200 m intervals by foot where trees and shrubs were visibly dense.</p> <p>Traversing Project Area by vehicle (where access was</p>	<p><i>considered to be of a reasonable effort.</i></p> <p><i>The survey was considered to be to be of a reasonable effort and suitable for confirming potential presence. This species was conservatively assessed as having the potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>		

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
			available) where trees and shrubs were not present.			
Ooline (<i>Cadellia pentastylis</i>)	V, VU	<p>Flora Survey Guidelines – Protected Plants NC Act (Flora Survey Guidelines) (DEHP, 2020)</p> <p>Meander surveys to be conducted when and where the species is present. This is based on undertaking surveys during flowering (if applicable) and where habitat is available.</p> <p>The search must be continued (timed) until no new plant species has been recorded for 30 minutes, or when the entire site/habitat has been surveyed.</p> <p>Flowering between October and December in Queensland; however, occasionally extends into early April. Fruiting from November to December.</p> <p>There are no specific survey guidelines for this species, however information such as</p>	<p>Boobook field surveys:</p> <p>57 vegetation community assessments within 50 m x 20 m plots (0.1 ha) within representative locations in all identified RE and regrowth vegetation types within the Project Area.</p> <p>The following BioCondition assessments were conducted:</p> <ul style="list-style-type: none"> ■ A 100 m x 50 m plot for canopy cover layer structure and diversity; ■ A 100 m transect to measure canopy cover; ■ A 50 m x 10 m subplot for measuring plant richness in shrub and ground layers; ■ A 50 m x 20 m subplot for measuring coarse woody debris; and ■ Five 1 x 1 m quadrats to estimate ecological 	<p>This species is present in the far south-eastern corner of the Project Area (South of Gilgulgul Road). It was observed as retained isolated trees and clumps or in remnant Brigalow woodlands. Ecological surveys in this area identified 35 plants.</p> <p>Attexo flora surveys were conducted over 4 days in late January and early February.</p> <p><i>No species-specific survey guidelines however, meander surveys as per the State Guidelines for Protected Plants considered adequate effort. This species was assessed as being known to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	Yes	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		its approved conservation advice was consulted before field surveys.	<p>components of ground cover within the assessment area.</p> <p>57 habitat quality assessments that also aimed to identify presence/absence of listed flora species, and suitable habitat for listed flora species.</p> <p>Opportunistic searches during all field traverses across the Project Area.</p> <p><u>Attexo field surveys:</u></p> <p>Meandering transects at 100 – 200 m intervals by foot where trees and shrubs were visibly dense.</p> <p>Traversing Project Area by vehicle (where access was available) where trees and shrubs were not present.</p> <p>Binoculars used to identify Ooline from a distance where necessary.</p>			
Slender Tylophora (<i>Vincetoxicum forsteri</i>)	E, EN	Flora Survey Guidelines – Protected Plants NC Act	<p><u>Boobook field surveys:</u></p> <p>57 vegetation community assessments within 50 m x</p>	Suitable habitat (dry eucalypt woodland) exists as several small fragments through the Project Area	Yes, as surveys were adequate to determine the presence of potential habitat and	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>(Flora Survey Guidelines) (DEHP, 2020)</p> <p>Meander surveys to be conducted when and where the species is present. This is based on undertaking surveys during flowering (if applicable) and where habitat is available.</p> <p>The search must be continued (timed) until no new plant species has been recorded for 30 minutes, or when the entire site/habitat has been surveyed.</p> <p>There are no specific survey guidelines for this species, however information such as its approved conservation advice was consulted before field surveys.</p>	<p>20 m plots (0.1 ha) within representative locations in all identified RE and regrowth vegetation types within the Project Area.</p> <p>The following BioCondition assessments were conducted:</p> <ul style="list-style-type: none"> ■ A 100 m x 50 m plot for canopy cover layer structure and diversity; ■ A 100 m transect to measure canopy cover; ■ A 50 m x 10 m subplot for measuring plant richness in shrub and ground layers; ■ A 50 m x 20 m subplot for measuring coarse woody debris; and ■ Five 1 x 1 m quadrats to estimate ecological components of ground cover within the assessment area. <p>57 habitat quality assessments that also aimed to identify presence/absence</p>	<p>and a larger area in the southeast corner.</p> <p>Despite surveys efforts, this species was not recorded at any time during the survey periods.</p> <p>Surveys were also undertaken during appropriate flowering and seeding times for this species in March.</p> <p><i>No species-specific survey guidelines however, the meander surveys conducted as per the State Guidelines for Protected Plants considered to be of a reasonable effort.</i></p> <p><i>The survey was considered to be to be of a reasonable effort and suitable for confirming potential presence.</i></p> <p><i>This species was assessed as being potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>	<p>the precautionary principle is being applied.</p>	

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
			<p>of listed flora species, and suitable habitat for listed flora species.</p> <p>Opportunistic searches during all field traverses across the Project Area.</p> <p><u>Attexo field surveys:</u></p> <p>Meandering transects at 100 – 200 m intervals by foot where trees and shrubs were visibly dense.</p> <p>Traversing Project Area by vehicle (where access was available) where trees and shrubs were not present.</p>			
Thomby Range Wattle (<i>Acacia wardellii</i>)	-, NT	<p>Flora Survey Guidelines – Protected Plants NC Act (Flora Survey Guidelines) (DEHP, 2020)</p> <p>Meander surveys to be conducted when and where the species is present. This is based on undertaking surveys during flowering (if applicable) and where habitat is available.</p>	<p><u>Boobook field surveys:</u></p> <p>57 vegetation community assessments within 50 m x 20 m plots (0.1 ha) within representative locations in all identified RE and regrowth vegetation types within the Project Area.</p> <p>The following BioCondition assessments were conducted:</p>	<p>Project Area is within the distribution for the species. Potential habitat of dry Eucalypt woodlands occurs within the Project Area.</p> <p>Despite surveys efforts, this species was not recorded at any time during the survey periods.</p> <p>Surveys were also undertaken during appropriate flowering and seeding times for this species in March.</p> <p><i>No species-specific survey guidelines however, meander surveys as per the</i></p>	Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied.	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		<p>Flowering between February to May.</p> <p>The search must be continued (timed) until no new plant species has been recorded for 30 minutes, or when the entire site/habitat has been surveyed.</p> <p>There are no specific survey guidelines for this species, however information such as its approved conservation advice was consulted before field surveys.</p>	<ul style="list-style-type: none"> ■ A 100 m x 50 m plot for canopy cover layer structure and diversity; ■ A 100 m transect to measure canopy cover; ■ A 50 m x 10 m subplot for measuring plant richness in shrub and ground layers; ■ A 50 m x 20 m subplot for measuring coarse woody debris; and ■ Five 1 x 1 m quadrats to estimate ecological components of ground cover within the assessment area. <p>57 habitat quality assessments that also aimed to identify presence/absence of listed flora species, and suitable habitat for listed flora species.</p> <p>Opportunistic searches during all field traverses across the Project Area.</p> <p><u>Attexo field surveys:</u></p>	<p><i>State Guidelines for Protected Plants considered adequate effort. This species was assessed as being potential to occur as per the Likelihood of Occurrence in Appendix B.</i></p>		

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
			<p>Meandering transects at 100 – 200 m intervals by foot where trees and shrubs were visibly dense.</p> <p>Traversing Project Area by vehicle (where access was available) where trees and shrubs were not present.</p>			
Winged Nightshade (<i>Solanum stenopterum</i>)	-, EN	<p>Flora Survey Guidelines – Protected Plants NC Act (Flora Survey Guidelines) (DEHP, 2020)</p> <p>Meander surveys to be conducted when and where the species is present. This is based on undertaking surveys during flowering (if applicable) and where habitat is available.</p> <p>Flowering in February and March, fruiting in March, May and July.</p> <p>The search must be continued (timed) until no new plant species has been recorded for 30 minutes, or when the entire site/habitat has been surveyed.</p>	<p>Boobook field surveys:</p> <p>57 vegetation community assessments within 50 m x 20 m plots (0.1 ha) within representative locations in all identified RE and regrowth vegetation types within the Project Area.</p> <p>The following BioCondition assessments were conducted:</p> <ul style="list-style-type: none"> ■ A 100 m x 50 m plot for canopy cover layer structure and diversity; ■ A 100 m transect to measure canopy cover; ■ A 50 m x 10 m subplot for measuring plant 	<p>Project Area is within the distribution for the species. There is a suitable habitat associated with Poplar Box and Casuarina woodland within the Project Area.</p> <p>Despite surveys efforts, this species was not recorded at any time during the survey periods.</p> <p>Surveys were also undertaken during appropriate flowering times for this species in March.</p> <p><i>No species-specific survey guidelines however, meander surveys as per the State Guidelines for Protected Plants considered to be of a reasonable effort.</i></p> <p><i>The survey was considered to be to be of a reasonable effort and suitable for confirming potential presence. This species was assessed as being</i></p>	<p>Yes, as surveys were adequate to determine the presence of potential habitat and the precautionary principle is being applied.</p>	Yes

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique/ Effort	Comment on Survey Adequacy	Surveys Suitable for Impact Assessments	Additional surveys to be Conducted as Part of Pre-clearance Surveys
		There are no specific survey guidelines for this species, however information such as its approved conservation advice was consulted before field surveys.	<p>richness in shrub and ground layers;</p> <ul style="list-style-type: none"> ■ A 50 m x 20 m subplot for measuring coarse woody debris; and ■ Five 1 x 1 m quadrats to estimate ecological components of ground cover within the assessment area. <p>57 habitat quality assessments that also aimed to identify presence/absence of listed flora species, and suitable habitat for listed flora species.</p> <p>Opportunistic searches during all field traverses across the Project Area.</p> <p><u>Attexo field surveys:</u></p> <p>Meandering transects at 100 – 200 m intervals by foot where trees and shrubs were visibly dense.</p> <p>Traversing Project Area by vehicle (where access was available) where trees and shrubs were not present.</p>	<i>potential to occur as per the Likelihood of Occurrence in Appendix B.</i>		

3.4 Likelihood Of Occurrence

A likelihood of occurrence assessment was undertaken and informed by the field survey results and desktop sources. Desktop sources identified a number of flora and fauna species listed under the EPBC Act (i.e., PMST search) and NC Act (WO records) that have previously been recorded or predicted to occur within a 10 km buffer of the Project Area. The PMST and WO results are attached as Appendix A. The buffered area is from here on referred to as the 'adjoining areas'. The 10 km buffer was chosen as this is the standard buffer distance utilised and adopted for the EPBC Act referral process.

The likelihood of occurrence approach refines the desktop generated list using site-specific information and specific-species habitat information obtained from field surveys. Desktop sources are indicative only and likelihood rankings, particularly regarding the presence of specific habitat requirements, are conservative. The assessment ranks the likelihood of the species occurring within the Project Area through analysis of species distribution information, nearest known records and the presence of specific habitat attributes as identified through the desktop analysis and field surveys. The criteria applied are outlined in Table 3-6.

According to the MNES terminology, suitable habitat are areas or a location which has the potential to provide necessary resources needed for the maintenance of a population. This includes the presence of desired habitat features for a species whereby activities such as breeding, nesting, and foraging contributes to the maintenance of the population. Suitable habitat can also include habitat critical to the survival of the species, whether denoted by the relevant species guidelines (such as conservation advice, recovery plans or scientific literature), or by the definition provided by SIG 1.1.

Potential habitat for a species is areas or a location which have the potential to host a species for a limited amount of time or to support an ecological function (such as foraging or dispersal) that is not restricted to that area. Habitat may be considered suitable for a species, but not preferred, where there are some desired features but not all, and so a population may not be maintained; may have poor connectivity to known suitable habitat; or may be known to be disturbed.

Habitat and distribution information for MNES is sourced from SPRAT profiles and/or Conservation Advice where available, supplemented by other primary sources (e.g., published literature). Species records were sourced from WO and/or ALA.

Recent records within the adjoining areas are defined as less than 20 years.

Impact assessments have been undertaken for species and TECs confirmed as known or considered to be likely to or potentially occur in the Project Area (Section 8). Given the disturbed nature of the landscape and in the context of the proposed activities, the risk of impact to 'potential' species is considered low, so assessment of impact for threatened species has focussed on confirmed species and those assessed as likely to occur.

To assist with the likelihood of occurrence assessment regarding the Brigalow Woodland Snail and Dulacca Woodland Snail, a statement from Craig Eddie (Principal Ecologist) is provided in Appendix I.

The full likelihood of occurrence assessment is attached as Appendix B.

Table 3-6: Likelihood of Occurrence Criteria

	Preferred habitat exists	Suitable habitat exists ²	Habitat does not exist ³
Recent ¹ records within the Project Area	Known	Known	Known
Recent records in the Locality ⁴	Likely	Potential	Unlikely
No records within the Locality, but the Project Area is within known distribution	Potential	Unlikely	Unlikely
No records in the Locality, and the Project Area is outside of distribution	Unlikely	Unlikely	Unlikely

1. Recent records are those that have been recorded in the last 20 years.
2. Habitat may be considered suitable, but not preferred because: some desired habitat features may be present, but not all; habitat may have poor connectivity; or habitat may be known to be disturbed.
3. Based on sources reviewed and/or field survey results.
4. 'Locality' refers to a 10 km² buffer around the Project Area and is inclusive of the Project Area.

3.5 Threatened Species and Communities Habitat Mapping

Habitats for those listed threatened and/or migratory species and threatened communities known, likely or with potential to occur have been mapped based on ground-truthed vegetation communities and defined habitat preferences and conditions (as observed from field surveys). The mapped habitats have been used to inform impact assessments. Mapping of 'potential' habitat has also been undertaken for those species and communities with potential to occur. Field surveys were developed to verify desktop information and vegetation boundaries. Data collected from the field surveys was used to determine the habitat mapping for listed threatened and/or migratory species and threatened communities from the likelihood of occurrence. This effort of habitat mapping and vegetation verification was further informed by data obtained from desktop sources (e.g., SPRAT profiles and/or Conservation Advice where available, supplemented by other primary sources as required).

Overall, field-verified vegetation and habitat mapping has been prepared based on a collation of the following datasets and field information:

- Ground-truthed vegetation assessments and aerial imagery observations to delineate vegetation boundaries and describe vegetation characteristics; and
- Regrowth mapping prepared from the ground-truthed field observations and recent aerial imagery.

Habitat and vegetation community mapping was prepared to reflect as accurately as possible actual ground conditions (based on data collected from 2022 field surveys). This habitat mapping used the RE definitions to describe floristic definitions and structural classification into community types from field investigations, with the vegetation and habitat mapping results produced by determining vegetation boundaries and floristic composition based on ground-truthed data collection and observations.

3.6 Survey Conditions

3.6.1 Terrestrial Surveys

The weather during the terrestrial survey period was mild and wet with a total of 425.8 mm rainfall recorded from January to May (Bureau of Meteorology, 2022). This is significantly higher than the long term (1912-2021) median value of 204.2 mm (BOOBOOK, 2022d). As such, wet weather caused impact to the field survey schedule and the soil remained moist with some areas waterlogged throughout the survey periods. Abundant plant growth occurred during the period of initial surveys, which then turned to withering and haying off in the later survey period (BOOBOOK, 2022d).

3.6.2 Aquatic Surveys

Rainfall in November 2021 through to February 2022 had monthly rainfalls significantly higher than the mean rainfall for those months (1912 – 2022). As a result, the rainfall is more likely to have saturated the area and increased the surface water availability when the field surveys were completed in comparison to a typical year.

3.6.2.1 In situ Water Quality

The *in situ* water quality parameters recorded for sites containing surface water in March 2022 included:

- Water temperatures- ranged from 20.7 – 32.8°C during the late wet sampling period;
- Dissolved oxygen (DO)- fluctuated between sites ranging from 9.1 – 200 % saturation;
- pH of surface water- ranged from weakly to strongly alkaline (7.3 – 9.4);
- Electrical conductivity- ranged from 198 to 2,540 µs/cm;
- Turbidity- was widely variable across all sites ranging from 11.9 to 620 NTU; and
- Further information on water quality is described in Section 4.3 in Appendix D.

3.7 Limitations and Assumptions

The field and desktop assessments undertaken provides an overview of the ecological values that exist within the Project Area. As described, surveys were undertaken in several sections of the Project Area to gain a detailed understanding of the types of species and habitat features that occur. Detailed field surveys were completed mainly in the wet/post-wet season, due the large amount of rain present. Sampling sites were distributed across the Project Area to obtain a spread of survey locations that were well distributed across areas where disturbances are expected to occur. The spread of sites was suitable for supporting the subsequent consideration and assessment of potential direct and indirect impacts.

The absence of a species from a database list or observational studies does not confirm its absence from the Project Area. The lack of existing records from databases is more likely to indicate a low historic sampling effort in the region, as opposed to an absence of threatening processes and species. To overcome these limitations, the likelihood of occurrence takes a precautionary approach and identifies species that have potential to occur (considering habitat features), to assess potential impacts accordingly.

Conditions during the survey periods were generally suitable for detection and identification of threatened flora. Due to this predictive mapping of threatened flora and fauna occurrence are conservative estimates of occurrence that assume species presence within areas of potentially suitable habitat (BOOBOOK, 2022d).

4. ENVIRONMENTAL VALUES

The following Sections present the ecological values of the Project Area based on the findings from the desktop review and field survey efforts. General information of the Project Area within the landscape context and classification and descriptions of the vegetation communities and broad habitats are presented in Section 4.2 and 4.3. Information specific to MNES and MSES is presented in Sections 4.4 and 5.1, respectively. While detailed descriptions of values are provided, a brief summary of MNES and MSES is included at the beginning of each Section.

4.1 Project Area Overview and Context

The Project Area occurs within the Brigalow Belt bioregion. The northern components of the Project Area feature watercourses on floodplains, surrounded by undulating hills. Towards the southern areas of the Project Area the landscape features steeper slopes and outcropping towards the south-eastern boundary. Several watercourses (stream orders 2–5) intersect the Project Area. Named watercourses include:

- Woleebee Creek runs south – north through the Project Area on the western boundary of PL 445 and PL 209;
- Conloi Creek feeds into Woleebee creek from the southeastern boundary of the Project Area;
- Hellhole Creek runs from the south through the southwestern boundary of the Project Area south of Gurulmundi Road, feeding into Woleebee Creek; and
- Wandoan Creek runs from the northwestern boundary, meandering to the northern boundary of the Project Area, west of Jackson – Wandoan Road.

The Project Area is entirely within the Brigalow Belt Bioregion and occurs across a boundary between the Taroom Downs subregion in the north and Southern Downs subregion in the south.

Landscapes in the Taroom Downs portion are dominated by meandering watercourses traversing broad alluvial plains flanked by rolling rises on fine-grained sediments, with a few scattered patches of colluvial sand deposits. Elevation in this area varies from 250 m above sea level on Woleebee Creek at the northern limit of the Project Area, up to 350 m on peaks to the southeast, with the bulk of the Taroom Downs portion on flats and gentle slopes below 300 m above sea level.

Landscapes in the Southern Downs portion include similar landforms, but with alluvial sediments restricted to gullies along of streamlines and increasing topographic relief to the south, rising to a rocky scarp and plateau in the extreme southeast. Elevation in the Southern Downs portion of the Project Area rises from around 265 m on Woleebee Creek to 420 m on the plateau in the extreme southeast. The Project Area is entirely drained by streams that flow north to the Dawson River, within the Fitzroy Basin.

The northern part of the Project Area is extensively cleared of native vegetation and converted to non-remnant pasture dominated by native and introduced grasses, notably Buffel Grass (*Cenchrus ciliaris*) and Sabi Grass (*Urochloa mossambicus*). This includes the entire Taroom Downs portion and the northern half of the portion in Southern Downs subregion. Riparian woodland dominated by Queensland Blue Gum (*Eucalyptus tereticornis*) with some fringing areas of Poplar Box (*Eucalyptus populnea*), Brigalow (*Acacia harpophylla*) and Belah (*Casuarina cristata*), follows the winding course of major watercourses through this landscape. These narrow woodland corridors are disturbed by thinning, regrowth, grazing, tracks, weeds, gaps and edge effects causing death of some peripheral trees. However, these corridors have high faunal habitat values, in particular for arboreal mammals and birds, due to features such as an abundance of large trees with hollows occurring on alluvial soils near water sources and ephemeral wetlands in floodplain depressions or cut-off oxbows from changes in stream path. The corridors along Wandoan Creek and Woleebee Creek form part of an extensive dendritic network of riparian woodland with connectivity north to the Dawson River at Taroom but isolated from other large woodland patches to the east, south and west. In the rolling downs beyond the watercourses, remaining fragments of woodland are small, scattered, isolated and disturbed.

The southern part of the Project Area, within Southern Downs subregion, includes similar but less continuous riparian woodland corridors along Hellhole Creek, Woleebee Creek and its tributaries. This area also includes many small, disturbed fragments of Brigalow and Belah woodland on the rolling downs. A more substantially wooded area occurs around the plateau in the extreme southeast with Brigalow and Belah forest, Mountain Coolibah (*Eucalyptus orgadophila*) woodland and open forest of Narrow-leaved Ironbark (*Eucalyptus crebra*).

Stands of Ooline (*Cadellia pentastylis*) up to 35 m high occur in Brigalow woodland on the footslopes and midslopes in this area. This forest and woodland includes fringing areas of regrowth and in some areas is disturbed by fire, light grazing, weeds, tracks and fence lines. Nonetheless, this area shows high ecological integrity and overall low levels of disturbance. This area is tenuously connected with a much larger area of forest beyond the Project Area, to the south and east, and it is on the periphery of the very extensive forested area around Barakula State Forest.

Significant ongoing threats to biodiversity within the Project Area include further loss of remnant and regrowth vegetation in an area that is already extensively cleared; potential loss of connectivity among areas of remnant and regrowth vegetation, especially through disruption of riverine corridors by tracks, powerlines and other linear infrastructure; loss of ecological integrity of vegetation patches through edge effects around fragments and along narrow corridors, death of larger trees without corresponding recruitment, disturbance of understorey vegetation, and invasion by weeds and pastoral grasses.

The main land use within the Project Area is grazing of stock for beef production. Some flood plain areas have been developed for centre-pivot agriculture. An approval to develop pipeline and gasfield infrastructure and to extract coal seam gas within this area (PL 209) was granted to APLNG incorporated as a component of the much broader Walloons gas fields (DSEWPaC, 2009a). Major pipelines and high-voltage powerlines pass through the Site to supply adjacent industrial and agricultural infrastructure.

4.2 Terrestrial Ecology and Habitat Values

The Project Area has been classified into five broad habitat types, defined based on vegetation community type, structure, and is based on ground-truthed mapping using the RE verification method. These habitat types have then been considered as respective foraging, breeding, roosting, denning, dispersal, and movement functions for listed threatened and/or migratory species that are known, likely or have the potential to occur within the Project Area. This ground-truthed habitat mapping has been informed by these five habitat types, and subsequently used to identify areas of habitat for listed threatened species. It is noted that some species will have certain species-specific habitat requirements within each habitat type, for example some reptiles might have microhabitat requirements within Eucalypt woodlands that restrict them to certain portions of that habitat type. This was also further verified through ground-truthing during the field surveys.

The habitats in the Project Area are mostly in moderate to low condition, with signs of degradation and fragmentation due to cattle grazing, erosion, and the presence of introduced flora species. A summary of these habitat types, along with their vegetation community classifications and attributes, are provided in Table 4-1 and their location across the Project Area is shown in Figure 4-1.

Table 4-1: Terrestrial Broad Habitat Types and Vegetation Communities in the Project Area

Habitat Type and Vegetation Community	Photographic Example	Potential Threatened Species Habitat
<p>Acacia woodlands dominated by Brigalow (<i>Acacia harpophylla</i>).</p> <p>This habitat type corresponds to areas with the floristic structural characteristics of the following REs:</p> <ul style="list-style-type: none"> ■ 11.3.1— <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest, with or without scattered emergent <i>Eucalyptus</i> spp. ■ 11.9.5— <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest to woodland on fine-grained sedimentary rocks; and ■ 11.9.5a— <i>Acacia harpophylla</i> predominates and forms a continuous canopy (10-18 m high). Other tree species such as <i>Eucalyptus populnea</i>, <i>Casuarina cristata</i>, <i>Cadellia pentastylis</i> and <i>Brachychiton</i> spp. <p>The Project Area contains 209.5 ha of this habitat type and vegetation community.</p>		<ul style="list-style-type: none"> ■ Belson's Panic ■ Collared Delma ■ Corben's Long-eared Bat ■ Diamond Firetail ■ Dulacca Woodland Snail ■ Dunmall's Snake ■ Fork-tailed Swift (aerial only) ■ Grey Snake ■ Koala ■ Northern Quoll ■ Ooline ■ Oriental Cuckoo ■ Painted Honeyeater ■ South-eastern Glossy-black Cockatoo ■ Southern Squatter Pigeon (dispersal habitat only when within 100 m of mapped breeding and foraging habitat) ■ Southern Whiteface ■ White-throated Needletail (aerial only) ■ Yakka Skink

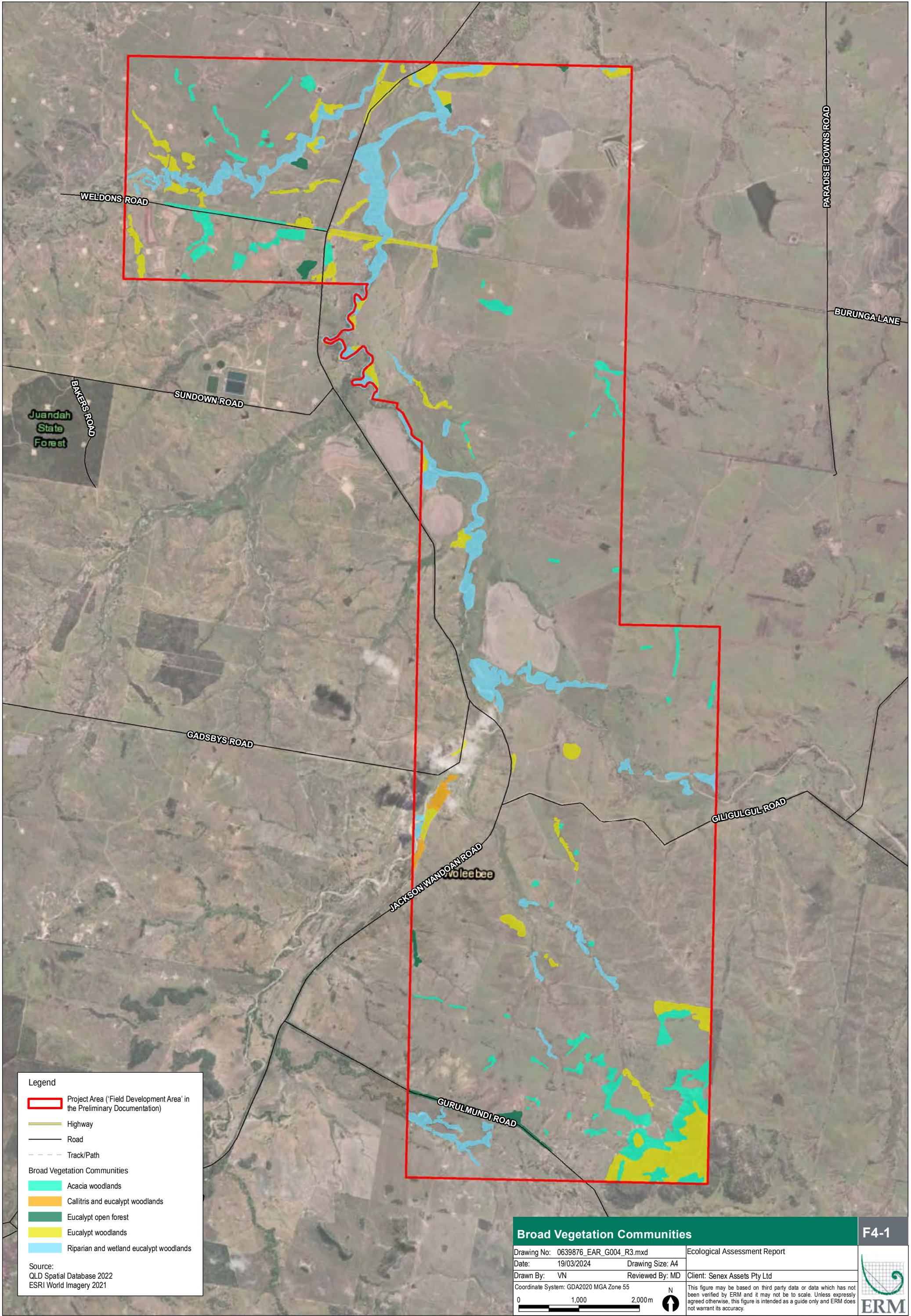
Habitat Type and Vegetation Community	Photographic Example	Potential Threatened Species Habitat
<p>Callitris and Eucalypt dominated woodlands.</p> <p>This habitat type corresponds to areas with the floristic structural characteristics of the following RE:</p> <ul style="list-style-type: none"> ■ 11.3.19— <i>Callitris glaucophylla</i>, <i>Corymbia</i> spp. and/or <i>Eucalyptus melanophloia</i> woodland on Cainozoic alluvial plains. <p>The Project Area contains 14.2 ha of this habitat type and vegetation community.</p>		<ul style="list-style-type: none"> ■ Brown Treecreeper ■ Collared Delma ■ Corben's Long-eared Bat ■ Diamond Firetail ■ Dulacca Woodland Snail ■ Dunmall's Snake ■ Fork-tailed Swift (aerial only) ■ Greater Glider (southern and central) ■ Koala ■ Northern Quoll ■ Oriental Cuckoo ■ South-eastern Glossy-black Cockatoo ■ Southern Squirrel Pigeon ■ Southern Whiteface ■ White-throated Needletail (aerial only) ■ Yakka Skink

Habitat Type and Vegetation Community	Photographic Example	Potential Threatened Species Habitat
<p>Eucalypt dominated woodlands mainly of <i>Eucalyptus crebra</i>, <i>E. populnea</i> and <i>E. melanophloia</i>.</p> <p>This habitat type corresponds to areas with the floristic structural characteristics of the following REs:</p> <ul style="list-style-type: none"> ■ 11.3.2— <i>Eucalyptus populnea</i> woodland on alluvial plains; ■ 11.3.4— <i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains; ■ 11.3.17— <i>Eucalyptus populnea</i> woodland with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> on alluvial plains; ■ 11.3.39— <i>Eucalyptus melanophloia</i> and/or <i>E. chloroclada</i> woodland to open woodland. ■ 11.10.7— <i>Eucalyptus crebra</i> woodland on coarse-grained sedimentary rock; ■ 11.5.1— <i>Eucalyptus crebra</i> and/or <i>E. populnea</i>, <i>Callitris glaucophylla</i>, <i>Angophora leiocarpa</i>, <i>Allocasuarina luehmannii</i> woodland on Cainozoic sand plains and/or remnant surfaces; ■ 11.5.5— <i>Eucalyptus melanophloia</i>, <i>Callitris glaucophylla</i> woodland on Cainozoic sand plains and/or remnant surfaces. Deep red sands; 		<ul style="list-style-type: none"> ■ Belson's Panic ■ Brown Treecreeper ■ Collared Delma ■ Corben's Long-eared Bat ■ Diamond Firetail ■ Dulacca Woodland Snail ■ Dunmall's Snake ■ Fork-tailed Swift (aerial only) ■ Greater Glider (southern and central) ■ Grey Snake ■ Koala ■ Northern Quoll ■ Ooline ■ Oriental Cuckoo ■ Painted Honeyeater ■ Slender Tylophora ■ South-eastern Glossy-black Cockatoo ■ Southern Squatter Pigeon ■ Southern Whiteface ■ White-throated Needletail (aerial only) ■ Yakka Skink ■ Yellow-bellied Glider (south-eastern)

Habitat Type and Vegetation Community	Photographic Example	Potential Threatened Species Habitat
<ul style="list-style-type: none"> ■ 11.9.2— <i>Eucalyptus melanophloia</i> +/- <i>E. orgadophila</i> woodland to open woodland on fine-grained sedimentary rocks; ■ 11.9.7— <i>Eucalyptus populnea</i>, <i>Eremophila mitchellii</i> shrubby woodland on fine-grained sedimentary rocks; ■ 11.10.7— <i>Eucalyptus crebra</i> woodland on coarse-grained sedimentary rocks; and ■ 11.10.11— <i>Eucalyptus populnea</i>, <i>E. melanophloia</i> +/- <i>Callitris glaucophylla</i> woodland on coarse-grained sedimentary rocks. <p>The Project Area contains 292.6 ha of this habitat type and vegetation community.</p>		

Habitat Type and Vegetation Community	Photographic Example	Potential Threatened Species Habitat
<p>Riparian and wetland Eucalypt woodlands dominated by <i>E. tereticornis</i>.</p> <p>This habitat type corresponds to areas with the floristic structural characteristics of the following REs:</p> <ul style="list-style-type: none"> ■ 11.3.25— <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines; and ■ 11.3.27f— Freshwater wetlands with <i>Eucalyptus coolabah</i> and/or <i>E. tereticornis</i> open woodland to woodland fringing swamps. <p>The Project Area contains 364.0 ha of this habitat type and vegetation community.</p>		<ul style="list-style-type: none"> ■ Australian Painted Snipe ■ Brown Treecreeper ■ Collared Delma ■ Common Sandpiper ■ Corben's Long-eared Bat ■ Diamond Firetail ■ Dunmall's Snake ■ Fork-tailed Swift (aerial only) ■ Greater Glider (southern and central) ■ Grey Snake ■ Five-clawed worm-skink ■ Koala ■ Latham's Snipe ■ Northern Quoll ■ Ooline ■ Oriental Cuckoo ■ South-eastern Glossy-black Cockatoo ■ Rufous Fantail ■ Satin Flycatcher ■ Sharp-tailed Sandpiper ■ Southern Squatter Pigeon ■ Southern Whiteface

Habitat Type and Vegetation Community	Photographic Example	Potential Threatened Species Habitat
		<ul style="list-style-type: none"> ■ White-throated Needletail (aerial only) ■ Yellow-bellied Glider (south-eastern)
<p>Eucalypt open forest dominated by <i>E. populnea</i>.</p> <p>This habitat type corresponds to areas with the floristic structural characteristics of the following RE:</p> <ul style="list-style-type: none"> ■ 11.9.10— <i>Eucalyptus populnea</i> open forest with a secondary tree layer of <i>Acacia harpophylla</i> and sometimes <i>Casuarina cristata</i> on fine-grained sedimentary rocks. <p>The Project Area contains 29.5 ha of this habitat type and vegetation community.</p>		<ul style="list-style-type: none"> ■ Belson's Panic ■ Brown Treecreeper ■ Collared Delma ■ Corben's Long-eared Bat ■ Diamond Firetail ■ Dulacca Woodland Snail Koala ■ Dunmall's Snake ■ Fork-tailed Swift (aerial only) ■ Greater Glider (southern and central) ■ Grey Snake ■ Northern Quoll ■ Ooline ■ Oriental Cuckoo ■ Painted Honeyeater ■ South-eastern Glossy-black Cockatoo ■ Southern Squatter Pigeon ■ Southern Whiteface ■ White-throated Needletail (aerial only) ■ Yakka Skink



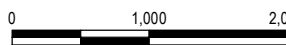
- Legend**
- Project Area ('Field Development Area' in the Preliminary Documentation)
 - Highway
 - Road
 - Track/Path
 - Broad Vegetation Communities**
 - Acacia woodlands
 - Callitris and eucalypt woodlands
 - Eucalypt open forest
 - Eucalypt woodlands
 - Riparian and wetland eucalypt woodlands

Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

Broad Vegetation Communities

Drawing No: 0639876_EAR_G004_R3.mxd	Ecological Assessment Report
Date: 19/03/2024	Drawing Size: A4
Drawn By: VN	Reviewed By: MD
Client: Senex Assets Pty Ltd	

Coordinate System: GDA2020 MGA Zone 55



This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

F4-1



The Project Area also includes areas of non-native and regrowth vegetation that could not be assigned a native vegetation community or broad habitat type due to an absence of required floristic composition or structural elements to be defined as such. These areas contain low habitat values, providing habitat to some of the MNES species that are considered known, likely or with the potential to occur in the Project Area. Due to the low ecological values in these area, only some MNES species are potentially present in these areas. These areas of regrowth and non-native vegetation communities have been identified and described in Table 4-2 and shown on Figure 4-2.

Table 4-2: Low Ecological Value Land within the Project Area

Low Ecological Value Land within the Project Area	Threatened Species Potentially Present
<p>Cleared exotic pasture used for grazing.</p> <p>This broad habitat type is the predominate type found throughout the Project Area. The dominant introduced grasses are notably Buffel Grass (<i>Cenchrus ciliaris</i>) and Sabi Grass (<i>Urochloa mossambicus</i>). The Project Area contains 7,924.0 ha of this low ecological value land type.</p> <p>Cleared exotic pasture is unlikely to provide suitable foraging, breeding or refuge resources for MNES species with the exception of occasional and isolated Ooline trees, Fork-tailed Swift (aerial only) and White-throated Needletail (aerial only). These areas of cleared pasture have the potential to be used occasionally by Koalas as they move across the ground, however the value of these cleared areas for dispersing animals is reduced due to the lack of suitable shelter trees used as refuge by dispersing individuals.</p> <p>Cleared exotic pastures are unlikely to provide adequate habitat for MNES species to occur, due to the dominance of exotic pasture grasses, driving species out of the area. MNES are unlikely to occur where exotic flora is abundant.</p> <p>Cleared exotic pastures are unlikely to provide adequate habitat for threatened snails (e.g., Dulacca Woodland Snail) as this species requires both an overstorey of trees and shrubs and on-ground timber cover for survival and egg-laying, as well as to maintain high levels of relative humidity at the substrate level. Cleared exotic pastures used for grazing are unlikely to provide an adequate overstorey of trees and shrubs required for the species survival.</p>	<ul style="list-style-type: none"> ■ Fork-tailed Swift (aerial only) ■ Ooline ■ Koala (dispersal habitat only) ■ White-throated Needletail (aerial only)
<p>Irrigated pastures and cropping.</p> <p>This broad habitat type features all irrigated pastures and cropping that are primarily used for agricultural purposes. The Project Area contains 554.4 ha of this low ecological value land type.</p> <p>These pastures are predominantly located in the north-eastern portion of the Project Area, as well as one defined area in the centre of the Project Area. These areas are subject to continued modification and management for agricultural purposes, including planting with pasture grasses and crops that are irrigated. This includes areas that are currently irrigated with centre-pivots and areas of cropping land that area actively managed for crop production.</p> <p>Irrigated pastures and cropping areas are unlikely to provide suitable foraging, breeding or refuge resources for MNES species due to land disturbance and habitat clearing for grazing and agriculture. Disturbance by grazing and livestock are unlikely to allow MNES fauna to occupy the area. Additionally, cleared pastures for irrigation and cropping do not contain suitable habitat trees, shrub layers, adequate ground cover with native flora, or microhabitat to enable foraging, breeding or refuge habitats (i.e., for threatened snails, reptiles, mammals and birds). Although this, Fork-tailed Swift and White-throated Needletail have the potential to fly over cleared</p>	<ul style="list-style-type: none"> ■ Fork-tailed Swift (aerial only) ■ White-throated Needletail (aerial only) ■ Koala (dispersal habitat only)

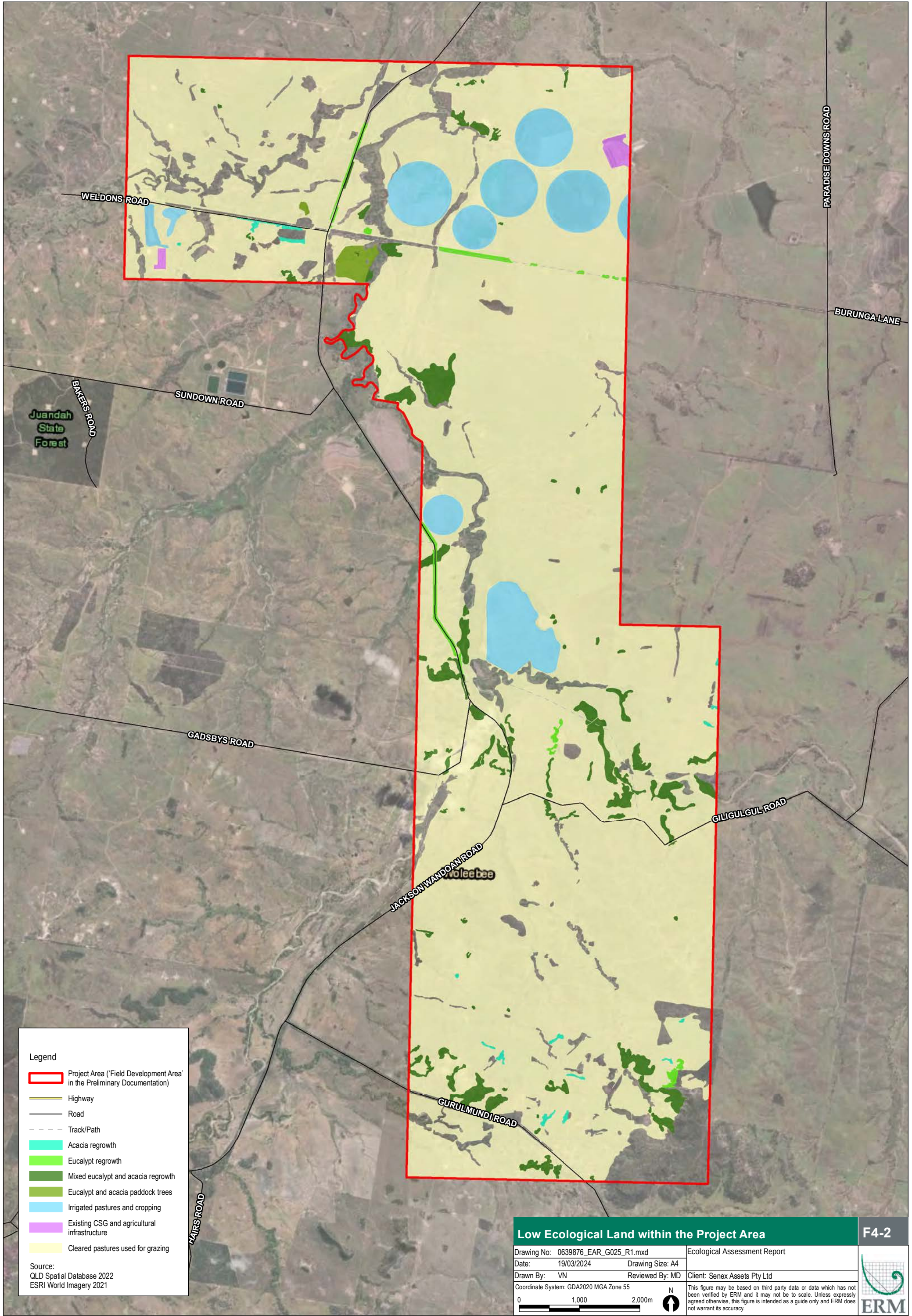
Low Ecological Value Land within the Project Area	Threatened Species Potentially Present
<p>pastures, however it is unlikely these species will land and use these pastures for foraging or roosting as they are both aerial foraging species who may occasionally fly over the Project Area.</p> <p>The value of these areas for dispersing Koalas is recognised, however they are limited due to the absence of any trees that could be used as shelter by Koalas when they move across the ground. Some of the larger centre-pivot irrigated areas are 1km across, so there is a potential that a Koala could cross these areas during dispersal.</p>	
<p>Acacia regrowth.</p> <p>The Project Area contains 14.5 ha of this low ecological value land type.</p> <p>Sapling or young juvenile Acacia regrowth vegetation that does not provide refuge, breeding or forage resource for threatened species and this therefore not considered to be habitat critical to the survival of any MNES species, or constitute any MNES TEC. An immature tree is any native woody vegetation (other than a mature tree or habitat tree) that generally 2-4 m in height.</p> <p>Immature trees do not contain hollows used for refuge or breeding for MNES species. Hollows occur in old growth trees (typically 100 years or more of growth), therefore, immature trees do not contain the valuable hollows for MNES species such as Greater Glider and Corben's long-eared bat that have a reliance on hollows for breeding and daytime roosts. To be considered suitable habitat for hollow-breeding birds and arboreal mammals, an abundance of hollow-bearing trees are required per hectare, and as hollows do not form in immature trees, it is highly unlikely this habitat type sustains breeding, foraging or refuge habitat for arboreal mammals.</p> <p>Immature Acacia regrowth does not contain sufficient canopy cover, shrub layer or ground cover suitable as habitat for MNES species. Acacia regrowth is unlikely to provide foraging habitat for Greater Glider (southern and central) and Koala, as both species have a strong preference for Eucalypt species.</p> <p>When within 100 m of Southern Squatter Pigeon breeding and foraging habitat, patches of this Acacia regrowth area provides dispersal habitat; however, none of the current areas of Acacia regrowth are currently within 100 m of the Southern Squatter Pigeon breeding and foraging habitat.</p> <p>The Acacia regrowth provides habitat for the Glossy black-cockatoo as the species exclusively feeds on sheoak seeds (<i>Allocasuarina</i> spp. and <i>Casuarina</i> spp.). Although these areas are dominated by acacia regrowth, these areas still have the potential to contain foraging trees, and as such, there may be marginal foraging habitat for Glossy black-cockatoo within Acacia regrowth.</p> <p>The Acacia regrowth provides potential habitat for the Diamond firetail as the species forages on grass seeds, leaves and insects within areas of high grass cover. The species is known to forage on both native and exotic grass species. The grass layer of this habitat types is dominated by exotic grasses, and as such, the species may utilise this area for foraging.</p> <p>The Acacia regrowth may also provide habitat for the Dulacca woodland snail. This species can inhabit Acacia regrowth where abundant leaf litter, logs, woody debris, and other suitable microhabitat are present.</p>	<ul style="list-style-type: none"> ■ Glossy Black-cockatoo (south-eastern) ■ Diamond Firetail ■ Dulacca Woodland Snail ■ Grey Snake ■ Fork-tailed Swift (aerial only) ■ White-throated Needletail (aerial only) ■ Koala (dispersal habitat) ■ Southern Squatter Pigeon (dispersal habitat only when within 100 m of mapped breeding and foraging habitat)

Low Ecological Value Land within the Project Area	Threatened Species Potentially Present
<p>Acacia regrowth may provide habitat for the Grey Snake. The mapped Acacia regrowth is slightly intersected or bordered by small gullies (albeit few and not in all Acacia regrowth areas) which may provide suitable habitat for the Grey Snake where regrowth is near small gullies and floodplains are present. There is potential for cracking clay soils which may provide suitable habitat for the Grey Snake.</p> <p>Areas of Acacia regrowth have an absence of eucalypt trees that provide foraging and breeding habitat for Koala. This habitat type may provide dispersal opportunities for Koala, given the species can move along the ground. The value of these areas of immature Acacia regrowth in the Project Area are limited, however, given the young age and low height of the shrubs and trees in these areas providing limited to no opportunities for shelter and roost trees used by dispersing animals.</p>	
<p>Eucalypt regrowth.</p> <p>The Project Area contains 35.6 ha of this low ecological value land type.</p> <p>Sapling or young juvenile Eucalypt regrowth vegetation that does not provide refuge, breeding or forage resource for threatened species and this therefore not considered to be habitat critical to the survival of any MNES species, or constitute any MNES TEC. An immature tree is any native woody vegetation (other than a mature tree or habitat tree) that is two meters or more in height.</p> <p>Immature trees do not contain hollows used for refuge or breeding for MNES species. Hollows occur in old growth trees (typically 100 years or more of growth), therefore, immature trees do not contain the valuable hollows for MNES species such as Greater Glider and Corben's long-eared bat. Additionally, to be considered suitable habitat for hollow-breeding birds and arboreal mammals, an abundance of hollow-bearing trees is required per hectare, and as hollows do not form in immature trees, it is highly unlikely this habitat type sustains breeding, foraging or refuge habitat for arboreal mammals.</p> <p>Eucalypt regrowth provides habitat Glossy black-cockatoo as the species feeds exclusively on sheoak seeds (<i>Allocasuarina spp.</i> and <i>Casuarina spp.</i>). Given these areas are dominated by <i>Eucalyptus spp.</i>, there is still a chance of <i>Allocasuarina spp.</i> and <i>Casuarina spp.</i> presence within this habitat type, and as such, Eucalypt regrowth may provide marginal foraging habitat for the species.</p> <p>The Acacia regrowth provides potential habitat for the Diamond firetail as the species forages on grass seeds, leaves and insects within areas of high grass cover. The species is known to forage on both native and exotic grass species. The grass layer of this habitat types is dominated by exotic grasses, and as such, the species may utilise this area for foraging.</p> <p>Eucalypt regrowth may also provide habitat for the Dulacca woodland snail. This species can inhabit ironbark (<i>Eucalyptus spp.</i>) and gum-topped box (<i>Eucalyptus woollsiana</i>) regrowth where abundant leaf litter, logs, woody debris, and other suitable microhabitat are present. As a conservative approach, Acacia woodland is mapped as Dulacca woodland snail habitat as the presence/absence of microhabitat (leaf litter and woody debris) is not confirmed.</p>	<ul style="list-style-type: none"> ■ Fork-tailed Swift (aerial only) ■ White-throated Needletail (aerial only) ■ Koala (dispersal habitat) ■ Glossy Black-cockatoo (foraging habitat) ■ Diamond Firetail (foraging habitat) ■ Dulacca Woodland Snail ■ Grey Snake ■ Southern Squatter Pigeon (dispersal habitat only when within 100 m of mapped breeding and foraging habitat)

Low Ecological Value Land within the Project Area	Threatened Species Potentially Present
<p>Eucalypt regrowth may provide habitat for the grey snake. The mapped Eucalypt regrowth is slightly intersected or borders by small gullies (albeit few and not in all Acacia regrowth areas) which may provide suitable habitat for the species where regrowth is near small gullies and floodplains are present.</p> <p>When within 100 m of Southern Squatter Pigeon breeding and foraging habitat, patches of this Eucalypt regrowth area provides dispersal habitat.</p> <p>Immature Eucalypt regrowth does not contain sufficient canopy cover, shrub layer or ground cover suitable as habitat for MNES species. Furthermore, reptiles are unlikely to utilise immature regrowth vegetation as these species require dense ground vegetation, large hollow logs and fallen trees for refuge.</p> <p>These areas of young eucalypt regrowth do not form an intact vegetation community that can be defined as an open forest or woodland, which is used by Koalas as foraging and breeding habitats. The eucalypt trees in these areas are young and provide limited value for koala foraging. They also provide limited shelter and roosting opportunities for dispersing individuals due to the generally low tree heights.</p>	
<p>Mixed acacia and eucalypt regrowth.</p> <p>The Project Area contains 280.1 ha of this low ecological value land type.</p> <p>A combination of immature Acacia regrowth and immature Eucalypt regrowth as described above. These areas also lack the size class structure and age to be classified as open forest or woodland communities or occur in very narrow linear strips of regrowth and disturbed vegetation in road corridors or easements. Where this vegetation type occurs in roadside vegetation, they are in narrow strips ranging from 15-30 m in width and are subject to edge effects associated with altered light, nutrient and grazing regimes, limiting the development of these strips into an intact and structurally complex habitat type.</p> <p>As these areas have been subject to historical and current disturbance from clearing for roads or agricultural land uses, they lack the large, mature eucalypt trees that form hollows to support those MNES species that require these features for breeding and roosting such as greater glider and Corben's long-eared bat. Habitat complexity in the shrub and ground layers are also very low, with minimal shelter, foraging and breeding opportunities for woodland birds and reptiles. In some locations the ground layer contains no coarse woody debris and is subject to disturbance from exotic grass cover and cattle grazing.</p> <p>There is some value in areas of mixed acacia and eucalypt regrowth for dispersing koalas, with shelter opportunities provided for individuals as they disperse across the landscape.</p>	<ul style="list-style-type: none"> ■ Fork-tailed Swift (aerial only) ■ White-throated Needletail (aerial only) ■ Koala (dispersal habitat) ■ Glossy Black-cockatoo (foraging habitat) ■ Diamond Firetail (foraging habitat) ■ Dulacca Woodland Snail ■ Grey Snake ■ Southern Squatter Pigeon (dispersal habitat only when within 100m of mapped)

Low Ecological Value Land within the Project Area	Threatened Species Potentially Present
<p>Mixed acacia and eucalypt regrowth provides habitat for Glossy black-cockatoo as the species exclusively feeds on sheoak seeds (<i>Allocasuarina spp.</i> and <i>Casuarina spp.</i>). Given these areas are dominated by regrowth <i>Acacia spp.</i> and <i>Eucalyptus spp.</i>, there is still a chance of <i>Allocasuarina spp.</i> and <i>Casuarina spp.</i> presence within this habitat type, and as such, mixed regrowth may provide marginal foraging habitat for the species.</p> <p>The Acacia regrowth provides potential habitat for the Diamond firetail as the species forages on grass seeds, leaves and insects within areas of high grass cover. The species is known to forage on both native and exotic grass species. The grass layer of this habitat types is dominated by exotic grasses, and as such, the species may utilise this area for foraging.</p> <p>Mixed acacia and eucalypt regrowth may provide habitat for the Dulacca woodland snail. The species can inhabit Brigalow regrowth where abundant leaf litter, logs, woody debris, and other suitable microhabitat are present. As a conservative approach, mixed regrowth is mapped as Dulacca woodland snail habitat as the presence/absence of microhabitat (leaf litter and woody debris) is not confirmed.</p> <p>Mixed Acacia and Eucalypt regrowth does not contain suitable ephemeral wetland environments for the grey snake, however Brigalow regrowth within the Project Area does occur on floodplains. Acacia and Eucalypt regrowth is intersected by, and/or borders small gullies (albeit few and not in all Acacia and Eucalypt regrowth areas) which may provide suitable habitat for the species where regrowth is near small gullies and floodplains are present. There is potential for cracking clay soils which may provide suitable habitat for the grey snake.</p> <p>When within 100 m of Southern Squatter Pigeon breeding and foraging habitat, patches of this mixed Acacia and Eucalypt regrowth area provides dispersal habitat.</p>	<p>breeding and foraging habitat)</p>
<p>Eucalypt and acacia paddock trees.</p> <p>The Project Area contains 30.9 ha of this low ecological value land type.</p> <p>These areas are defined by areas of isolated, scattered and small groups of paddock trees, with a combination of mature eucalypts and <i>Acacia harpophylla</i> (Brigalow) trees with separation between each tree (or small group of 2-3 trees) ranging from 40-90 m. The shrub layer is completely absent and managed in these areas through continued grazing and agricultural practices and the ground layer is composed of exotic pasture grasses.</p> <p>The ability for species that rely on hollows, such as Greater Glider and Corben's long-eared bat, to utilise these areas is restricted due to the separation distance between adjacent remnant habits and the paddock trees being larger than the glide distance for this species. Habitat values for birds, including hollow-dependent species is also limited due to the lack of foraging habitat and complexity in the shrub and ground layers providing suitable resources for feeding and shelter.</p> <p>Coarse woody debris, large logs and rocks are also absent from these areas, providing no habitat for listed threatened reptiles.</p>	<ul style="list-style-type: none"> ■ Fork-tailed Swift (aerial only) ■ White-throated Needletail (aerial only) ■ Koala (dispersal habitat) ■ Glossy Black-cockatoo (foraging habitat) ■ Diamond Firetail (roosting habitat) ■ Dulacca Woodland Snail

Low Ecological Value Land within the Project Area	Threatened Species Potentially Present
<p>Additionally, it is unlikely that eucalypt and acacia paddock trees to provide habitat for Squatter pigeon, given the disconnected nature of the vegetation along with distance to waterbodies.</p> <p>Koalas may traverse this habitat type, during dispersal across the ground and may use the paddock trees for shelter or daytime roosts. These areas have been classified as dispersal habitat for Koalas, however as the isolated paddock trees do not constitute a eucalypt open forest or woodland they do not provide the foraging and breeding resources for this species.</p> <p>Eucalypt and acacia paddock trees provides habitat for the Glossy black-cockatoo as the species exclusively feeds on sheoak seeds (<i>Allocasuarina spp.</i> and <i>Casuarina spp.</i>). Whilst this habitat type is dominated by <i>Eucalyptus spp.</i> and <i>Acacia spp.</i> paddock trees, the presence of <i>Allocasuarina spp.</i> and <i>Casuarina spp.</i> cannot be ruled out. Therefore, Eucalypt and Acacia paddock trees may provide potential foraging habitat for Glossy black-cockatoo.</p> <p>Eucalypt and acacia paddock trees potentially provides roosting habitat in the form of nests in trees for the Diamond firetail.</p> <p>Eucalypt and acacia paddock trees may provide habitat for the Dulacca Woodland Snail. This species can inhabit cleared paddocks where suitable logs, woody debris or other suitable microhabitat features remain. As microhabitat presence/absence within this habitat type cannot be confirmed, paddock trees are mapped as Dulacca Woodland Snail habitat as a conservative approach.</p> <p>Eucalypt and acacia paddock trees may provide habitat for the Grey Snake where habitat borders a small gully.</p> <p>When within 100 m of Southern Squatter Pigeon breeding and foraging habitat, patches of this Eucalypt and Acacia paddock trees provides dispersal habitat.</p>	<ul style="list-style-type: none"> ■ Grey Snake ■ Southern Squatter Pigeon (dispersal habitat only when within 100m of mapped breeding and foraging habitat)
<p>Existing CSG and Agricultural Infrastructure.</p> <p>The Project Area contains 22.8 ha of this low ecological value land type.</p> <p>This includes existing CSG and agricultural infrastructure. These areas are not considered as likely to contain threatened species as they are existing infrastructure areas with no natural features.</p>	<p>Nil</p>



Legend

- Project Area ('Field Development Area' in the Preliminary Documentation)
- Highway
- Road
- Track/Path
- Acacia regrowth
- Eucalypt regrowth
- Mixed eucalypt and acacia regrowth
- Eucalypt and acacia paddock trees
- Irrigated pastures and cropping
- Existing CSG and agricultural infrastructure
- Cleared pastures used for grazing

Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

Low Ecological Land within the Project Area

F4-2

Drawing No: 0639876_EAR_G025_R1.mxd		Ecological Assessment Report		
Date: 19/03/2024		Drawing Size: A4		
Drawn By: VN		Reviewed By: MD		
Coordinate System: GDA2020 MGA Zone 55		Client: Senex Assets Pty Ltd		
<div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div><div>01,0002,000m</div></div>		<div><div>N</div><div>↑</div></div> <div>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</div>		



4.3 Aquatic Ecology and Habitat Values

The waterways present within the Project Area are all ephemeral, with most waterways drying completely during dry periods. Very few of these waterways retain pooling water during dry periods. At the time of the field surveys, most waterways present in the Project Area had already ceased surface water flows with disconnected pools noted along the watercourses. There was some subsurface flow present at sites along most creeks that contained sandy substrates. The gaps between water pools were often separated by open grasslands and poorly defined channels. Riparian vegetation was present, and density of such vegetation varied from moderate to non-existent, with most survey sites having relatively low vegetation present. The in-stream habitats present were concluded to be mostly of 'fair' condition across most sites that were surveyed (17 of 24), with the remaining seven concluded to be of 'poor' condition.

The information gathered from the field surveys and the condition of the habitats has been used to inform the broad aquatic habitat types and vegetation communities within the Project Area. These broad habitat types and vegetation communities are further detailed in Table 4-3. It is noted that these habitat types are based on the two main creek systems present within the Project Area: Wandoan Creek and Woleebee Creek.

Table 4-3: Aquatic Vegetation Communities and Broad Habitat Types within the Project Area

Habitat Type and Vegetation Community*	Photographic Example
<p>Woleebee Creek Aquatic Habitat.</p> <p>This waterbody was concluded as likely to retain subsurface (hyporheic flows) for some time after heavy rainfall.</p> <p>The wetland type of this habitat was riverine, with a stream order of 5.</p> <p>In terms of species, the habitat had a presence of Palaemonidae (freshwater Prawns) and Paratacidae (freshwater Crayfish), as well as the Eastern Long-Necked Turtle, which was captured. The overall habitat bioassessment score for this habitat was of fair condition.</p>	
<p>Wandoan Creek Aquatic Habitat.</p> <p>This waterbody had subsurface flows expressing in some areas. It was concluded as overall uncertain as to whether these were hyporheic or groundwater expressions, and the watercourse was regarded as shallow and highly ephemeral. The wetland type of this habitat was riverine, with a stream order of 4. In terms of species, the habitat had a presence of Palaemonidae (freshwater Prawns) and Paratacidae (freshwater Crayfish). The Green-stripe Frog was also recorded. The overall habitat bioassessment score for this habitat was of fair condition.</p>	
<p><i>*Images and data in this table are accredited to KCB, 2024.</i></p>	

Table 4-4 summarises the aquatic fauna field results from field surveys within the Project Area. For further detail refer to Appendix D.

Table 4-4: Aquatic Fauna Field Results

Fauna	Field Survey Results
Aquatic macroinvertebrates	<ul style="list-style-type: none"> Low abundance of aquatic macroinvertebrates and taxa diversity across all samples in the Project Area, likely due to the largely ephemeral nature of the waterways (typical for ephemeral streams in central Queensland). Relatively low PET (Plecoptera, Ephemeroptera, and Trichoptera orders) taxa diversity. Relatively low Signal2 scores, indicating the aquatic macroinvertebrate assemblages were relatively depauperate. <p>Further detail presented in Section 4.6 of Appendix D.</p>
Macrocrustaceans	<p>Three families were detected:</p> <ul style="list-style-type: none"> Atyidae (Glass Shrimp) – recorded at only one site; Palaemonidae (Freshwater Prawn) – recorded at all sites sampled; and Paratacidae (Freshwater Crayfish) – recorded at all sites sampled. <p>Further detail presented in Section 4.7 of Appendix D.</p>
Fish	<p>Eight species were collected from 14 sites sampled. Native species listed from most to least abundant include:</p> <ul style="list-style-type: none"> Spangled Perch (<i>Leiopotherapon unicolor</i>) – 100% of sites; Agassiz's Glassfish (<i>Ambassis agassizii</i>) – 79% of sites; Midgely's Carp Gudgeon (<i>Hypseleotris bucephala</i>) – 79% of sites; Eastern Rainbowfish (<i>Melanotaenia splendida splendida</i>) – 71% of sites; Bony Bream (<i>Nematalosa erebi</i>) – 50% of sites; Eel-tailed Catfish (<i>Tandanus tandanus</i>) – one specimen; and Sleepy Cod (<i>Oxyeleotris lineolatus</i>) – one specimen. <p>All the native fish species recorded are relatively common and widespread across their distributions.</p> <p>Further detail presented in Section 4.8 of Appendix D.</p>
Turtles and Platypus	<ul style="list-style-type: none"> A single specimen of Eastern Long-necked Turtle (<i>Chelodina longicollis</i>) was captured. This species can move long distances overland between waterholes, particularly after heavy rainfall. No Platypuses (<i>Ornithorhynchus anatinus</i>) were recorded in the March 2022 surveys and there are no available historical records within 50 km of the Project Area. Three sites were assessed as being average for habitat suitability for platypus, while all remaining sites were considered poor habitat suitability for platypus. It is considered unlikely that platypus would occur across the Project Area. Further detail presented in Section 4.9 in Appendix D.
Frogs	<p>Three species of frog were recorded in the March 2022 sampling:</p> <ul style="list-style-type: none"> Green-Stripe Frog (<i>Cyclorana alboguttata</i>) – recorded at seven sites; Broad-Palmed Rocket Frog (<i>Litoria latopalmata</i>) – recorded at one site; and Cane Toad (<i>Rhinella marina</i>) – recorded at two sites. <p>Further detail provided in Section 4.10 in Appendix D.</p>

Information sourced from Appendix D (Freshwater Ecology, 2022).

4.4 Matters of National Environmental Significance (MNES)

The MNES within the Project Area are summarised in Table 4-5, with detailed descriptions provided in the following Sections.

Following ground-truthing of vegetation mapping during field surveys, the presence of two TECs have been confirmed within the Project Area, namely Brigalow (*Acacia harpophylla* dominant and codominant) and Poplar Box Grassy Woodland on Alluvial Plains.

Based on the outcomes of the detailed habitat assessments and targeted field surveys, five listed threatened fauna, Koala, Greater Glider (southern and central), South-eastern Glossy Black-cockatoo, Dulacca Woodland Snail and White-throated Needle-tail, and one flora species, Ooline, have been identified as known or likely to occur within the Project Area.

The Project Area occurs within the distribution for the Greater Glider (southern and central) (*Petauroides volans*). It is noted in the Conservation Advice, that it is likely that two separate taxa exist, to the level of subspecies in this area. However, it is noted that until such ambiguity is resolved, the listed entity will be referred to as *Petauroides volans* (DCCEEW, 2022a). For the sake of this analysis, this species will be referred to herein as the Greater Glider.

An additional 16 listed threatened species (two flora and 14 fauna) and six migratory species were determined to be potentially occurring given the overlap of distribution with the Project Area and presence of habitat for these species. For these species, potential future presence cannot be ruled out, although no records occur within the Project Area or in the locality and no observations were made during the field surveys.

The full likelihood of occurrence is attached as Appendix B.

The following Sections detail the confirmed TECs and listed threatened and/or migratory species known and likely to occur in the Project Area, and potential habitat for species with potential to occur. TECs and species habitats have been mapped and presented.

Table 4-5: MNES within the Project Area

Matter	Relevance to the Project Area
World heritage properties	There are no world heritage properties within the Project Area.
National heritage properties	There are no national heritage properties within the Project Area.
Wetlands of international importance	There are no wetlands of international importance associated with the Project Area.

Matter	Relevance to the Project Area
Threatened species and ecological communities	<p>There are six EPBC Act listed threatened species (one flora and five fauna) that are known or likely to occur within the Project Area:</p> <ul style="list-style-type: none"> ■ Dulacca Woodland Snail (<i>Adclarkia dulacca</i>) (likely to occur) – Endangered; ■ Greater Glider (central and southern) (<i>Petauroides volans</i>) (known to occur) – Endangered; ■ Koala (<i>Phascolarctos cinereus</i>) (likely to occur) – Endangered; ■ Ooline (<i>Cadellia pentastylis</i>) (known to occur) – Vulnerable; ■ South-eastern Glossy Black-cockatoo (<i>Calyptorhynchus lathami lathami</i>) (likely to occur) – Vulnerable; and ■ White-throated Needletail (<i>Hirundapus caudacutus</i>) (known to occur) – Vulnerable. <p>There are an additional 16 listed threatened species with potential to occur within the Project Area (Section 4.4.3 and 4.4.8).</p> <p>Two TECs that have been confirmed as known within the Project Area:</p> <ul style="list-style-type: none"> ■ Brigalow (<i>Acacia harpophylla</i> dominant and codominant); and ■ Poplar Box grassy woodland on alluvial plains.
Migratory species	<p>There are two EPBC Act listed migratory species that are regarded as known or likely to occur within the Project Area:</p> <ul style="list-style-type: none"> ■ White-throated Needletail (<i>Hirundapus caudacutus</i>) (known to occur); and ■ Fork-tailed Swift (<i>Apus pacificus</i>) (likely to occur). <p>There are six listed migratory species with potential to occur within the Project Area (Section 4.4.12 4.4.12).</p>
Commonwealth marine area	There are no Commonwealth marine areas within the Project Area.
The Great Barrier Reef Marine Park	The Great Barrier Reef is not associated with the Project Area
Nuclear actions	N/A to this Project.
Water resources	Considered as part of assessments by others.

Table 4-6: Summary of Habitat for Listed Threatened Species Known or Likely to Occur within the Project Area

MNES	Total Habitat in Project Area	Vegetation/Habitat Group/s
EPBC Act listed species (threatened and/or migratory)		
Dulacca Woodland Snail	<ul style="list-style-type: none"> ■ 666.3 ha. ■ Likely to occur from historical record in the Project Area. No observations in field surveys. 	<ul style="list-style-type: none"> ■ Acacia woodlands dominated by Brigalow (<i>Acacia harpophylla</i>). ■ Eucalypt dominated woodlands mainly with <i>Eucalyptus crebra</i> and <i>E. populnea</i>.
South-eastern Glossy Black-cockatoo	<ul style="list-style-type: none"> ■ 1,003 ha. ■ Likely to occur from historical record in the Project Area. No observations in field surveys. 	<ul style="list-style-type: none"> ■ All remnant and regrowth vegetation of most broad terrestrial broad habitat types particularly those dominated by Eucalypt species with large hollow bearing trees, along with remnant and regrowth RE with potential feed trees (<i>Casuarinaceae</i> spp.). ■ Potential nest trees occur in remnant eucalypt woodland and forest and in well-developed riparian corridors across the northern portions of the Project Area.
Greater Glider (central and southern)	<ul style="list-style-type: none"> ■ 528 ha. ■ Known to occur from field survey observations. 	<ul style="list-style-type: none"> ■ All remnant vegetation of most broad terrestrial broad habitat types particularly those dominated by Eucalypt species wherever large trees with hollows occur in woodland connected with these corridors and also in the extensively wooded in the south of the Project Area.
Koala	<ul style="list-style-type: none"> ■ 698.5 ha foraging and breeding habitat and 9,072.6 ha dispersal habitat. ■ Likely to occur in the Project Area from sparse, historical records in the locality and potential scratches observed during field surveys, although it is noted that there is uncertainty that the scratches were definitely caused by Koala. 	<p>Foraging and breeding habitat recorded in the Project Area includes:</p> <ul style="list-style-type: none"> ■ Eucalypt woodlands and open forests. ■ Potential food trees occur including <i>E. tereticornis</i>, <i>E. populnea</i>, <i>E. crebra</i>, <i>E. longirostrata</i>, <i>E. melanophloia</i>, <i>E. exserta</i> and <i>Corymbia citriodora</i> subsp. <i>variegata</i>). <p>Dispersal habitat has been defined as:</p> <ul style="list-style-type: none"> ■ Cleared exotic grasslands and Brigalow woodlands.

MNES	Total Habitat in Project Area	Vegetation/Habitat Group/s
EPBC Act listed species (threatened and/or migratory)		
Ooline	<ul style="list-style-type: none"> ■ 118.7 ha habitat. ■ Known to occur from field survey observations. 	<p>Ooline habitat:</p> <ul style="list-style-type: none"> ■ Consists of relatively narrow remnant and regrowth patches in the far south of the Project Area. ■ All broad habitat types excluding those Eucalypt and Callitris woodlands. ■ Acacia woodlands dominated by Brigalow (<i>Acacia harpophylla</i>).
White-throated Needletail	<ul style="list-style-type: none"> ■ 0 ha mapped as a likely flyover visitor only. ■ Known to occur from field survey observations. 	<ul style="list-style-type: none"> ■ No habitat mapped, flyover visitor only.

4.4.1 Threatened Ecological Communities

The desktop review identified the potential occurrence of five TECs listed under the EPBC Act in the Project Area, including:

- Brigalow (*Acacia harpophylla* dominant and co-dominant) – Endangered;
- Coolibah – Black Box woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions— Endangered;
- Poplar box grassy woodland on alluvial plains – Endangered;
- Semi-evergreen vine thickets (SEVT) of the Brigalow Belt (North and South) and Nandewar Bioregions— Endangered; and
- Weeping Myall woodlands – Endangered.

Following ground-truthing of vegetation mapping during field surveys, it has been confirmed the presence of two TECs within the Project Area, being Brigalow TEC and Poplar Box TEC. The remaining three TECs are not present within the Project Area.

The extent of Brigalow TEC and Poplar Box TEC is considerably smaller than the total mapped extent of the component RE. This is because smaller areas of retained REs 11.3.1, 11.9.5 and 11.9.5a (Brigalow TEC) and RE 11.3.2 (Poplar Box TEC) did not meet TEC size and/or condition criteria (patch size too small, ground stratum was dominated by exotic weeds and/or patch was not dominated by relevant tree species).

A brief description of the confirmed TECs are listed in Table 4-7, together with the constituent REs which are further described and defined in Sections 4.4.1.1 and 4.4.1.2. The following Sections provide further supporting information for each confirmed TEC.

Table 4-7: Description and Ground-truthed Extent of TEC within the Project Area

TEC Description	EPBC Act Status	RE Codes	Ground-truthed Extent (ha)	Number of Patches (Size Range [ha])	Comment
Brigalow (<i>Acacia harpophylla</i> dominant and codominant)	Endangered	11.9.5, 11.9.5a	95.8 ha	17 (0.1–44.9 ha)	An additional 14 patches and a total of 56.2 ha (RE 11.3.1, 11.9.5 and 11.9.5a) did not meet TEC condition criteria ¹ .
Poplar Box grassy woodland on alluvial plains ²	Endangered	11.3.2	32.3 ha	10 (0.03–9.6 ha)	An additional 15 patches (RE 11.3.2) did not meet TEC condition criteria ² .

¹ TEC condition criteria and thresholds found in: DoE (2013); and ² DoEE (2019).

4.4.1.1 Brigalow TEC

The Brigalow TEC was listed as Endangered under the EPBC Act on 4 April 2001 (Threatened Species Scientific Committee [TSSC], 2001a). This community occurs within Queensland and New South Wales and is characterised by *Acacia harpophylla* being either dominant in the tree layer, or co-dominant with other species – notably *Casuarina cristata*, other species of *Acacia*, or species of *Eucalyptus* (Butler, 2007). In QLD, Brigalow TEC comprises of 16 REs (DoE, 2013).

Within the Project Area, 17 patches of Brigalow TEC were detected in REs 11.9.5 and 11.9.5a, covering a total area of 95.8 ha (refer to Figure 4-3). This included 13 ha of regrowth and 82.8 ha of remnant vegetation. An example of a remnant patch of Brigalow TEC within the Project Area is shown in Photograph 4-1. An additional 14 patches of Brigalow vegetation (RE 11.3.1, 11.9.5 and 11.9.5a; totalling 56.2 ha) did not meet the criteria for recognition as a TEC as:

- *A. harpophylla* was absent or subdominant; and/or
- The was patch less than 0.5 ha in size (including areas that extended beyond the Project Area boundary); and/or
- Exotic perennial plants comprised over 50% of total vegetation cover within the patch.

4.4.1.2 Poplar Box Grassy Woodland TEC

Poplar Box Grassy Woodland on Alluvial Plains TEC was listed as Endangered under the EPBC Act on 4 July 2019 (DoEE, 2019). This community is typically a grassy woodland with a canopy dominated by *Eucalyptus populnea* and understorey mostly of grasses and other herbs, mostly occurring in gently undulating to flat landscapes and occasionally on gentle slopes on a wide range of soil types of alluvial and depositional origin (Webb et al. 1980). In QLD, Poplar Box TEC comprises of five REs (11.3.2, 11.3.17, 11.4.7, 11.4.12 and 12.3.10) (DEE, 2019).

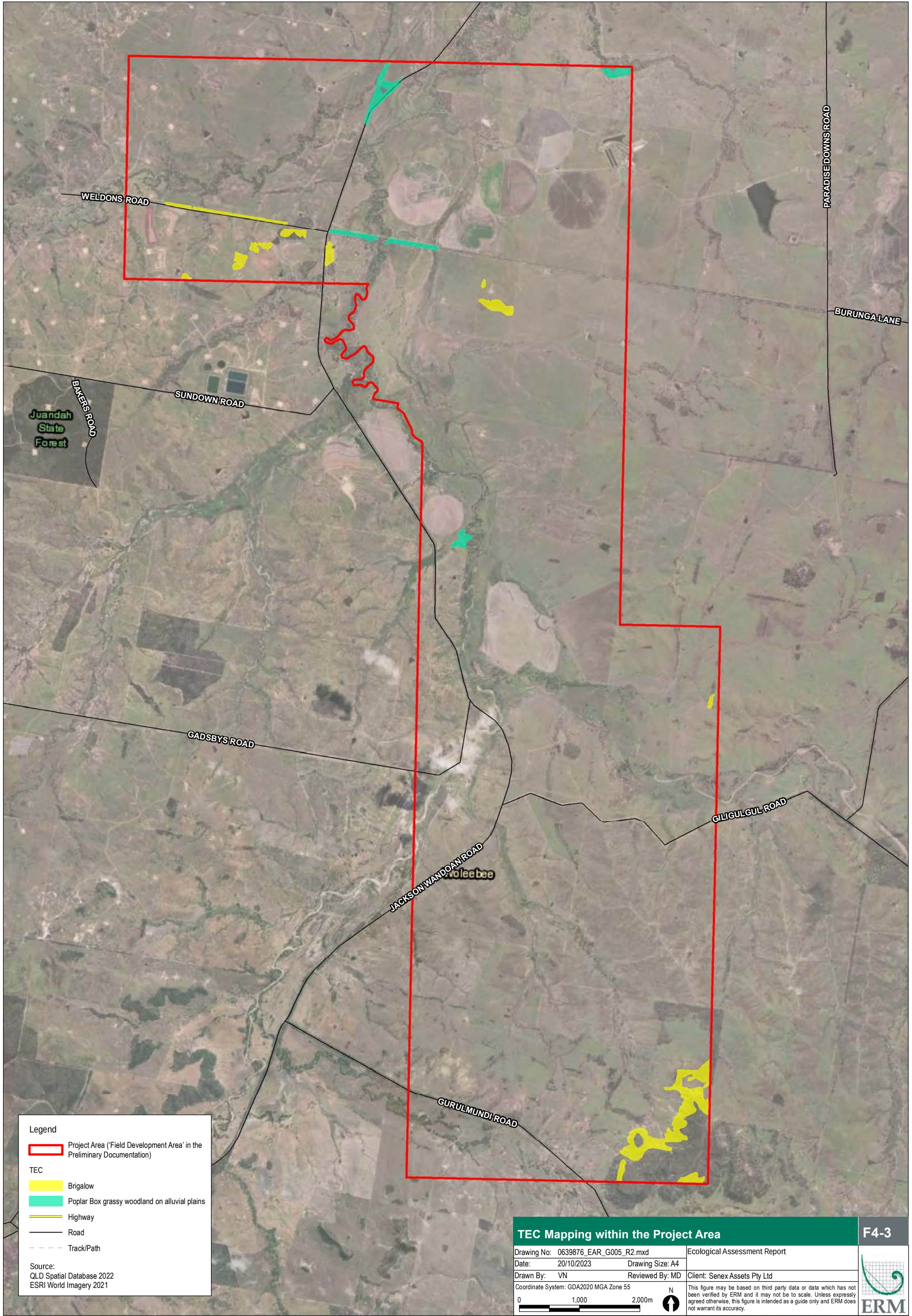
Within the Project Area, ten patches of Poplar Box TEC were detected in RE 11.3.2, covering a total area of 32.3 ha, with an example of this community shown in Photograph 4-2. Three of these patches were assessed as Category B (Good Quality) vegetation and seven patches were assessed as Category C (Moderate Quality) vegetation, all occurring on floodplains in the north, with some patches extending beyond the Project Area boundaries. An additional 15 patches of regrowth and remnant Poplar Box woodland on alluvial plains (RE 11.3.2) was assessed and did not meet the criteria for recognition as TEC (smaller than 5 ha (including any portions that extended beyond the Project Area boundary) and/or the ground stratum was dominated by exotic weeds) (Appendix C). TEC mapping is presented on Figure 4-3.



Photograph 4-1: Example Brigalow TEC within Project Area



Photograph 4-2: Example Poplar Box Woodland TEC within Project Area



Legend

Project Area ('Field Development Area' in the Preliminary Documentation)

TEC

Brigalow

Poplar Box grassy woodland on alluvial plains

Highway

Road

Track/Path

Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

TEC Mapping within the Project Area

Drawing No: 0639876_EAR_G005_R2.mxd Ecological Assessment Report

Date: 20/10/2023 Drawing Size: A4

Drawn By: VN Reviewed By: MD Client: Senex Assets Pty Ltd

Coordinate System: GDA2020 MGA Zone 55

0 1,000 2,000m



This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

F4-3



4.4.2 Terrestrial Listed Threatened Flora Species Likely to Occur

There were fourteen threatened flora species identified by desktop searches as having the potential to occur within 10 km of the Project Area. The field surveys recorded 124 flora species, including one EPBC Act listed threatened terrestrial flora species, Ooline (*Cadellia pentastylis*), within the Project Area. Further information on Ooline and its associated habitat within the Project Area is provided in Section 4.4.2.1 and mapped in Figure 4-4 and Figure 4-5.

Based on the likelihood of occurrence assessment using desktop and field data, no additional species were considered known or likely to occur within the Project Area. Two species were considered to have the potential to occur within the Project Area. Further information on these potentially occurring species can be found in Section 4.4.3 and mapped in Figure 4-6.

Records of threatened flora species is provided in Appendix J.

4.4.2.1 Ooline

Species Profile

Ooline (*Cadellia pentastylis*) is currently listed as Vulnerable under the EPBC Act, effective 16 July 2000 and is known to occur in the Project Area from field survey observations (Appendix B). The species is a medium-sized spreading tree growing to 10 m and rarely to 25 m high. Leaves are glossy green, paler and dull underneath, and 1-7 cm long, 1.5-2 cm wide, with broad rounded tips. Leaf venation is prominent on both leaf surfaces when dry. Flowers are usually single, with white petals 5-7 mm long and occur sporadically. Fruit is a cluster of up to five brown coloured drupes, 3-5 mm in diameter, surrounded by papery, red sepals (DECC, 2005a).

Ooline is distributed from the western edge of the NSW north-west slopes, from Mt Black Jack near Gunnadah to west of Tenterfield, and extends into Queensland to Carnarvon Range and Callide Valley, south-west of Rockhampton (DEWHA, 2008a).

Ooline is listed as Vulnerable under the EPBC Act and is known to occur in the Project Area from field survey observations (Appendix B). This species grows on undulating plains, valley slopes, hillsides and scarps, often in association with Brigalow and SEVT communities (DEWHA, 2008a).

Species Threats

As per the conservation advice for the Ooline (DEWHA, 2008a), the threats include:

- Known threats;
 - Inbreeding, low seed viability, agricultural clearing, grazing, soil compaction by domestic stock, invasion of habitat by weeds, frequent fires, tunnel and sheet erosion, roadworks damage to roadside populations, and high insect attack.
- Potential threats;
 - Lack of recruitment; and
 - Logging of the tree species.

Species Occurrence in the Broader Area

A search of the ALA database identified multiple historical known records of Ooline within 10 km of the Project Area. A cluster of known Ooline records exists near Gurulmundi State Forest, with the closest being 4 km south of the Project Area, recorded between 2012 and 2020. Additionally, there is another cluster of known Ooline records located 13 km west of the Project Area, recorded between 2011 and 2017. For more information on the description of the habitat in which the record was identified, refer to Appendix H. Refer to Figure 4-5 for records within the broader area.

Habitat Assessment

Ooline grows in dry rainforest, semi-evergreen vine thickets and sclerophyll ecological communities, often locally dominant or as an emergent. This species grows on undulating plains, valley slopes, hillsides and scarps, often in association with the following ecological communities (DEWHA, 2008a):

- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions;
- Brigalow (*Acacia harpophylla* dominant and co-dominant); and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

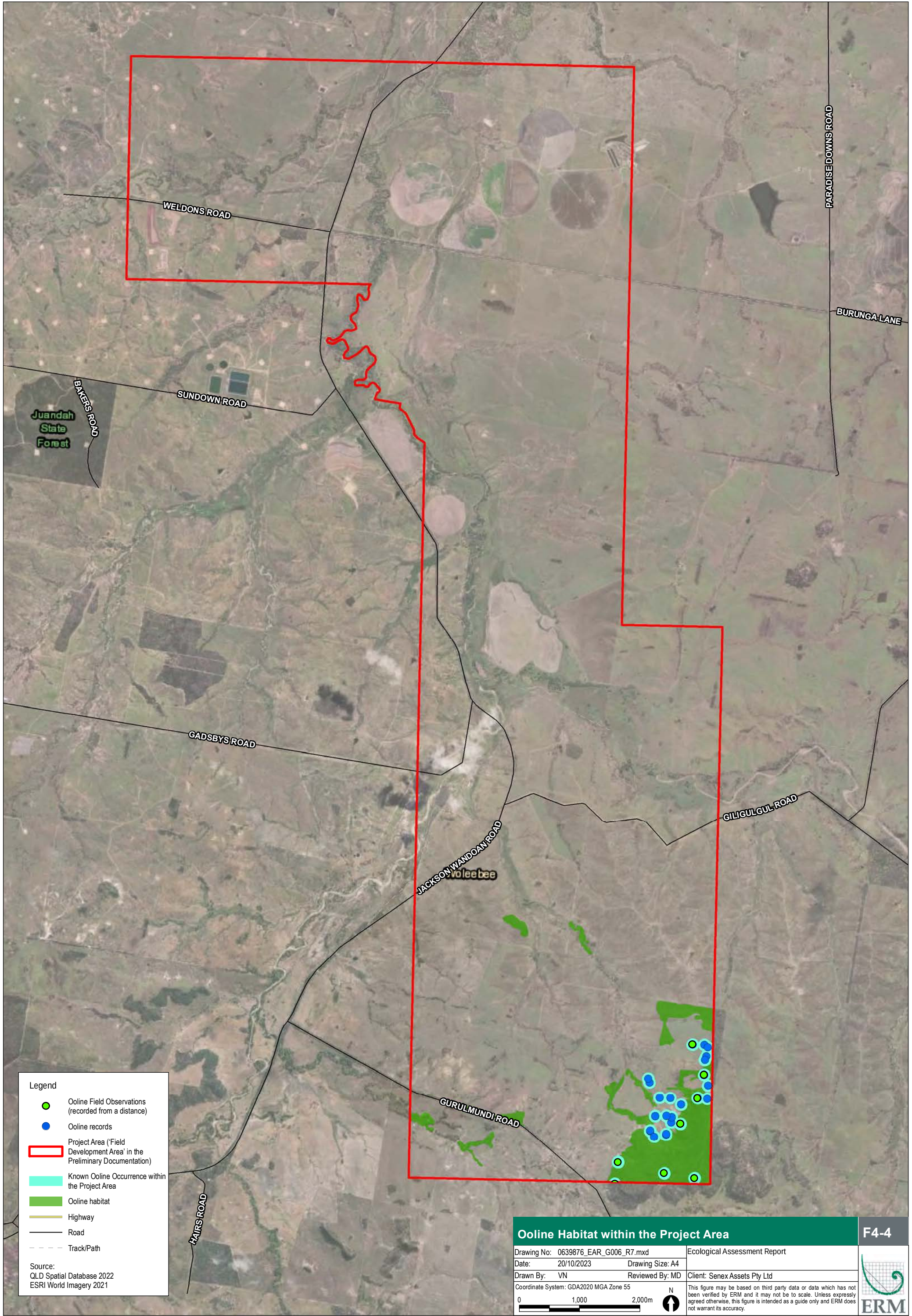
There is a total of 118.7 ha of mapped Ooline habitat within the Project Area. During the 2022 field surveys, Ooline was observed in the south-eastern part of the Project Area in Brigalow woodland (this is further described in Appendix C). In addition, the desktop searches showed four additional records within the Project Area and another six within the 10 km buffer (Appendix A).

During the 2023 field surveys, 35 individuals were recorded within the eastern portion of the Hillandale property, adjacent to existing Ooline records. The individuals identified had ranged from juveniles to mature plants from 1 to 18 m in height, occurring in mostly cleared agricultural land (Attexo, 2023).

Ooline habitat consists of relatively narrow remnant and regrowth patches in the far south of the Project Area. It is inclusive of all broad habitat types excluding those Eucalypt and Callitris woodlands and Acacia woodlands dominated by Brigalow (*Acacia harpophylla*).



Photograph 4-3: Example Stand of Ooline in Areas of Exotic Pasture



Legend

- Ooline Field Observations (recorded from a distance)
- Ooline records
- Project Area ('Field Development Area' in the Preliminary Documentation)
- Known Ooline Occurrence within the Project Area
- Ooline habitat
- Highway
- Road
- Track/Path

Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

Ooline Habitat within the Project Area

Drawing No: 0639876_EAR_G006_R7.mxd
Date: 20/10/2023
Drawn By: VN
Ecological Assessment Report
Drawing Size: A4
Reviewed By: MD
Client: Senex Assets Pty Ltd

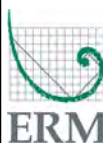
Coordinate System: GDA2020 MGA Zone 55

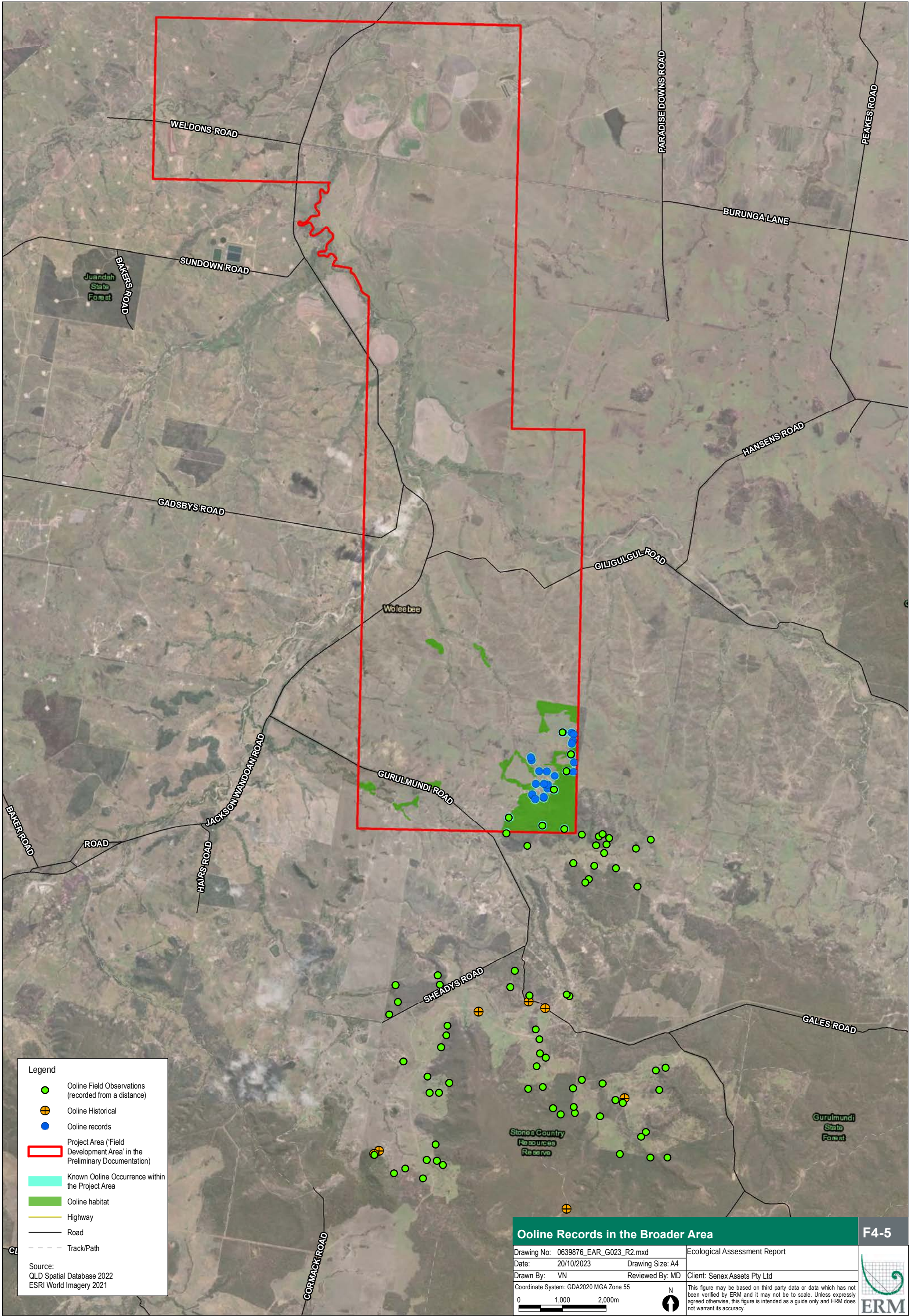
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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

F4-4





4.4.3 Listed Threatened Terrestrial Flora Species with Potential to Occur

Two listed threatened terrestrial flora species, Belson's Panic (*Homopholis belsonii*) and Slender Tylophora (*Vincetoxicum forsteri*), have been assessed as having the potential to occur within the Project Area (Appendix B). In essence, because part of this species' distributions overlaps the Project Area and suitable habitat is present within the Project Area, their presence cannot be ruled out. This is despite no signs or observations of these species within the Project Area during field surveys using survey techniques aligned with the relevant survey guidelines.

Belson's Panic and Slender Tylophora are listed as Vulnerable and Endangered under the EPBC Act, respectively.

Within the Project Area, potential mapped habitat for Belson's Panic totals 366.3 ha and includes:

- Eucalypt dominated woodlands mainly of *Eucalyptus crebra*, *E. populnea* and *E. melanophloia*; and
- Acacia woodlands dominated by Brigalow (*Acacia harpophylla*).

Potential Slender Tylophora mapped habitat within the Project Area totals 122.7 ha and includes Eucalypt dominated woodlands mainly of *E. crebra*, and *E. melanophloia*. In accordance with the precautionary principle, 'potential habitat' for Belson's Panic and Slender Tylophora has been mapped.

4.4.3.1 Belson's Panic

Species Profile

Belson's Panic (*Homopholis belsonii*) is currently listed as Vulnerable under the EPBC Act, effective 16 July 2000. The species is a perennial grass growing to 0.5 m high. Leaf blades are 2–4.5 mm wide. The common axis of the inflorescence is 8–15 cm long and the primary branches are 8–15 cm long with hairy axils. There are two or three laterally compressed 8 mm long spikelets on a typical lowermost branch (DEWHA, 2008b).

The species is known to occur within the southern Brigalow belt, Queensland and on the north-western slopes and plains of NSW. In NSW, this species occurs between Wee Waa, Goondiwindi and Glen Innes. In Queensland, it has been recorded in the Darling Downs west of Toowoomba, near Oakey, Jondaryan, Bowenville, Dalby, Acland, Sabine, Quinalow, Goombungee, Gurulmundi and Millmerran, and further west between Miles and Roma. This species occurs within the Border Rivers Maranoa–Balonne, Condamine (Queensland) and Border Rivers–Gwydir (NSW) Natural Resource Management Regions (DEWHA, 2008b).

Species Threats

As per the conservation advice for the Belson's Panic (DEWHA, 2008b), the threats include:

- Habitat clearing for mining;
- Habitat clearing for agricultural purposes;
- Development or pasture improvement;
- Overgrazing of habitat by domestic stock; and
- Introduction of invasive weeds.

Species Occurrence in the Broader Area

A search of the ALA database identified one (1) historical known record of Belson's Panic within 10 km of the Project Area, located approximately 2 km north of Project Area, recorded in 2007. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

Belson's Panic occurs at elevations ranging from 200 m to 520 m above sea level. It is known to occur in dry woodland habitats on poor soils, such as those derived from basalt. It occurs on rocky hills supporting White Box (*Eucalyptus albens*) and in Wilga (*Geijera parviflora*) woodland; flat to gently undulating alluvial areas supporting Belah (*Casuarina cristata*); and soils and plant communities of Poplar Box (*Eucalyptus populnea*) woodlands.

It may also be associated with shadier areas of Brigalow (*Acacia harpophylla*), Myall (*A. melvillei*), and Weeping Myall (*A. pendula*) communities; in Mountain Coolibah (*Eucalyptus orgadophila*) communities; and on roadsides. It is generally found among fallen timber at the base of trees or shrubs, among branches and leaves of trees hanging to ground level or along the bottom of netting fences. The distribution of this species overlaps with the "Brigalow (*Acacia harpophylla* dominant and co-dominant)" EPBC Act-listed threatened ecological community (DEWHA, 2008c).

Field assessments conducted in 2022 confirmed a small portion of the Project Area to contain potential habitat, in the form of Eucalypt dominated woodlands mainly of *Eucalyptus crebra*, *E. populnea* and *E. melanophloia*; and Acacia woodlands dominated by Brigalow (*Acacia harpophylla*). Therefore, as suitable habitat is located within the Project Area, Belson's Panic is considered to have a potential to occur. The species was not recorded during the 2022 or 2023 field surveys.

4.4.3.2 Slender Tylophora

Species Profile

Slender Tylophora (*Vincetoxicum forsteri*) is currently listed as Endangered under the EPBC Act, effective 16 July 2000. The species is an herbaceous climber with clear latex that grows to about 2 m long. The stems are cylindrical, up to 3 mm in diameter with internodes up to 100 mm long. Leaves are dark green, linear, up to 100 mm long and 4 mm wide, and extra-floral nectaries are absent from the base of the leaf. Flowers are clustered in radiating groups of 3–8. Flowers are 6–22 mm in diameter, with petals olive-green externally, dark purple internally and with short hairs internally concentrated towards the tip. Fruits form follicles 95–100 mm long and 5 mm wide (DEWHA, 2008c).

Slender Tylophora has rarely been collected and is known from eight localities in the Dubbo area and Mt Crow near Barraba in NSW, and "Myall Park" near Glenmorgan in Queensland. This species is conserved within Goobang National Park, Eura State Forest, Goonoo State Forest, Pilliga West State Forest and Coolbaggie Nature Reserve (DEWHA, 2008c).

Species Threats

As per the conservation advice for the Slender Tylophora (DEWHA, 2008c), the threats include:

- Habitat disturbance from grazing and fire;
- Introduction of invasive weeds, particularly Lantana (*Lantana camara*); and
- Habitat disturbance from forestry activities.

Species Occurrence in the Broader Area

A search of the ALA database did not identify any records of Slender Tylophora 10 km of the Project Area.

Habitat Assessment

The species grows in dry scrub, open forest and woodlands associated with *Melaleuca uncinata*, *Eucalyptus fibrosa*, *E. sideroxylon*, *E. albens*, *Callitris endlicheri*, *C. glaucophylla*, *Allocasuarina luehmannii*, *Acacia hakeoides*, *A. lineata*, *Myoporum* spp., and *Casuarina* spp. This species occurs within the Border Rivers–Gwydir, Central West, Namoi (NSW), and Border Rivers Maranoa–Balonne (Queensland) Natural Resource Management regions (DEWHA, 2008c).

Field assessments conducted in 2022 confirmed a small portion of the Project Area to contain potential habitat, in the form of Eucalypt dominated woodlands mainly of *Eucalyptus crebra*, *E. populnea* and *E. melanophloia*. Therefore, as suitable habitat is located within the Project Area, Slender Tylophora is considered to have a potential to occur. The species was not recorded during the 2022 or 2023 field surveys.

4.4.4 Listed Threatened Terrestrial Flora Species identified in the RFI but not Known, Likely or Potential to Occur

4.4.4.1 Bluegrass

Species Profile

Bluegrass (*Dichanthium setosum*) is currently listed as Endangered under the EPBC Act, effective 16 July 2000. Bluegrass is an upright perennial grass less than 1 m tall. It has mostly hairless leaves about 2–3 mm wide. The flowers are densely hairy and clustered together along a stalk in a cylinder shape and appear mostly during summer. The species can form pure swards or occur as scattered clumps (DEWHA, 2008d).

The species occurs chiefly on the northern tablelands in the Saumarez area, west of Armidale, and 18–30 km east of Guyra. It is more rarely found on the north-western slopes, central western slopes and north-western plains of NSW, extending west to Narrabri. In Queensland it has been reported from the Leichhardt, Morton, North Kennedy and Port Curtis regions. This species occurs in the Mistake Range, in Main Range National Park, and possibly in Glen Rock Regional Park, adjacent to the Main Range National Park (DEWHA, 2008d).

Species Threats

As per the conservation advice for Bluegrass (DEWHA, 2008d), the threats include:

- Heavy grazing from domestic stock;
- Loss of habitat through agricultural clearing;
- Frequent fires;
- Introduction of invasive grasses; and
- Road widening.

Species Occurrence in the Broader Area

A search of the ALA database identified one historical known record of Bluegrass within 10 km of the Project Area. This record is located approximately 2 km north of the Project Area, recorded in 2017. Additionally, a cluster of Bluegrass records are located in Wandoan, approximately 12 km north-east of the Project Area, recorded in 1930, 1971 and 2020. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

Bluegrass is associated with heavy basaltic black soils and stony red-brown hard setting loam with clay subsoil and is found in moderately disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pasture. The extent to which this species tolerates disturbance is unknown. The species occurs within the Border Rivers–Gwydir, Central West, Namoi, Northern Rivers (NSW), South East and Fitzroy (Queensland) Natural Resources Management Regions (DEWHA, 2008d).

Field assessments conducted in 2022 confirmed no potential habitat within the Project Area that supports the species. Therefore, Bluegrass is considered unlikely to occur. The species was not recorded during the 2022 or 2023 field surveys.

4.4.4.2 *Calytrix gurulmundensis*

Species Profile

Calytrix gurulmundensis is currently listed as Vulnerable under the EPBC Act, effective 16 July 2000. *C. gurulmundensis*, is a shrub growing to 2 m tall. Leaves are linear, 4–11 mm long, 0.5–1 mm wide and aromatic when crushed. Flowers have cream petals with yellow at the base, but can also be white, pinkish-white or yellow, and are up to 11 mm long and 3 mm wide. Flowers can have 60–70 yellow stamens with a few filaments inflexed in the bud stage. Flowering occurs from July to October. The species is known from the Gurulmundi, Guluguba and Barakula area in Queensland (DEWHA, 2008e).

Species Threats

As per the conservation advice for *Calytrix gurulmundensis* (DEWHA, 2008e), the threats include:

- Vegetation clearing;
- Increased fragmentation and loss of remnant vegetation;
- Altered fire regimes;
- Quarrying, and
- Inappropriate timber harvesting.

Species Occurrence in the Broader Area

A search of the ALA database did not identify any historical known records of *Calytrix gurulmundensis* within 10 km of the Project Area. The closest known records of the species are a cluster located in Gurulmundi State Forest, approximately 11 km south-east of the Project Area, recorded between 1961 and 2021.

Habitat Assessment

This species occurs on ridge tops in open scrubland with sparse stunted *Eucalyptus* spp., *Acacia* spp., and *Casuarina*, in *Triodia*-hummock grassland with scattered shrubs, and growing on yellow lateritic sandy clay, shallow red gravelly soil and sandstone. This species has a linear range of less than 100 km. This species occurs within the Fitzroy and Border Rivers and Maranoa–Balonne (Queensland) Natural Resource Management Regions (DEWHA, 2008e).

The distribution of this species is not known to overlap with any EPBC Act-listed threatened ecological community (DEWHA, 2008e).

Field assessments conducted in 2022 confirmed no potential habitat within the Project Area that supports the species. Therefore, suitable habitat is not located within the Project Area, the *C. gurulmundensis* is considered unlikely to occur. The species was not recorded during the 2022 or 2023 field surveys.

4.4.4.3 *Curly-bark Wattle*

Species Profile

Curly-bark Wattle (*Acacia curranii*) is currently listed as Vulnerable under the EPBC Act, effective 16 July 2000. The species is an erect or spreading multi-stemmed shrub growing to 4 m tall, with distinctive red curling (minniritchi) bark. Branches are angular, maroon-grey with silky, downy hairs. The leaf-like phyllodes are erect, linear, depressed along the midrib, 13–18 cm long, 1–1.5 mm wide and covered by silky silver hairs. Flowers are golden yellow in colour and arranged in spikes 5–7 mm long on a stalk 1.5 mm long. Pods are flat, up to 6 cm long by 3 mm wide and with coarse long hairs. Seeds are oblong, about 3 mm long, greyish-brown with a pale area and a basal seed stalk (aril). Flowering time is August and September (DEWHA, 2008f).

Curly-bark Wattle is known from three separate areas: Lake Cargelligo and Gunderbooka Range near Bourke in NSW, and Gurulmundi in Queensland. A population of about 150 trees has been recorded on Mount Gunderbooka. This species is conserved within the Gundabooka National Park and Nombininie Nature Reserve (DEWHA, 2008f).

Species Threats

As per the conservation advice for Curly-bark Wattle (DEWHA 2008f), the threats include:

- Habitat erosion;
- Grazing, browsing and horning of adult and seedling plants by feral goats (*Capra hircus*);
- Grazing by domestic stock;
- Clearing of vegetation for fire trail widening;
- Quarrying activities;
- Predation of seeds by insects, and
- Lack of suitable fire disturbances for seedling establishment.

Species Occurrence in the Broader Area

A search of the ALA database did not identify any historical known records of Curly-bark Wattle within 10 km of the Project Area. The closest known records of the species are a cluster located in Gurulmundi State Forest, approximately 11 km south-east of the Project Area, recorded between 1961 and 2008.

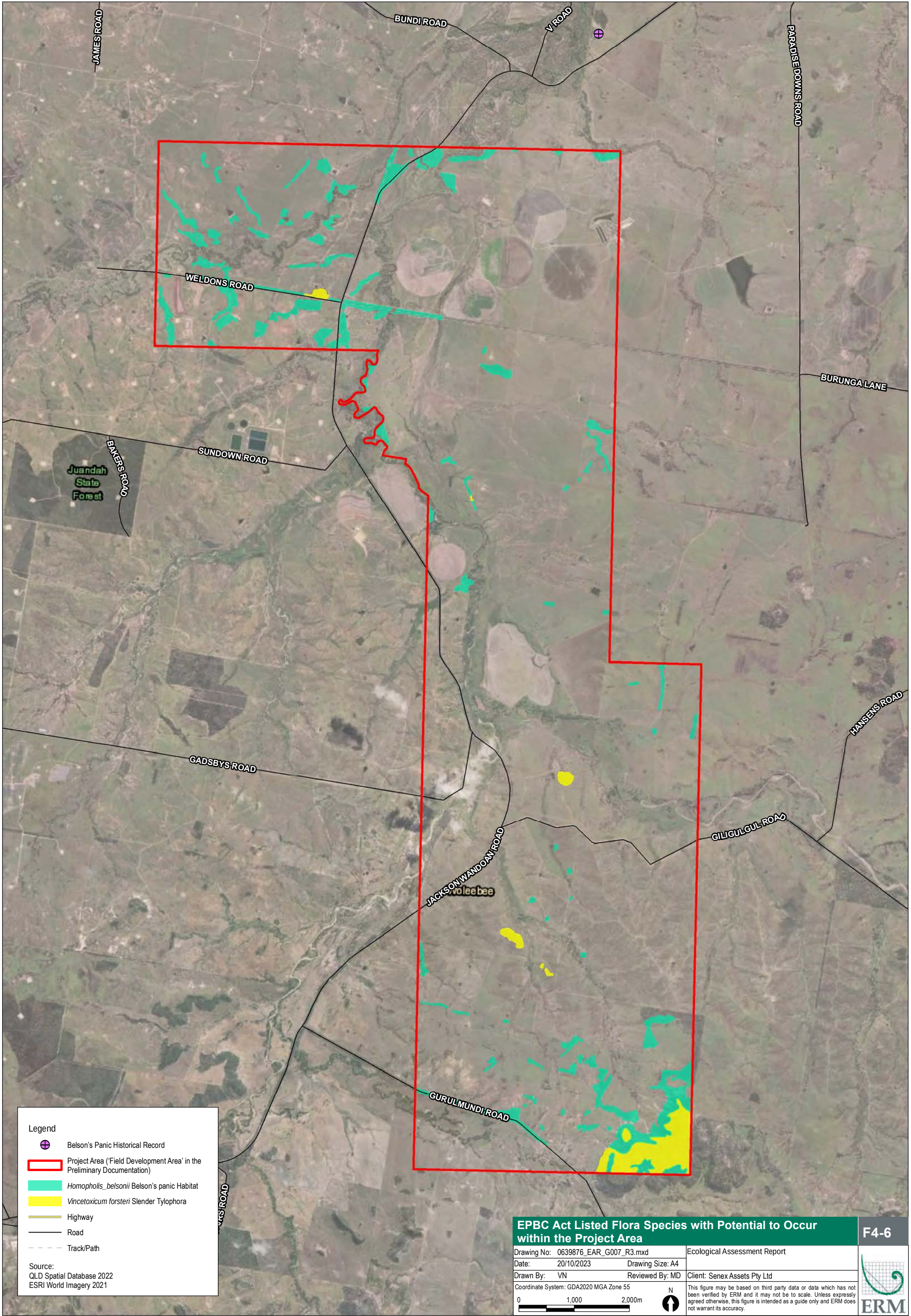
Habitat Assessment

Curly-bark Wattle grows in dry sclerophyll forests and semi-arid woodlands. This species occurs within the Lachlan, Western (NSW), and Border Rivers Maranoa–Balonne (Queensland) Natural Resource Management Regions (DEWHA, 2008f).

The distribution of this species overlaps with the following EPBC Act-listed threatened ecological communities (DEWHA, 2008f):

- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions;
- Brigalow (*Acacia harpophylla* dominant and co-dominant);
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland; and
- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions.

Field assessments conducted in 2022 confirmed no potential habitat within the Project Area that supports the species. Therefore, suitable habitat is not located within the Project Area, the Curly-bark Wattle is considered unlikely to occur. The species was not recorded during the 2022 or 2023 field surveys.



- Legend
- Belson's Panic Historical Record
 - Project Area ('Field Development Area' in the Preliminary Documentation)
 - Homopholis belsonii* Belson's panic Habitat
 - Vincetoxicum forsteri* Slender Tylophora
 - Highway
 - Road
 - Track/Path

Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

EPBC Act Listed Flora Species with Potential to Occur within the Project Area

Drawing No: 0639876_EAR_G007_R3.mxd
Date: 20/10/2023
Drawn By: VN
Reviewed By: MD

Ecological Assessment Report
Client: Senex Assets Pty Ltd

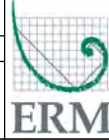
Coordinate System: GDA2020 MGA Zone 55

0 1,000 2,000m



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F4-6



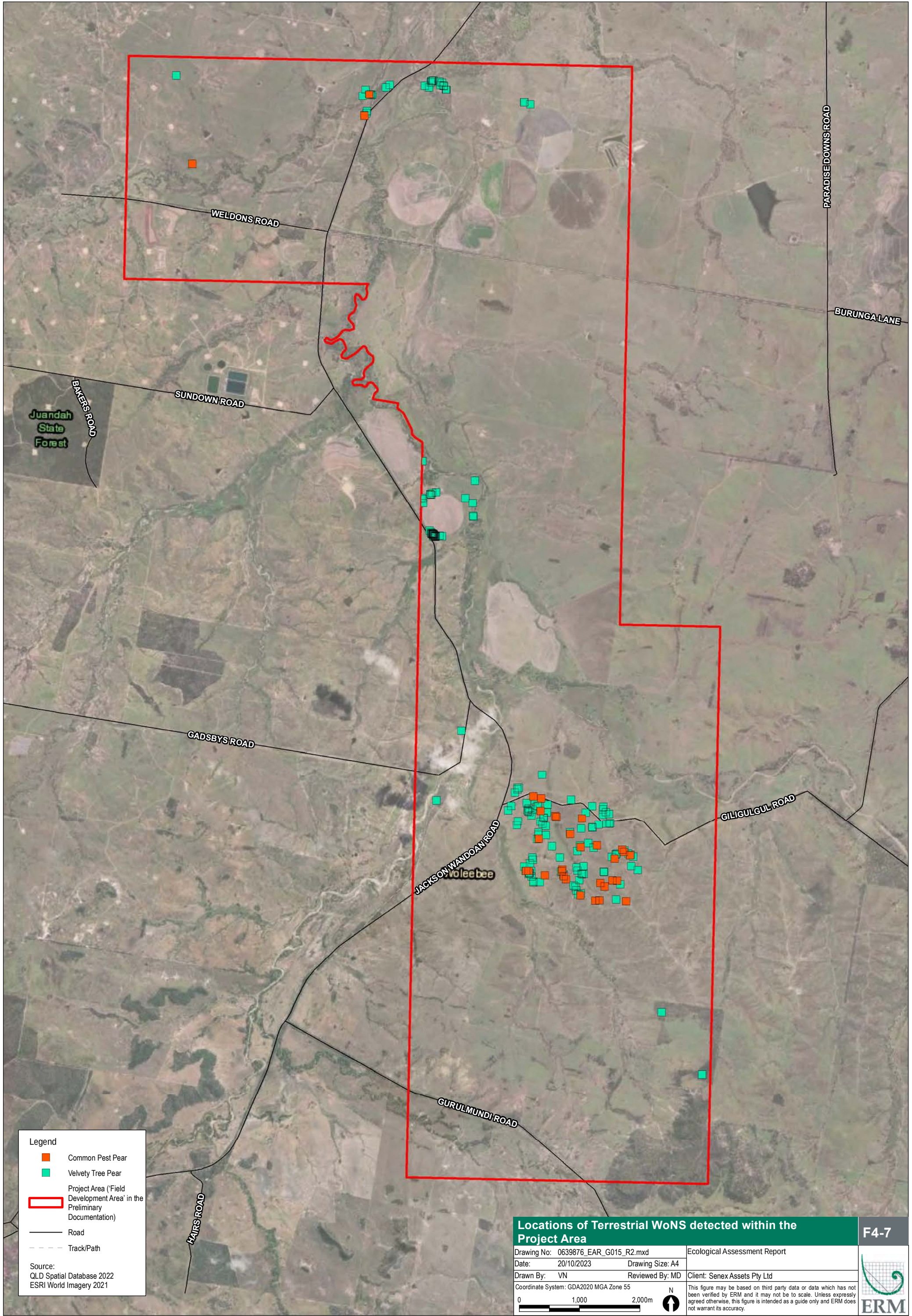
4.4.5 Weeds of National Significance

Desktop searches of the Queensland Government WildNet database (DES, 2022a) found five species of WoNS recorded within 10 km of the Project Area (the 'adjoining areas'). These species and WoNS detected during field surveys are given in Table 4-8. Locations of WoNS detected within the Project Area are shown in Figure 4-7.

Table 4-8: Terrestrial Weeds of National Significance Relevant to the Project Area

Scientific Name	Common Name	WoNS/ Biosecurity Act Status	Comments*
<i>Parthenium hysterophorus</i>	Parthenium Weed	WoNS, Cat. 3 Restricted Matter	■ Potentially occurring within the Project Area. Previously recorded within the 10 km buffer.
<i>Senecio madagascariensis</i>	Fireweed	WoNS, Cat. 3 Restricted Matter	■ Potentially occurring within the Project Area. Previously recorded within the adjoining areas (DES, 2022a).
<i>Anredera cordifolia</i>	Madeira Vine	WoNS, Cat. 3 Restricted Matter	■ Potentially occurring within the Project Area. Previously recorded within the adjoining areas (DES, 2022a).
<i>Opuntia aurantiaca</i>	Tiger Pear	WoNS, Cat. 3 Restricted Matter	■ Detected during field surveys at moderate densities in Brigalow woodland. The closest records in ALA (2022) are over 45 km away, around Yuleba North, Barakula and Taroom. No previous records in WildNet from the Project Area (DES, 2022a).
<i>Opuntia stricta</i>	Common Pest Pear	WoNS, Cat. 3 Restricted Matter	■ Previously recorded within the adjoining areas (DES, 2022a). Detected in field surveys throughout the Project Area at low densities.
<i>Opuntia tomentosa</i>	Velvety Tree Pear	WoNS, Cat. 3 Restricted Matter	■ Previously recorded within the adjoining areas (DES, 2022a). Detected in field surveys throughout the Project Area at low densities.

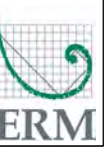
*Information sourced from BOOBOOK (2022) Appendix C.



Locations of Terrestrial WoNS detected within the Project Area

Drawing No: 0639876_EAR_G015_R2.mxd		Ecological Assessment Report	
Date: 20/10/2023	Drawing Size: A4		
Drawn By: VN	Reviewed By: MD	Client: Senex Assets Pty Ltd	
Coordinate System: GDA2020 MGA Zone 55		<div>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</div>	
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4.4.6 Aquatic Listed Threatened Flora Species

A total of four floating attached macrophyte species and 15 emergent macrophyte species were recorded across all sites. No listed aquatic flora species were recorded during field surveys or considered likely to occur in the Project Area. See likelihood of occurrence (Appendix B).

4.4.7 Terrestrial Listed Threatened Fauna Species Known and Likely to Occur

Five EPBC Act listed threatened species (Koala, Greater Glider, Glossy Black-cockatoo, Dulacca Woodland Snail and White-throated Needletail) are considered known or likely to occur within the Project Area (a full likelihood of occurrence is shown in Appendix B). A summary of listed threatened species that are known or likely to occur and their associated habitat within the Project Area is provided in Section 4.4.7.1 to 4.4.7.5.

Records of threatened fauna species is provided in Appendix J.

4.4.7.1 Koala

Species Profile

The Koala is currently listed as Endangered under the EPBC Act, as of the 12th of February 2022. The Koala is a medium-sized marsupial featuring a light grey to dark grey stocky body, dependent on species range, round ears, and sharp claws. The morphological appearance of Koalas is dependent on the species range, with northern species being smaller (averaging 6.5 kg) and lighter in colouration, and southern species larger (averaging 12 kg) and darker (DAWE, 2022c). Across the species range, males are typically larger than females.

The Koala is generally found in temperate to tropical forests as well as woodlands and semi-arid communities dominated by eucalyptus species (Martin and Handasyde, 1999). The species can be found in habitat broadly defined as woodlands and open forests, as long as food trees are present (DoE, 2022). The Koala has one of the broadest distributions of threatened terrestrial species under the EPBC Act with a range extending from north-eastern Queensland to the south-east corner of Southern Australia. The biological species distribution is widespread in coastal and inland areas that extends over approximately one million square kilometres (Martin & Handasyde, 1999).

Under the revised *Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory* (DAWE, 2022c), released on 12th February 2022, habitat for the koala is described as:

Koala habitat includes both coastal and inland areas that are typically characterised by Eucalyptus forests and woodlands. Biophysical habitat attributes for the koala include places that contain the resources necessary for individual foraging, survival (including predator avoidance), growth, reproduction and movement.

Species Threats

As per the conservation advice for the Koala (DAWE, 2022c), the threats include:

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

Species Occurrence in the Broader Area

A search of the Atlas of Living Australia (ALA) database did not identify any historical known Koala records within 10 km of the Project Area. The closest known records of the Koala are both located approximately 12 km west and north-east of the Project Area, recorded in 1984 and 1987 respectively. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

Habitat critical to the survival of the Koala is defined '*as areas that the species relies on to avoid or halt decline and promote the recovery of the species.*' Under the EPBC Act, the following factors are considered when identifying habitat that is critical to the survival of the species:

- (a) *Whether the habitat is used during periods of stress (examples: flood, drought or fire);*
- (b) *Whether the habitat is used to meet essential life cycle requirements (examples: foraging, breeding, nesting, roosting, social behaviour patterns or seed dispersal processes);*
- (c) *The extent to which the habitat is used by important populations;*
- (d) *Whether the habitat is necessary to maintain genetic diversity and long-term evolutionary development;*
- (e) *Whether the habitat is necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements;*
- (f) *Whether the habitat is necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation;*
- (g) *Any other way in which habitat may be critical to the survival of a listed threatened species or a listed threatened ecological community.*

In Queensland, Koalas are widespread, however, they can occur in patchy and low-distribution populations. Across Queensland, Koalas typically inhabit moist coastal forests, subhumid woodlands and eucalypt woodlands located adjacent to a permanent water source (DAWE, 2022c). Additionally, Koalas are known to occur within urban and rural landscapes, utilising regrowth and remnant eucalypt dominated vegetation communities for foraging and breeding resources.

Targeted searches for the species were conducted in suitable habitat throughout the Project Area in 2022. Despite field surveys specifically targeting Koalas through faecal pellet searched and spotlighting, no direct sightings were recorded. However, potential evidence of Koala occurrence within the Project Area was recorded through indirect signs of scratch marks on riparian Queensland Blue Gum trees in several locations along Wandoan Creek, Woleebee Creek and a tributary of Hellhole Creek. Whilst potentially being caused by Koala, there is always some uncertainty that they were caused by Koala when relying on scratch marks as a method of species observation.

No faecal pellets were observed during targeted surveys, with active searches completed for pellets at each habitat assessment points. Additionally, a review of the historical species records within a 10 km buffer of the Project Area are absent, however, sparse records from 1980s and 1990s exists only from beyond the 10 km buffer. There is no evidence of recent, direct Koala sightings in the Project Area or surrounds (10 km buffer) within the last 25 years. It is concluded that there is a general absence of Koalas in the Project Area, and it is considered that Koala occurrence in the Project Area is very rare.

Due to the indirect method of recording observations of Koala in the form of scratch marks in the Project Area (Photograph 4-4) that could potentially be caused by Koala, it has been conservatively concluded that habitat critical to the survival of the species does occur within the Project Area, with Koala habitat classified as either **foraging and breeding habitat** or **dispersal habitat**. Habitat has been classified and mapped based on recent habitat guidance for the species (Youngentob, et al,

2022). Within the Project Area, foraging and breeding habitat has been mapped in areas of remnant and regrowth open eucalypt forests and woodland that are dominated by eucalypt food trees or contain occasional eucalyptus (e.g., *E. tereticornis*, *E. populnea*, *E. crebra*, *E. longirostrata*, *E. melanophloia*, *E. exserta* and *Corymbia citriodora* subsp.). Within the Project Area, the following areas of field verified regrowth and remnant vegetation have been classified and mapped as Koala foraging and breeding habitat:

- Callitris and Eucalypt dominated woodlands;
- Eucalypt dominated woodlands;
- Riparian and wetland Eucalypt woodlands;
- Eucalypt open forest; and
- Regrowth eucalypt woodland.

Dispersal habitat for Koalas encompasses the broader landscape of the Project Area that does not contain eucalypt woodlands or open forests. Within the Project Area, Koala dispersal habitat is comprised of generally cleared exotic grasslands and Acacia woodlands dominated by Brigalow (*Acacia harpophylla*), with some isolated or scattered trees. The Project Area comprises of 698.5 ha of koala foraging and breeding habitat, and 9,072.6 ha of dispersal habitat. This habitat mapping method and the corresponding three potential habitat types of foraging and breeding, dispersal, and non-koala habitat, as well as the hectares for each, are provided in Table 4-9.

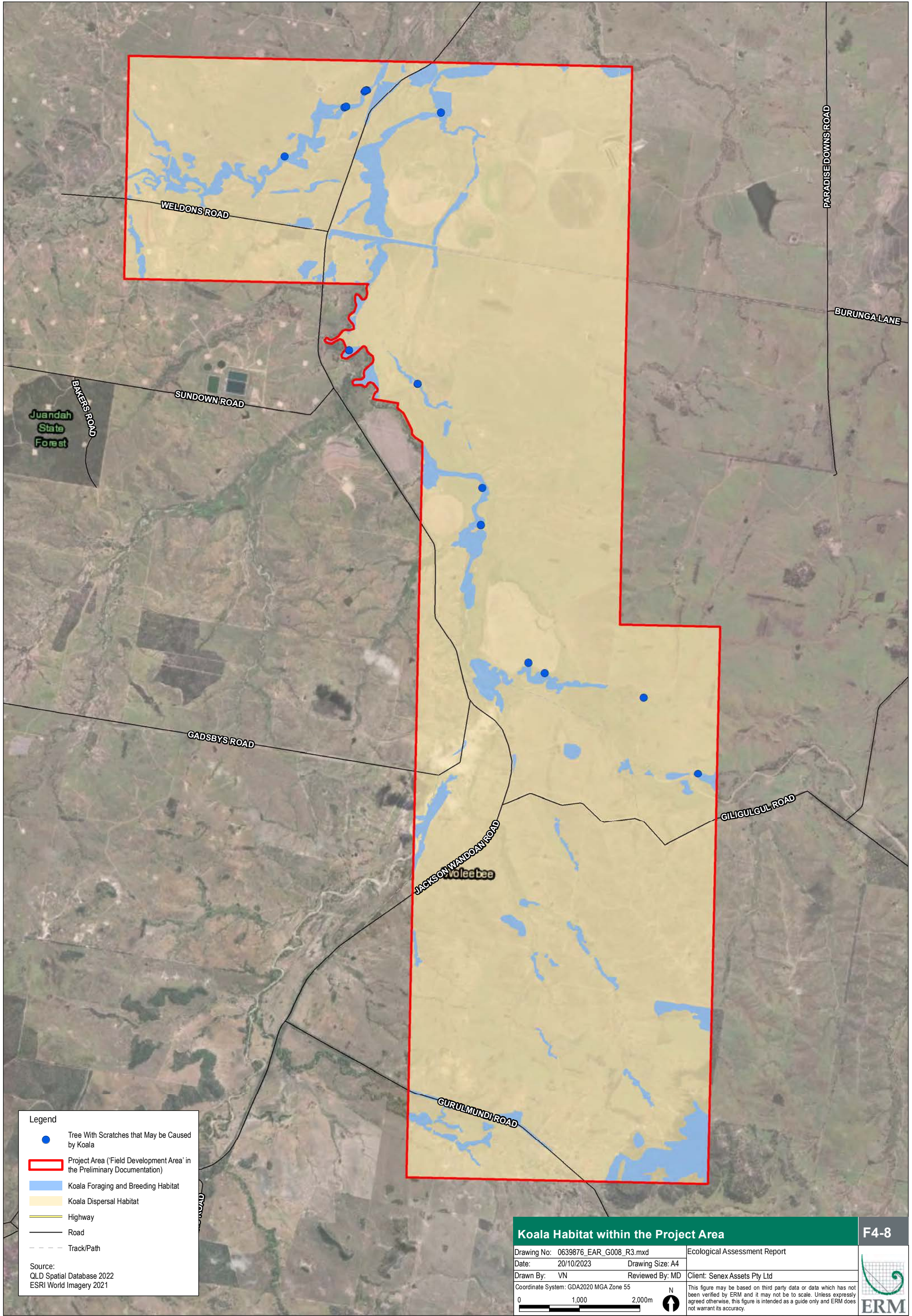


Photograph 4-4: Potential Koala Scratch Marks on a Queensland Blue Gum Tree

Table 4-9: Koala Habitat Types within the Project Area

	Potential Foraging and Breeding Habitat	Potential Dispersal Habitat	Potential Non-koala Habitat
Description	<ul style="list-style-type: none"> Any forest or woodland containing species that are known koala food trees, or shrubland with emergent food trees. This includes remnant and regrowth vegetation. 	<ul style="list-style-type: none"> Part of the broader landscape that includes grass/bare ground, rural land-uses, dwellings/towns, buildings, farm dams, sealed or unsealed roads and existing rail infrastructure. Contains isolated or scattered foraging or shelter trees. Contains vegetation generally not used frequently for foraging and breeding purposes by the species. 	<ul style="list-style-type: none"> Not suitable habitat includes barriers defined in the DCCEE Guidelines (natural or artificial) that prevent the movement of koalas, such as mountain ranges, water bodies or treeless areas that are greater than 2 km wide.
Presence within the Project Area	<p>Regrowth and remnant vegetation of:</p> <ul style="list-style-type: none"> Callitris and Eucalypt dominated woodlands; Eucalypt dominated woodlands mainly of <i>E. crebra</i>, <i>E. populnea</i> and <i>E. melanophloia</i>; Riparian and wetland Eucalypt woodlands dominated by <i>E. tereticornis</i>; Eucalypt open forest dominated by <i>E. populnea</i>; and Open regrowth eucalypt woodland vegetation. 	<ul style="list-style-type: none"> Cleared areas with occasional regrowth eucalypt woodlands along drainage lines. Acacia woodlands dominated by Brigalow (<i>Acacia harpophylla</i>). 	<ul style="list-style-type: none"> Potential non-habitat presents in the Project Area as waterways and treeless areas greater than 2 km wide.
Total in the Project Area	<ul style="list-style-type: none"> 698.5 ha foraging and breeding habitat 	<ul style="list-style-type: none"> 9,072.6 ha dispersal habitat 	<ul style="list-style-type: none"> 0 ha non-koala habitat

Records for where evidence of potential Koala scratches have been recorded in the Project Area, as well as the Koala habitat mapping for foraging and breeding habitat, and dispersal habitat, is shown on Figure 4-8.



Legend

- Tree With Scratches that May be Caused by Koala
- Project Area ('Field Development Area' in the Preliminary Documentation)
- Koala Foraging and Breeding Habitat
- Koala Dispersal Habitat
- Highway
- Road
- Track/Path

Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

Koala Habitat within the Project Area

Drawing No: 0639876_EAR_G008_R3.mxd Ecological Assessment Report

Date: 20/10/2023 Drawing Size: A4

Drawn By: VN Reviewed By: MD Client: Senex Assets Pty Ltd

Coordinate System: GDA2020 MGA Zone 55

0 1,000 2,000m



This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

F4-8



4.4.7.2 Greater Glider (Southern and Central)

Species Profile

The Greater Glider (southern and central) (*Petauroides volans*) was upgraded from a listing of 'Vulnerable' to 'Endangered' under the EPBC Act, on the 5th of July 2022. The Greater Glider (southern and central) is eastern Australia's largest gliding possum, with a head and body length of 35-46 cm and a long furry tail measuring 45 – 60 cm (DCCEEW, 2022a). Their colouration is variable and can include dark grey, brown or cream, with a whitish or paler underside (Van Dyck et al. 2013). The Greater Glider (southern and central) occurs from Victoria, north to the Atherton Tablelands in Queensland.

The Project Area occurs within the distribution for the Greater Glider (southern and central). It is noted in the Conservation Advice, that it is likely that two separate taxa exist, to the level of subspecies in this area. However, it is noted that until such ambiguity is resolved, the listed entity will be referred to as *Petauroides volans* (DCCEEW, 2022a).

This species has been concluded as known to occur within the Project Area as the species was detected during spotlighting surveys of riparian woodland along Wandoan Creek and along Woleebee Creek, as shown on Photograph 4-5 (BOOBOOK, 2022).

Species Threats

As per the conservation advice for the Greater Glider (southern and central) (DCCEEW, 2022a), the threats include:

- Inappropriate fire regimes;
- Habitat clearing and fragmentation;
- Timber harvesting;
- Entanglement in barbed wire fencing;
- Increased temperatures and changes to rainfall patterns;
- Hyper-predation by owls;
- Competition from Sulphur-crested Cockatoos (*Cacatua galerita*); and
- Predation by feral cats (*Felis catus*) and European Red Foxes (*Vulpes vulpes*).

Species Occurrence in the Broader Area

Several individuals were identified during spotlighting surveys of riparian woodland along Wandoan Creek and along Woleebee Creek (BOOBOOK, 2022). A search of the ALA database identified one (1) historical known record of the Greater Glider (southern and central) within 10 km of the Project Area, located approximately 2 km west of the south-western corner of the Project Area, recorded in 1989. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

Greater Glider (southern and central) habitat consists of tall, eucalypt forests with mature hollow-bearing trees (Eyre, 2004). Eyre et al., (2022) identifies habitat for the species to include REs with confirmed Greater Glider (southern and central) records and areas that contain habitat attributes, including live and dead hollowing bearing denning trees, feed and large trees and habitat connectivity. Habitat critical to survival for the Greater Glider (southern and central) has been defined in the species conservation advice (DCCEEW, 2022a) as:

- (a) Large contiguous areas of eucalypt forest, which contain mature hollow-bearing trees and a diverse range of the species' preferred food species in a particular region;

- (b) *Smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/or that enable recolonization;*
- (c) *Cool microclimate forest/woodland areas (e.g., protected gullies, sheltered high elevation areas, coastal lowland areas, southern slopes);*
- (d) *Areas identified as refuges under future climate changes scenarios; and*
- (e) *Short-term or long-term post-fire refuges (i.e., unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas.*

High quality habitat for the Greater Glider (southern and central) is represented by remnant vegetation, particularly large patches, where the canopy is dominated by eucalypt species and there is an abundance of hollow bearing trees, particularly trees with multiple hollows. They are known to prefer hollows in live trees, particularly those high up in the tree trunk. Areas without a dominance of eucalypt species or where hollow bearing trees are absent are not considered suitable habitat.

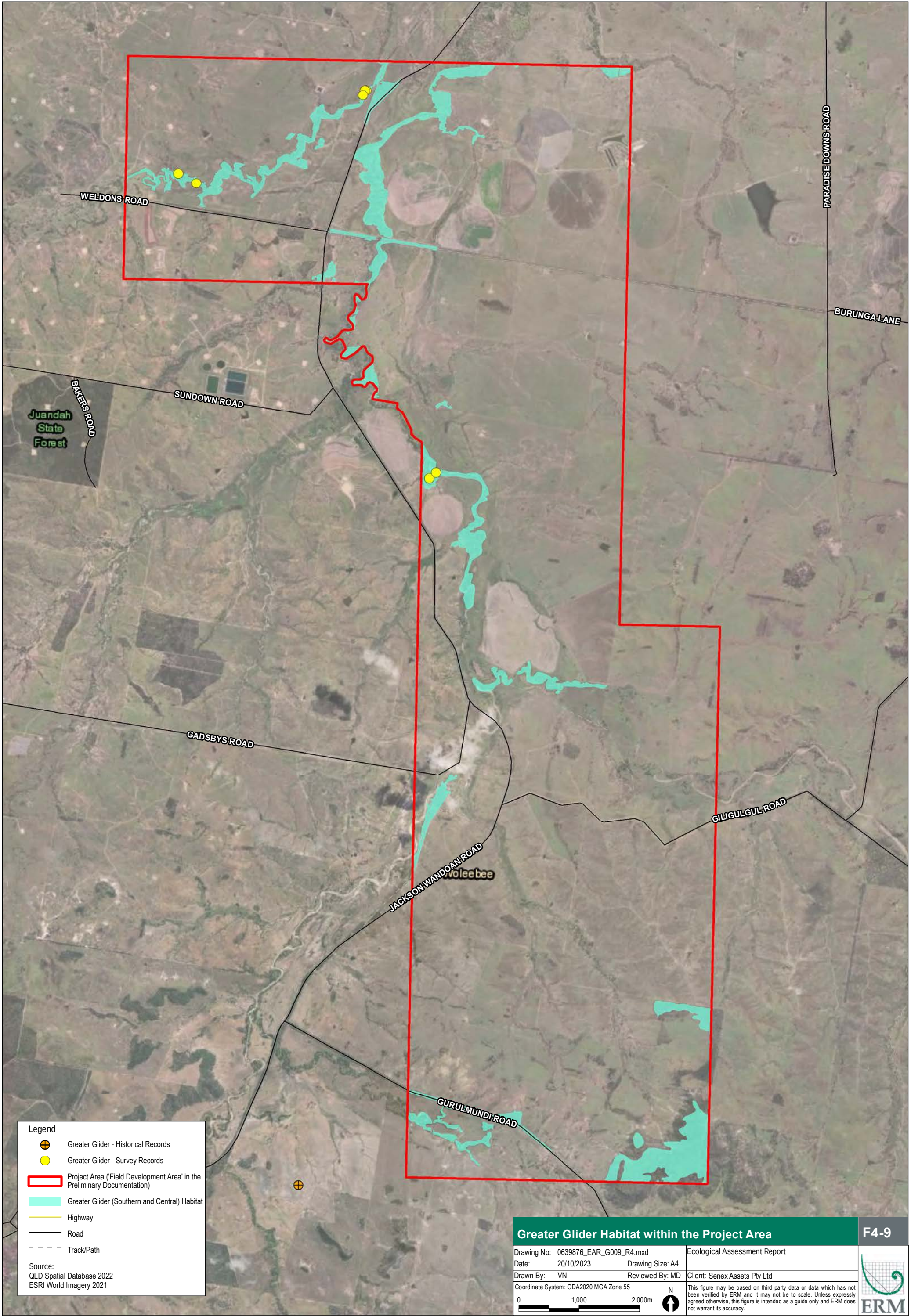
The most recent Greater Glider (southern and central) conservation advice (DCCEEW, 2022a) notes that the species home ranges approximate to 1 – 4 ha and requires 4 to 20 different dens to be considered suitable denning habitat. Additionally, the 'Guide to Greater glider habitat in Queensland' (Eyre et al., 2022), informs that the Greater Glider (southern and central) is estimated to require a minimum of 2 – 4 live denning trees for every 2 ha of suitable forest habitat. Greater Glider (southern and central) densities in southern Queensland have been identified as sensitive to a proportion of cleared land within a 1 km radius (Eyre 2006).

Greater Glider (southern and central) habitat within the Project Area aligns with the conservation advice description of "*large contiguous areas of eucalypt forest, which contain mature hollow-bearing trees and a diverse range of the species' preferred food species*". Suitable Greater Glider (southern and central) foraging habitat has been identified within the Project Area based on ground-truthing of habitats listed in Eyre et al. (2022), as well as the identification of habitat attributes for the species such as mature hollow bearing trees. Therefore, Greater Glider (southern and central) habitat within the Project Area is considered habitat critical to survival of the species.

The Project Area encompasses a total of 528 ha of Greater Glider (southern and central) foraging habitat, as show on Figure 4-9. Mapped foraging habitat for the Greater Glider (southern and central) within the Project Area consists of all remnant vegetation of the broadest terrestrial habitat types, particularly those dominated by Eucalypt species and large trees with hollows in woodlands connected to these corridors.



Photograph 4-5: Greater Glider Recorded in Riparian Vegetation Along Woleebee Creek



4.4.7.3 South-eastern Glossy Black-cockatoo

Species Profile

South-eastern Glossy Black-cockatoo (*Calyptorhynchus lathami lathami*) is currently listed as Vulnerable under the EPBC Act, effective 10th August 2022. The Glossy Black-cockatoo (south-eastern) The South-eastern Glossy Black-cockatoo exhibits a dull black plumage, blackish-brown head with variable yellow patches and either bright red panels (adult males) or yellowish-red panels in the tail (females). The South-eastern Glossy Black-cockatoo are the smallest of the black-cockatoo species with a body length of approximately 48 cm and weighing approximately 420 grams (DCCEEW, 2022b).

South-eastern Glossy Black-cockatoo are widespread from Mitchell (Queensland) through eastern New South Wales and to east Gippsland (Victoria). The species distribution occurs throughout coastal areas and ranges of eastern Australia, with scattered records occurring further inland. Although the species is widespread within this range, sightings are considered uncommon. It was estimated that the extent of species occurrence is 470,000 km² with an area of occupancy for the species being 40,000 km² (Cameron et al., 2021).

South-eastern Glossy Black-cockatoo are specialised feeders, relying on the seeds of *Casuarinaceae* (She-oak) trees.

South-eastern Glossy Black-cockatoo utilise large hollows in both living and dead eucalyptus trees or stags near water and food sources for nesting (Higgins, 1999; Pavey et al., 2016). Nesting hollows are typically 20– 25 cm in diameter and located approximately 10 – 20 m from the ground. The species commonly prefers nesting hollows in close proximity to a water source where it will return to the same nesting hollow over successive seasons (Birdlife Australia, 2022).

Additionally, the species is capable of moving among isolated trees and small habitat patches within fragmented landscapes (Pavey et al., 2016, Holmes 2012). South-eastern Glossy Black-cockatoo rove widely across this landscape, with some evidence of seasonal movements following maturation of She-oak fruits (Stock & Wild 2005; Hourigan, 2012; BOOBOOK, unpubl. data).

Species Threats

As per the conservation advice for the South-eastern Glossy Black-cockatoo (DCCEEW, 2022b), the threats include:

- Inappropriate fire regimes;
- Clearing of native vegetation / timber harvesting;
- Habitat fragmentation;
- Grazing;
- Invasive weeds;
- Climate change – increased likelihood of extreme events (i.e., heatwave and drought);
- Temporal or spatial shift of resource availability as a result of climate change;
- Competition for nest hollows;
- Psittacine Beak and Feather Disease;
- Predation; and
- Bird and egg collection.

Species Occurrence in the Broader Area

A search of the ALA database identified one (1) historically known record of the South-eastern Glossy Black-cockatoo within 10 km of the Project Area, located approximately 1 km south of the south-eastern corner of the Project Area, recorded in 2009. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

The species conservation advice (DCCEEW, 2022b) defines habitat critical to the survival important habitats of the South-eastern Glossy Black-cockatoo to refer to the following attributes:

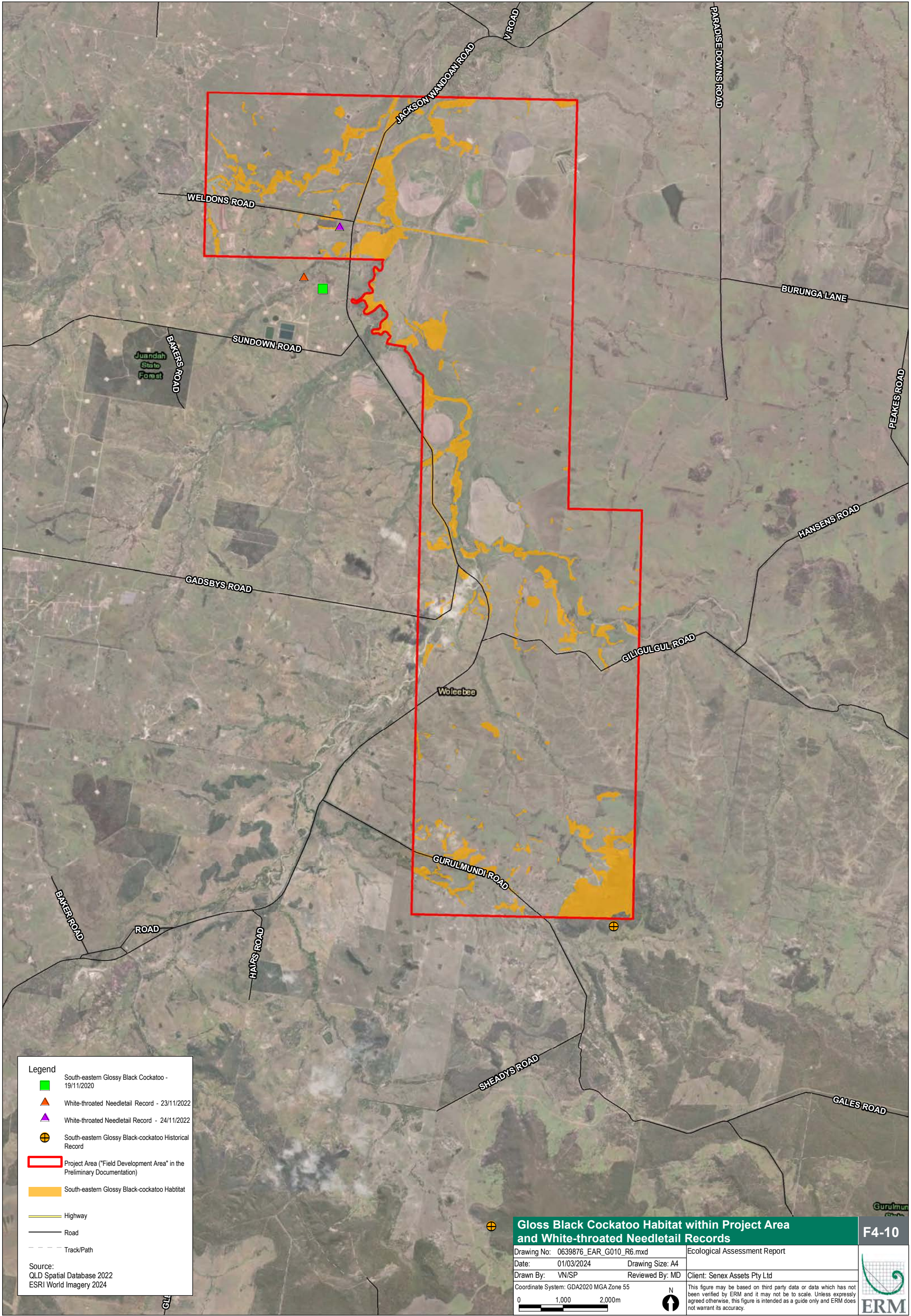
- For activities such as foraging, breeding, roosting, or dispersal;
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- To maintain genetic diversity and long-term evolutionary development; or
- For the reintroduction of populations or recovery of the species or ecological community.
- Additionally, the species conservation advice specifies the breeding habitat critical to the survival of the South-eastern Glossy black-cockatoo to include following tree species:
 - Narrow-leaved ironbark (*Eucalyptus crebra*);
 - Blue-leaved ironbark (*E. nubila*);
 - Blakely's red gum (*E. blakelyi*); and
 - River red gums (*E. camaldulensis*).
- Potential nest hollows for the species comprise the following attributes:
 - >8 m above ground;
 - Located in branches >30 cm in diameter;
 - Branch or stem no more than 45° from vertical; and
 - Minimum entrance diameter of >15 cm.

The South-eastern Glossy Black-cockatoo feeds on any of the nine species of She-oak (*Allocasuarina* spp. and *Casuarina* spp.), however is known to prefer Black She-oak (*A. littoralis*) and Forest She-oak (*A. torulosa*) within south-east Queensland (DCCEEW, 2022b). Species preference and She-oak species availability varies depending on the region. Higgins 1999 confirmed South-eastern Glossy Black-cockatoo will feed on only one or two species of She-oak in a region. Field surveys were conducted in 2022, confirming the presence and abundance of Casuarinaceae food trees within the Project Area. Identified food trees within the Project Area included Belah (*Casuarina cristata*) throughout the Project Area, and Bull Oak (*Allocasuarina luehmannii*) in scattered woodland patches on sandy soils. No evidence of feeding (chewed cones) was observed during field surveys. However, this species has previously been recorded within the Project Area (BOOBOOK, 2021a).

South-eastern Glossy Black-cockatoo are hollow nesters, utilising both living and dead eucalyptus trees. Suitable nest hollows for the species are 15 cm in entrance diameter and approximately 1 m deep. Field surveys of the Project Area identified the presence of potential nest trees to occur in remnant eucalypt woodland and forest and in well-developed riparian corridors across the Project Area.

Using the information gathered from the species conservation advice and field assessments, habitat for the South-eastern Glossy Black-cockatoo totals 1,003 ha within the Project Area, as shown on Figure 4-10. The mapped South-eastern Glossy Black-cockatoo habitat includes all remnant and regrowth vegetation of most broad terrestrial habitat types, particularly those dominated by Eucalypt species with large hollow bearing trees, along with remnant and regrowth RE with potential feed trees (*Casuarinaceae* spp.).

Some low ecological value areas provide potential habitat for the South-eastern Glossy Black-Cockatoo. Potential foraging habitat is located within acacia regrowth, eucalypt regrowth, mixed acacia and eucalypt regrowth and eucalypt and acacia paddock trees as the species exclusively feeds on sheoak seeds (*Allocasuarina* spp. and *Casuarina* spp.). Whilst these habitat types are dominated by *Eucalyptus* spp. and *Acacia* spp. paddock trees, the presence of *Allocasuarina* spp. and *Casuarina* spp. cannot be ruled out.



4.4.7.4 *Dulacca Woodland Snail*

Species Profile

The Dulacca Woodland Snail (*Adclarkia dulacca*) is currently listed as Endangered under the EPBC Act, effective 7 December 2016 (TSSC, 2016a). The Dulacca Woodland Snail is a medium-sized snail, with a shell diameter of 17 mm on average which is slightly flattened, pale green-brown in colouration and features a brown band above the periphery of spirals on its shell (Stanisic et al., 2010). The animal itself is orange-brown. The species is endemic to south-east Queensland, only occurring in small, isolated populations from Miles to Dulacca and south to Meandarra (Stanisic, 2011 cited in TSSC, 2016a). The mobility of this species is limited; however, it can move between areas of suitable microhabitat (TSSC, 2016a) if the prevailing conditions are suitable for it to do so.

The likelihood of occurrence has concluded this species as likely to occur within the Project Area due to the presence of suitable habitat and previous records within the Project Area (Appendix B).

Species Threats

As per the conservation advice for the Dulacca Woodland Snail (TSSC, 2016a), the threats include:

- Land clearing;
- Habitat loss at a smaller scale;
- Predation by rats (*Rattus* spp.), mice (*Mus musculus*) and feral pigs (*Sus scrofa*);
- Invasion of Buffel grass (*Cenchrus ciliaris*);
- Trampling by cattle and horses; and
- High fire intensity.

Species Occurrence in the Broader Area

A search of the ALA database identified two (2) historical known records of the Dulacca Woodland Snail within 10 km of the Project Area. These records are located approximately 4 km (south-west) and 8 km (directly south) and were both recorded in 2009. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

Habitat critical to the survival of land snails includes habitat with tree cover and ground debris (TSSC, 2016a). Habitat critical to the survival of the Dulacca Woodland Snail has not specifically been defined.

The Dulacca Woodland Snail inhabits vine thicket, Brigalow (*Acacia harpophylla*) woodland/open forest, ironbark (*Eucalyptus* spp.) woodland, Lancewood (*Acacia shirleyi*) woodland and Gum-topped Box (*E. woollsiana*) woodland (TSSC, 2016a). It is largely confined to the Dulacca Downs subregion where it is found in a highly fragmented landscape, living in patches or strips of habitat retained on roadsides, shade lines and/or ridges (Stanisic et al., 2010; ALA, 2022). The Dulacca Woodland Snail is also able to exist in areas of Brigalow regrowth and even in cleared paddocks but only where logs, woody debris or other suitable microhabitat sites remain (TSSC, 2016a).

The Project Area includes several small patches of suitable habitat for the Dulacca Woodland Snail (Brigalow woodlands), and the species has previously been collected from an area of REs 11.9.5a and 11.7.2 in the south of the Project Area (ALA, 2022). Using the information gathered from the species conservation advice and field assessments, habitat for the Dulacca Woodland Snail within the Project Area encompasses 666.3 ha, consisting of:

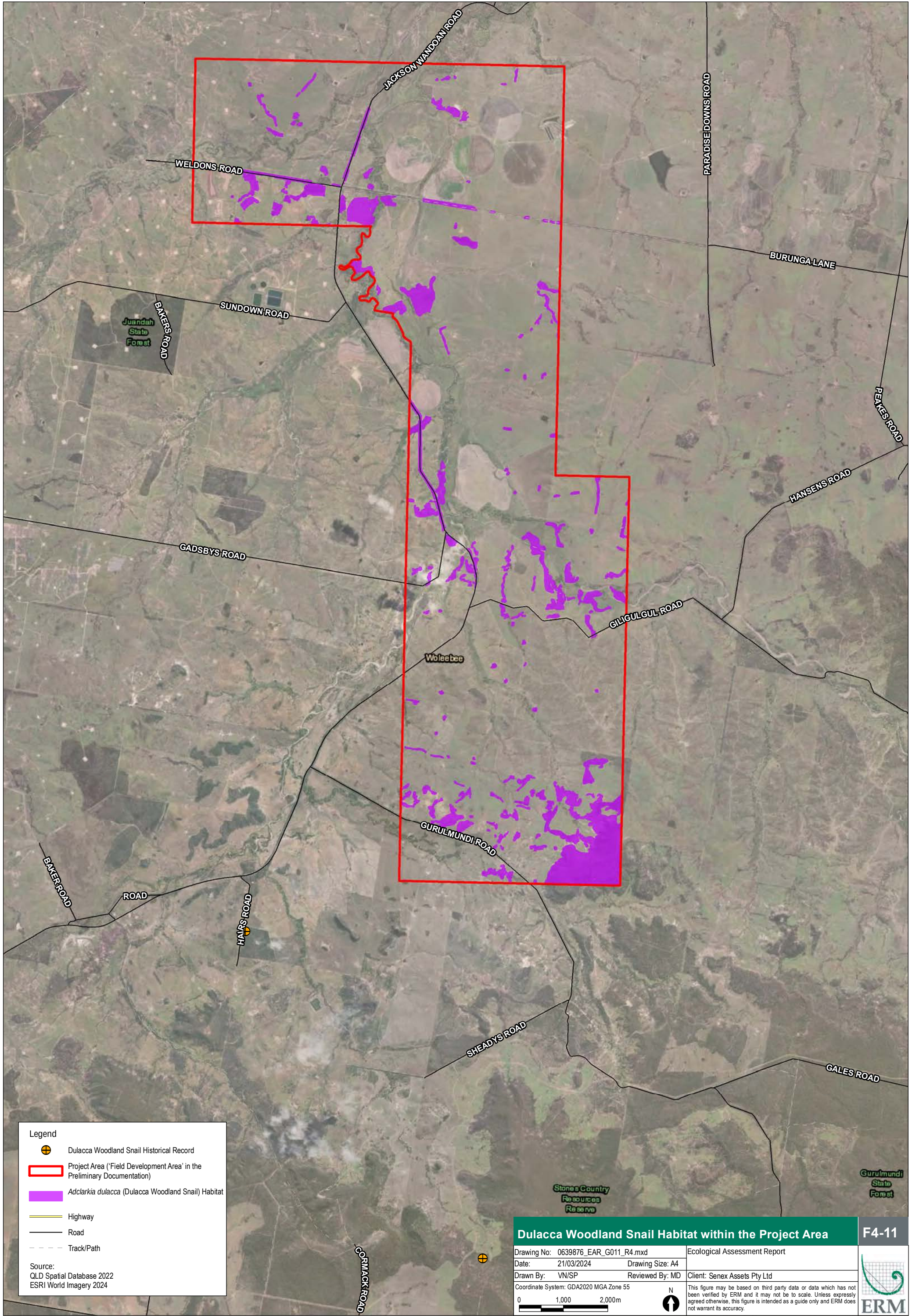
- Acacia woodlands dominated by Brigalow (*Acacia harpophylla*); and
- Eucalypt dominated woodlands mainly with *Eucalyptus crebra* and *E. populnea*.

Additionally, the species has the potential to occur in low ecological value areas consisting of:

- Acacia regrowth;
- Eucalypt regrowth;
- Mixed acacia and eucalypt regrowth; and
- Eucalypt and acacia paddock trees.

The species can inhabit areas including Brigalow regrowth, ironbark and gum-topped box regrowth and cleared habitat where abundant or suitable leaf litter, logs, woody debris, and other suitable microhabitat are present. As a conservative approach, these low ecological value habitat types have been mapped as Dulacca woodland snail habitat as the presence/absence of microhabitat (leaf litter and woody debris) is not confirmed.

Habitat mapping for the Dulacca Woodland Snail is presented in Figure 4-11.



4.4.7.5 White-throated Needletail

Species Profile

The White-throated Needletail is currently listed as Vulnerable under the EPBC Act, effective 4 July 2019. The White-throated Needletail (*Hirundapus caudacutus*) is a large swift measuring about 20 cm in length, with a robust, barrel-like body and a short, square tail, it has long pointed wings. The plumage is predominantly grey-brown, glossed with green. The throat and undertail are white.

The White-tailed Needletail often occur in large flocks over eastern and northern Australia, comprising approximately hundreds or thousands of birds (TSSC, 2019). The species is considered almost exclusively aerial, flying at varying heights to feed on airborne insects (i.e., beetles, cicadas, flying ants, bees and wasps, flies, termites, moths, locusts, and grasshoppers, TSSC, 2019). Within Australia, White-throated Needletail are known to roost in trees during their migration stopover (Carter 2020).

The White-throated Needletail is a seasonal visitor to Australia for the boreal winter, between the months of September to April. The species does not breed in Australia, as breeding grounds are located in the Northern Hemisphere, where egg laying occurs from late May to early June (Chantler 1999, cited in TSSC 2019). During September, the species arrives in Australia and migrates south to the Great Dividing Range in Queensland and NSW in October and November, usually arriving in the southern parts of their range (Victoria and Tasmania) in November (TSSC, 2019).

The likelihood of occurrence has concluded this species as likely to occur within the Project Area annually (September-April), following storm fronts, as a transient aerial flyover visitor only (Appendix B).

Species Threats

As per the conservation advice for the White-throated Needletail (TSSC, 2019), the threats include:

- Habitat loss and fragmentation;
- Direct mortality from wind turbines and overhead wires; and
- Poisoning.

Species Occurrence in the Broader Area

The White-throated Needletail was not observed during field investigations for the current Project, however, was observed within the Project Area during subsequent field surveys for Senex on 24 November 2022 (Cunningham, M pers. comm.), as shown on Figure 4-10. A flock of eight birds were observed flying low near Weldons Road. A search of the ALA database did not identify any historical known White-throated Needletail records within 10 km of the Project Area.

Habitat Assessment

The White-throated Needletail is predominantly aerial when on migration in Australia (September to April), occasionally stopping to roost in large patches of rainforest, woody vegetation and open Eucalypt forests consisting of dense foliage and hollows (Coventry, 1989; Higgins, 1999), generally associated with elevated areas.

Whilst occasional aerial observations have been made for this species, the Project Area is unlikely to contain important foraging habitat for the species. Additionally, no threshold area for important habitat for this species can be determined at present and has not been identified in the species conservation advice (TSSC, 2019).

White-throated Needletail are likely to only fly aurally over the Project Area and in occasional flocks during the migratory period, being September to April, following storm fronts. The Project Area does not contain rainforests or elevated open forests with dense foliage that could be used for occasional roosting by the species. While potential flights over the Project Area may occur from time to time, only

elevated areas are regarded as roosting habitat. Thus, potential habitat has not been mapped for this species, and so no subsequent impact area has been calculated.

4.4.8 Listed Threatened Terrestrial Fauna Species with Potential to Occur

A total of fourteen EPBC Act listed threatened terrestrial fauna species have been assessed as having the potential to occur within the Project Area as a result of the likelihood of occurrence presented in Appendix B. In essence, because part of these species' distributions overlaps with the Project Area, their presence cannot be ruled out. This is despite no signs or observations of these species within the Project Area during field surveys using survey techniques aligned with survey guidelines. In accordance with the precautionary principle, 'potential habitat' for the nine species has been mapped and shown in Figure 4-12 and Figure 4-13 for bird species, Figure 4-14 for mammal species and Figure 4-15 for reptiles.

Table 4-10 lists all EPBC Act listed threatened terrestrial species that have been assessed as having the potential to occur within the Project Area and describes the potential habitat that has been mapped for each species.

Table 4-10: EPBC Act Listed Threatened Terrestrial Fauna Species with Potential to Occur within the Project Area

Species Name	Common Name	EPBC Act Status	Potential Habitat Mapped within the Project Area*
Birds			
<i>Rostratula australis</i>	Australian Painted Snipe	E, Mi	<ul style="list-style-type: none"> 69.7 ha of potential habitat is present within the Project Area. Potential habitat includes small areas of ephemeral wetland habitat within the Project Area; however these may only periodically provide temporary refuges for this species. These areas correspond with riparian with riparian woodlands. This aligns with the broad habitat type of Riparian and wetland Eucalypt woodlands dominated by <i>E. tereticornis</i>.
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper	V	<ul style="list-style-type: none"> 272.1 ha of potential habitat is present within the Project Area. Potential habitat includes dry open eucalypt forests and woodlands with an open, grassy understorey and fallen timber. These areas should be subjected to a form of ongoing disturbance (i.e., historically Indigenous burning practices) to be favourable for the species.
<i>Stagonopleura guttata</i>	Diamon Firetail	V	<ul style="list-style-type: none"> 1,287.4 ha of potential habitat is present within the Project Area. Potential habitat includes grassy understoreys of open woodlands dominated by Eucalypt spp., Acacia spp., and/or Casuarina spp. Eucalyptus and Acacia woodlands and forests, occurs throughout the Project Area. Additionally, a number of low ecological value habitat types including acacia regrowth, eucalypt regrowth, mixed acacia and eucalypt regrowth and eucalypt and

Species Name	Common Name	EPBC Act Status	Potential Habitat Mapped within the Project Area*
			acacia paddock trees, only where there is high grass cover or dense shrub cover have the potential to provide foraging habitat for the species. The presence of isolated paddock trees in areas of cleared, managed or low grass and shrub cover are unlikely to provide habitat for Diamond Firetail.
<i>Aphelocephala leucopsis</i>	Southern Whiteface	V	<ul style="list-style-type: none"> 938.5 ha of potential habitat is present within the Project Area. Potential habitat includes a wide range of open woodlands and shrubland environments dominated by Acacia spp. and Eucalyptus spp., particularly where understorey of grasses and/or shrubs are present. Almost all woodland habitats present within the Project Area are considered suitable habitat for the Southern Whiteface.
<i>Grantiella picta</i>	Painted Honeyeater	V	<ul style="list-style-type: none"> 272.1 ha of potential habitat is present within the Project Area. Potential habitat comprises remnant and regrowth communities with abundant Acacia and Casuarina hosts of Mistletoes. Potential habitat comprises larger contiguous areas of remnant and regrowth woodland and open forest, more specifically with a multilayered shrubby understorey which the species prefers. This is made up of broad habitat type Eucalypt dominated woodlands mainly of <i>E. crebra</i>, <i>E. populnea</i> and <i>E. melanophloia</i>.
<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern subspecies)	V	<ul style="list-style-type: none"> 164.3 ha of breeding and foraging habitat, and 316 ha of dispersal habitat (up to 2.1 ha of dispersal habitat to be cleared) is present within the Project Area. Potential breeding and foraging habitat remains in the southern part of the Project Area (south of Giligulgul road) in grassy woodland with open areas for foraging.
Mammals			
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	<ul style="list-style-type: none"> 259.6 ha of potential habitat is present within the Project Area. Potential habitat is made up of all broad habitat types excluding the cleared exotic pasture and small isolated fragments, narrow corridors and the largely cleared landscape north of Giligulgul Road.
<i>Dasyurus hallucatus</i>	Northern Quoll	E	<ul style="list-style-type: none"> 226.7 ha of potential habitat is present within the Project Area. Potential habitat comprises contiguous areas of remnant and regrowth woodland and forest within 5

Species Name	Common Name	EPBC Act Status	Potential Habitat Mapped within the Project Area*
			km of cliffs and rocky scarps and connected to these refuges by continuous native vegetation. This includes all broad habitat types excluding cleared exotic pasture.
<i>Petaurus australis australis</i>	Yellow-bellied Glider (south-eastern subspecies)	V	<ul style="list-style-type: none"> 145.8 ha of potential habitat is present within the Project Area. Potential habitat is comprised of large contiguous areas of remnant only Eucalypt woodland and open forests, including some riparian dominated woodlands. This is because the species requires large hollow-bearing trees for dens and preferred feed tree species (selected Eucalypts).
Reptiles			
<i>Delma torquata</i>	Collared Delma	V	<ul style="list-style-type: none"> 259.7 ha of potential habitat is present within the Project Area. Potential habitat comprises large logs, rocky outcrops and abundant woody debris occurs in the large contiguous area of forest and woodland associated with the escarpment and plateau in the south-eastern corner of the Project Area. This includes all broad habitat types with the above microhabitat features, excluding cleared exotic pasture.
<i>Furina dunmalli</i>	Dunmall's Snake	V	<ul style="list-style-type: none"> 259.7 ha of potential habitat is present within the Project Area. Potential habitat comprises large logs, rocky outcrops and abundant woody debris occurs in the large contiguous area of forest and woodland associated with the escarpment and plateau in the south-eastern corner of the Project Area. This includes all broad habitat types with the above microhabitat features, excluding cleared exotic pasture.
<i>Hemiaspis damelii</i>	Grey Snake	E	<ul style="list-style-type: none"> 431.2 ha of potential habitat is present within the Project Area. Potential habitat includes Brigalow (<i>Acacia harpophylla</i>) and Belah (<i>Casuarina cristata</i>) woodlands on heavy, dark brown to black cracking clay soils, particularly in association with water bodies. Both woodlands were observed within the Project Area, along with suitable ephemeral wetlands. Additionally, a number of low ecological value habitat types including acacia regrowth, eucalypt regrowth, mixed acacia and eucalypt regrowth and eucalypt and acacia paddock trees have the potential to provide foraging habitat for the species. These areas are slightly intersected or bordered by small gullies which

Species Name	Common Name	EPBC Act Status	Potential Habitat Mapped within the Project Area*
			may provide suitable habitat for the species where regrowth is near small gullies and floodplains.
<i>Egernia rugosa</i>	Yakka Skink	V	<ul style="list-style-type: none"> 228 ha of potential habitat is present within the Project Area. Potential habitat is comprised of larger contiguous areas of remnant and regrowth woodland and open forest. The species requires loamy soils with large logs, accumulations of woody debris and/or rocky outcrops. This includes all broad habitat types with the above microhabitat features, excluding cleared exotic pasture and riparian Eucalypt woodlands.
<i>Anomalopus mackayi</i>	Five-clawed Worm-skink	V	<ul style="list-style-type: none"> 209.6 ha of potential habitat is present within the Project Area. Potential habitat includes woodlands generally supported by clay-loam soils, including grassy White Box woodlands, open woodlands and River Red Gum–Coolibah-Bimble Box woodlands. Limited areas of potential Five-clawed Worm-skink habitat are present within the Project Area.

Status listing per EPBC: E = Endangered; V= Vulnerable; Mi =Migratory.

For the full reasoning for the potential outcomes for such species, refer to Appendix B.

*Information on potential habitat sourced from Appendix C (BOOBOOK, 2022).

4.4.8.1 Australian Painted Snipe

Species Profile

The Australian Painted Snipe (*Rostratula australis*) is currently listed as Endangered and Marine under the EPBC Act, effective 15 May 2013.

Females are generally larger and more colour abundant than males, with a chocolate-brown head, white markings around the eyes, pink-orange bill darkening at the tip and a metallic green back and wings (DSEWPac, 2013). Males are smaller in size and exhibit a mottled grey-brown head and neck with a buff stripe through the eyes and the centre of the crown, black wings, a black band across the breast and a duller beak (DSEWPac, 2013).

The Australian Painted Snipe is widespread and particularly common across eastern Australia, occurring in multiple Natural Resource Management (NRM) regions and Interim Biogeographic Regionalisation for Australia (IBRA) Bioregions across Australia (DSEWPac, 2013).

Species Threats

As per the conservation advice for the Australian Painted Snipe (DSEWPac, 2013), the threats include:

- Habitat loss and degradation as a result of drainage and water diversion for agriculture and reservoirs;
- Trampling of wetland vegetation / nests by livestock;
- Grazing by livestock;

- Climate change and reduced run-off (in the future);
- Predation and nest predation by feral cats (*Felis catus*) and European Red Fox (*Vulpes vulpes*);
- Coastal and port development; and
- Invasive weeds.

Species Occurrence in the Broader Area

A search of the ALA database did not identify any known records of the species within 10 km of the Project Area. The closest historical known record of the species is located approximately 79 km north of the Project Area, recorded near Bellington Hut State Forest. The record does not list the record date. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

The Australian Painted Snipe inhabits shallow, freshwater wetlands (occasionally brackish) and in ephemeral and permanent waterbodies (i.e., lakes, swamps, claypans, grassland / saltmarsh, dams, rice crops, sewage farms and bore drains), particularly for foraging activities. Suitable habitat for the species can be found in all states and territories in Australia.

Breeding habitat for the Australian Painted Snipe consists of shallow wetlands with bare mud and both upper parts of the understorey (i.e., shrubs and tall grasses) and canopy cover nearby. Majority of nest records have been recorded from or near small islands within freshwater wetlands, however these can also occur in/near swamps (including cane grass swamps), within flooded areas, in ground cover of water-buttons and grasses, at the base of tussocks, and under low saltbush (DSEWPoC, 2013).

Temporary foraging and dispersal habitat for the Australian Painted Snipe includes shallow, ephemeral waterbodies, including gilgai (with no gilgai observed in the Project Area).

Field assessments of the Project Area in 2022 confirmed small areas of foraging habitat present within small ephemeral wetlands on drainage lines. These habitats may provide temporary refuge for the species and support occasional transient visitors to the Project Area, particularly when water is present. Habitat mapping for the Project Area identified 69.7 ha of potential Australian Painted Snipe habitat. Therefore, as suitable foraging habitat is located within the Project Area, the Australian Painted Snipe is considered to have a potential to occur. The species was not recorded during the 2022 field surveys.

4.4.8.2 Brown Treecreeper (south-eastern)

Species Profile

Brown Treecreeper (south-eastern) (*Climacteris picumnus victoriae*) is currently listed as vulnerable under the EPBC Act, effective 3 March 2023. The Brown Treecreeper (south-eastern) is the largest Treecreeper in Australia. The bird species exhibits a grey-brown colouration with black streaking on the lower breast and belly, a pale face, black bars on the undertail, a dark line through the eye and a dark crown (DCCEEW, 2023a). Male and female Brown Treecreeper (south-eastern) differ slightly in appearance, as do juveniles and adults (Higgins & Peter, 2002).

The Brown Treecreeper (south-eastern) is endemic to south-eastern Australia, with a distribution spanning from the Grampians in western Victoria to the Bunya Mountains in Queensland, occurring inland to the Great Dividing Range (Shodde & Mason, 1999).

Species Threats

As per the conservation advice for the Brown treecreeper (DCCEEW, 2023a), the threats include:

- Habitat loss and fragmentation caused by clearing for agriculture;

- Habitat degradation caused by domestic livestock over-grazing;
- Conventional grazing practices;
- Unintentional effects of firewood collection;
- Increased likelihood of extreme events (i.e., wildfire, heatwave and drought);
- Inappropriate fire regimes;
- Noisy miner territorial competition;
- Nest hollow competition;
- Cat and fox predation; and
- Rabbit and overabundant kangaroo grazing pressure.

Species Occurrence in the Broader Area

A search of the ALA database did not identify any historical known Brown Treecreeper (south-eastern) records within 10 km of the Project Area. The nearest species record occurs 251 km south of the Project Area from 1990. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

The Brown Treecreeper (south-eastern) inhabits dry open eucalypt forests and woodlands, predominantly those dominated by stringybarks or other rough-barked eucalypt species. Favourable habitat for the species must be subjected to a form of ongoing disturbance (i.e., historically Indigenous burning practices) to prevent the ground layer from becoming too dense and uniform, leading to unfavourable habitat (DCCEEW, 2023a).

The species breeds and roosts in open dry eucalypt forest and woodlands with hollows, in either live trees, dead standing trees or tree stumps (considered essential for nesting). Brown Treecreeper (south-eastern) forage for invertebrates on-ground and in mature, live and/or dead trees (Bounds, 2019), with suitable foraging habitat for the species consisting of forests and woodlands with an open, grassy understorey, in which areas with fallen timber provide greater foraging opportunities (DCCEEW, 2023).

Habitat critical to the survival of Brown Treecreeper (south-eastern) can be defined as areas containing the following features (DCCEEW, 2023a):

- *“Relatively undisturbed grassy woodland with native understorey.*
 - *Habitat structure should be quite open at ground level so that birds are able to feed on or near the ground and maintain vigilance against predators.*
 - *The required degree of openness is mostly likely to be created by moderate levels of disturbance by fire and/or grazing.*
- *Large living and dead trees which are essential for roosting and nesting sites and for foraging;*
- *Fallen timber which provides essential foraging habitat and;*
- *Hollows in standing dead or live trees and tree stumps are also essential for nesting.”*

Any known or likely habitat should be considered as habitat critical to the survival of the subspecies (DCCEEW, 2023a).

As per the field assessments undertaken in 2022, the Project Area contains patches of suitable Callitris / Eucalyptus woodlands along the eastern boundary, slightly north and south of Jackson-Wandoan Road. Additionally, suitable habitat in the form of open Eucalypt forest was observed along the Gurulmundi Road within the southern boundary of the Project Area, and small patches exist both north and south of Weldons Road. Habitat mapping for the Project Area identified 272.1 ha of potential Brown Treecreeper habitat. Therefore, as suitable habitat is located within the Project Area,

the Brown Treecreeper (south-eastern) is considered to have a potential to occur. The species was not recorded during the 2022 field surveys.

4.4.8.3 Diamond Firetail

Species Profile

Diamond Firetail (*Stagonopleura guttata*) is listed as Vulnerable under the EPBC Act effective 31 March 2023. Adult Diamond Firetails feature a grey head and back, ashy-brown wings, white belly and a red rump. The species head features a red bill and red around the eyes. Diamond Firetail are considered a large bird species, averaging 10 – 12 cm in body length and weighing approximately 17 grams (DCCEEW, 2023b).

Distribution of the Diamond Firetail occurs from south-east Queensland to the Eyre Peninsula in South Australia, with species occurring approximately 300 km inland of this distribution (Higgins et al., 2007).

Diamond Firetails may move locally but are largely considered a sedentary species. The species typically occurs in a social group of between 5 to 40 individuals, however during breeding season (August – January) the species separates into smaller flocks. Females lay one clutch of eggs per season, where a typical clutch size is 4 – 5 eggs (Higgins et al., 2007).

Species Threats

As per the conservation advice for the Diamond Firetail (DCCEEW, 2023b), the threats include:

- Habitat loss caused by land clearing;
- Weeds, particularly exotic annual grasses altering habitat;
- Habitat degradation caused by domestic livestock grazing and overabundant native animal grazing;
- Habitat degradation caused by rabbits;
- Increase in frequency, scale or intensity of fire;
- Increased likelihood of extreme events (i.e., wildfire, heatwave, and drought);
- Noisy miner territorial competition; and
- Predation by pied currawongs.

Species Occurrence in the Broader Area

A search of the ALA database did not identify any historical known Diamond Firetail records within 10 km of the Project Area. The closest known record is located near Gurulmundi State Forest, approximately 14 km south-east of the Project Area, and was recorded in 2019. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

As per the species conservation advice (DCCEEW, 2023b), habitat critical to the survival of the Diamond firetail includes areas of:

- “*Eucalypt, acacia or casuarina woodlands, open forests, and other lightly timbered habitats;*
- *Low tree density, few large logs, and little litter cover but high grass cover for foraging, roosting and breeding; and*
- *Drooping she-oak (Allocasuarina verticillata) within the Mt Lofty Ranges.*”

It is known that Diamond Firetail prefer habitats with relatively low tree density, minimal large logs and little litter cover. However, these habitats must include high grass cover for foraging, roosting and breeding (Antos et al., 2008).

Foraging habitat for the Diamond Firetail consists of grassy understoreys of open woodlands dominated by Eucalypt spp., Acacia spp., and/or Casuarina spp., where the species forages

exclusively on the ground for ripe grass, herb seeds, green leaves and insects. Diamond Firetail have also been recorded to occur in farmland and grassland with scattered trees (Higgins et al., 2007).

The species roosts in dense shrubs or smaller nests built especially for roosting.

Breeding nests are globular structures built either in prickly shrubby understorey, or higher up in associated woodlands or open forests, especially under bird of prey nests.

Field assessments of the Project Area concluded that suitable habitat, being any Eucalyptus and Acacia woodlands and forests, occurs throughout the Project Area. Habitat mapping for the Project Area identified 1,287.4 ha of potential Diamond Firetail habitat. Therefore, as suitable habitat is located within the Project Area, the Diamond Firetail is considered to have a potential to occur. The species was not recorded during field surveys.

Additionally, a number of low ecological value habitat types including acacia regrowth, eucalypt regrowth, mixed acacia and eucalypt regrowth and eucalypt and acacia paddock trees have the potential to provide foraging habitat for the species. These habitat types provide a grass layer dominated by exotic grasses which the species may utilise for foraging. The current habitat mapping includes wooded areas that could be used for roosting.

4.4.8.4 Southern Squatter Pigeon

Species Profile

The Southern Squatter pigeon (*Geophaps scripta scripta*) is currently listed as Vulnerable under the EPBC Act, effective 16 July 2000. The Southern Squatter pigeon is a medium sized ground dwelling bird approximately 30 cm in length.

Adult individuals feature a predominantly grey-brown body, with bold black and white stripes on the face and throat. The species features dark brown colouration on the upper wings, light grey-brown on the upper breast grading to blue grey on the lower breast and centre of the belly. The belly, flanks and underwings of the species are white. Additionally, the species features a black bill and dull-purple legs and feet (Higgins & Davies 1996).

Species Threats

As per the conservation advice for the Southern Squatter pigeon (TSSC, 2015a), the threats include:

- Vegetation clearing and fragmentation;
- Overgrazing of habitat by livestock and feral herbivores;
- Introduction of weeds;
- Inappropriate fire regimes;
- Thickening of understorey vegetation; predation by feral cats and foxes;
- Trampling of nests by livestock; and
- Illegal shooting.

Species Occurrence in the Broader Area

A search of the ALA database identified one (1) historical known records of the Southern Squatter Pigeon within 10 km of the Project Area. This individual was recorded within Cherwondah State Forest, approximately 6 km east of the Project Area, and was recorded in 2016. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

Southern Squatter pigeon foraging only habitat is generally defined as open forests to sparse, open woodlands and scrub, and less often, savannas. Habitats are mostly remnant, regrowth or partly modified vegetation communities dominated in the overstorey by Eucalyptus, Corymbia, Acacia or

Callitris species. The species is nearly always found within 3 km of a permanent water source including rivers, creeks and waterholes (TSSC, 2015a).

In Queensland, foraging and breeding habitat for the Southern Squatter Pigeon is known to occur on well-draining, sandy or loamy soils on low, gently sloping, flat to undulating plains and foothills (i.e., RE Land Zone 5) and lateritic (duplex) soils on low 'jump-ups' and escarpments (i.e., RE Land Zone 7) (TSSC, 2015a).

Dispersal habitat for the species typically consists of any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies. Additionally, where scattered trees still occur and the distance of cleared land between remnant trees or patches of species' habitat does not exceed 100 m, individuals may be found foraging in, or moving across modified or degraded environments (Squatter Pigeon Workshop, 2011).

Within the northern portions of the Project Area, there is an overall lack of foraging and breeding habitat as a result of previous land clearing activities. However, suitable dry woodland habitat remains on and around the plateau in the south-eastern portion of the Project Area. Habitat mapping for the Project Area identified 164.3 ha of breeding and foraging habitat and 316 ha of dispersal habitat (up to 2.1 ha of dispersal habitat to be cleared). Additionally, the following low ecological value land types can provide dispersal habitat when within 100 m of mapped breeding and foraging habitat:

- Eucalypt regrowth;
- Acacia regrowth; however, none of the current areas of Acacia regrowth are currently within 100 m of the Southern Squatter Pigeon breeding and foraging habitat;
- Acacia and Eucalypt regrowth; and
- Eucalypt and Acacia paddock trees.

Therefore, as suitable habitat is located within the Project Area, the Southern Squatter Pigeon is considered to have a potential to occur. The species was not recorded during field surveys.

4.4.8.5 Southern Whiteface

Species Profile

Southern Whiteface (*Aphelocephala leucopsis*) is listed as Vulnerable under the EPBC Act effective 31 March 2023. The Southern whiteface is a small stocky bird, averaging 11.5 cm in body length, featuring a brown dorsum, dark brown wings, white belly and a black tail with a white tip (Shodde and Mason, 1999). As per the species name, a white band runs across the species' forehead, with a darker band across the top of the head.

Distribution of the Southern Whiteface occurs south of the Australian tropics, particularly occurring from the north-east of the Western Australia wheatbelt and east to the Great Dividing Range (Shodde and Mason, 1999), with the northern-most distribution occurring from Carnarvon to the southern portion of the Northern Territory in central Australia.

Southern Whiteface are largely sedentary birds, however, are known to migrate during drought regions to the wetter regions outside of their normal distribution (Higgins and Peter, 2002). Southern Whiteface breed anytime between July and October, however the timing across the species range can be influenced by rainfall in arid regions (Higgins and Peter, 2002). Females lay a clutch size of three to four eggs on average. Young Southern Whiteface fledge within 14 and 19 days.

Species Threats

As per the conservation advice for the Southern Whiteface (DCCEEW, 2023c), the threats include:

- Habitat loss caused by clearing for agriculture;
- Habitat degradation caused by domestic livestock grazing;
- Increased frequency or length of droughts; and
- Increased likelihood of extreme events (i.e., wildfire, drought and heatwaves).

Species Occurrence in the Broader Area

A search of the ALA database did not identify any historical known records of the Southern Whiteface within 10 km of the Project Area. The closest known record of the Southern Whiteface is located near Yuleba State Forest, approximately 57 km south-west of the Project Area, recorded in 2016. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

As per the species conservation advice (DCCEEW, 2023c), habitat critical to the survival of the Southern whiteface includes areas of:

- *“Relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both;*
- *Habitat with low tree densities and an herbaceous understorey litter cover which provides essential foraging habitat;*
- *Living and dead trees with hollows and crevices which are essential for roosting and nesting.”*

The Southern Whiteface resides in a wide range of open woodlands and shrubland environments dominated by *Acacia* spp. and *Eucalyptus* spp., particularly where understorey of grasses and/or shrubs are present. Along with the general habitat, breeding and roosting habitat for the species further consists of tree hollows, in either live or dead standing trees.

The Southern Whiteface forages almost exclusively on the ground, with preference for areas with low tree densities and an understorey consisting of herbs and leaf litter in open woodlands and shrublands.

Field surveys conducted across the Project Area in 2022 identified that almost all woodland habitats present within the Project Area are considered suitable habitat for the Southern Whiteface, with the exception of cleared grazed land dominated by exotic pasture grasses. Habitat mapping for the Project Area identified 938.5 ha of potential Southern Whiteface habitat. Therefore, as suitable habitat is located within the Project Area, the Southern Whiteface is considered to have a potential to occur. The species was not recorded during field surveys.

4.4.8.6 Painted Honeyeater

Species Profile

The Painted Honeyeater (*Grantiella picta*) is currently listed as Vulnerable under the EPBC Act, effective 8 July 2015. The Painted Honeyeater is a small bird, with females smaller than males. The Painted Honeyeater features black and white underparts, a deep pink bill, red eyes, black spots on the flanks and yellow edging on the flight and tail feathers (DoE, 2015a).

The Painted Honeyeater has a sparse distribution along eastern Australia, occurring from the eastern Northern Territory and north-western Queensland to south-eastern Australia. Painted Honeyeater populations, particularly breeding populations, are most abundant inland of the Great Dividing Range, especially between the Grampians (Vic) and Roma (QLD) (Higgins et al., 2001). The species is known to migrate seasonally, in response to fruiting of Mistletoe plants (DoE, 2015a).

Species Threats

As per the conservation advice for Painted Honeyeater (DoE, 2015a), the threats include:

- Deliberate destruction of mistletoe in production forests;
- Exacerbation of tree decline through pasture improvement activities;
- Competition with the aggressive noisy miner (*Manorina melanoccephala*);
- Predation by invasive species (e.g., black rats);
- Collision with road vehicles; and

- Nest predation by over-abundant Pied currawongs (*Strepera graculina*), Pied and Grey butcherbirds (*Cracticus nigrogularis* and *Cracticus torquatus*), and crows and ravens.

Species Occurrence in the Broader Area

A search of the ALA database did not identify any historical known records of the Painted Honeyeater within 10 km of the Project Area. The closest known record of the Painted Honeyeater is located approximately 47 km south-west of the Project Area, recorded in 1997. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

The Painted Honeyeater inhabits Mistletoe in eucalypt forests and woodlands, riparian woodlands of Black Box and River Red Gum, box-ironbark-yellow gum woodlands, woodlands dominated by paperbarks, acacia spp., casuarina spp., Callitris spp., and occasionally farmlands and gardens (DoE, 2015a). Woodlands with a higher abundance of mature trees are of higher preference for Painted Honeyeater, as these contain a higher abundance of Mistletoes.

Breeding habitat for the Painted Honeyeater consists of Boree/Weeping Myall (*Acacia pendula*) woodlands, Brigalow (*A. harpophylla*) woodlands, box-gum woodlands and box-ironbark forests on the inland slopes of the Great Dividing Range. Additional breeding habitats include forests and woodlands with high quantities of mistletoe and where parasitism rates are high, preferably remnant vegetation. The species typically nests in mature trees that are abundant with mistletoe, where the species may use the mistletoe as a nesting substrate.

The Painted Honeyeater favours mistletoes of the genus *Amyema*, growing on forests and woodland eucalypts and acacias, for foraging and roosting habitat.

Field assessments of the Project Area in 2022 confirmed Mistletoe to be present (albeit sparingly) in Eucalypt woodlands, as well Brigalow woodlands (limited potential habitat). Habitat mapping for the Project Area identified 272.1 ha of potential Painted Honeyeater habitat. Therefore, as suitable habitat is located within the Project Area, the Painted Honeyeater is considered to have a potential to occur. The species was not recorded during the 2022 field surveys.

4.4.8.7 Corben's Long-eared Bat

Species Profile

Corben's Long-eared Bat (*Nyctophilus corbeni*) is currently listed as Vulnerable under the EPBC Act, effective 4 April 2001. Corben's Long-eared Bat is a relatively large bat species, with a head and body length of 50-75 mm, forearm length of 40-50 mm and a tail length of 35-50 mm (Reardon, 2012). Females are generally heavier than males, averaging 14-21 grams, whilst males average 11-15 grams. The species is light brown to dark grey-brown in colouration and exhibits long ears (30 mm length) that are generally folded but erect as a response to alerts, (TSSC, 2015b).

Corben's Long-eared Bat is distributed across eastern Australia, from southern-central Queensland, south to central-western New South Wales, north-western Victoria and eastern South Australia (TSSC, 2015b). Within its distribution, the species is rarely recorded with the exception of in Nandewar and Brigalow Belt South Bioregions. Majority of species records were located inland of the Great Dividing Range (Parnaby, 2009). It is thought that approximately 30% of the species total distribution is located in Queensland, however records exist for only fewer than 30 localities (TSSC, 2015b).

Species Threats

As per the conservation advice for Corben's Long-eared Bat (TSSC, 2015b), the threats include:

- Known threats:

- Habitat loss, fragmentation and degradation as a result of altered fire regimes, timber extraction and mining activities.
- Potential threats:
 - Reduction in hollow availability;
 - Exposure to agrichemicals;
 - Grazing; and
 - Predation by feral animals.

Species Occurrence in the Broader Area

A search of the ALA database did not identify any historical known records of Corben's Long-eared Bat within 10 km of the Project Area. The closest known record of the species is located in Binkey State Forest, approximately 28 km south-east of the Project Area, recorded in 2002. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

Within its distribution, Corben's Long-eared Bat inhabits inland woodlands, including box, ironbark, cypress-pine woodlands (particularly in Queensland), Buloke woodlands, Brigalow woodland, Belah woodlands, smooth-barked apple woodland, river red gum forest, black box woodland, and various types of tree mallee. The species is most abundant in extensive woodlands, rather than smaller patches and in habitats with distinct tree canopy, dense and cluttered understoreys (Turbill & Ellis, 2006).

Little information is publicly available on the species breeding behaviours and habitats. However, foraging and roosting habitat likely consists of forests and woodlands dominated by *Allocasuarina luehmannii*, *Acacia harpophylla*, *Casuarina cristata*, *Eucalyptus camaldulensis*, and various other types with dead hollow-bearing trees or trees with exfoliating bark. Roosting occurs within dead trees including ironbark, cypress and bull oak, and occasionally under peeling bark. Foraging only habitats consist of remnant and regrowth vegetation and low woodlands.

Field assessments conducted in 2022 confirmed a small portion of the Project Area to contain potential foraging habitat, in the form of wooded areas and connectivity to woodlands surrounding the Project Area. Suitable habitat in the Project Area is associated with larger patches of remnant Eucalypt and Acacia woodlands. Habitat mapping for the Project Area identified 259.6 ha of potential Corben's Long-eared Bat habitat. Therefore, as suitable foraging habitat is located within the Project Area, the Corben's Long-eared Bat is considered to have a potential to occur. The species was not recorded during the 2022 field surveys.

4.4.8.8 Northern Quoll

Species Profile

The Northern Quoll (*Dasyurus hallucatus*) is currently listed as Endangered under the EPBC Act, effective 12 April 2005. The Northern Quoll exhibits reddish-brown fur with white spots on the back, cream-coloured belly, and a pointed snout (TSSC, 2005). The Northern Quoll is the smallest quoll species in Australia, weighing approximately 1.2 kg, with males typically larger than females.

Historically, the Northern Quoll was found across northern Australia, from the Pilbara region in Western Australia and continuously to Brisbane Queensland. However, due to the extent of species threats, the Northern Quoll now occurs in only five regional populations across Queensland, the Northern Territory and Western Australia (SPRAT, 2017). Within Queensland, the species occurs from Gracemere and Mount Morgan in central Queensland, north to Weipa and west to Carnarvon National Park. Although their limited distribution in Queensland, the species has recently been recorded outside of their distribution, in Maleny (south-east Queensland) (Qld DERM, 2009), Mareeba, Mount Carbine, Tolga and Cooktown (Woinarski et al. 2008).

The Northern Quoll typically feeds on invertebrates (e.g., beetles, spiders, scorpions, grasshoppers and centipedes), fruits, human refuse, vertebrates (e.g., Northern Brown Bandicoot, Common Brushtail Possum, rats, bats, bird eggs, snakes, Sugar Glider, frogs, quails and more recently, Cane Toads) (TSSC, 2005).

Species Threats

As per the Species Profile and Threats database (SPRAT, 2017), threats to the Northern Quoll include:

- Habitat loss, fragmentation and degradation;
- Lethal toxic ingestion caused by Cane Toads (*Rhinella marina*);
- Inappropriate fire regimes;
- Weed invasion;
- Predation by feral animals, including feral cats (*Felis catus*) and European Red Fox (*Vulpes vulpes*); and
- Parasitism – potential threat only.

Species Occurrence in the Broader Area

A search of the ALA database did not identify any historical known records of the Northern Quoll within 10 km of the Project Area. The closest known record of the Northern Quoll was recorded in 1892, approximately 153 km north-east of the Project Area. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

Across its distribution, the Northern Quoll occupies a diverse range of habitats particularly for foraging and dispersal activities, ranging from rocky areas to eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and desert within close proximity to a permanent water source (SPRAT, 2017). Preferable habitats for the species typically encompass some form of rocky areas for denning with nearby access to vegetated habitats for foraging.

Breeding and denning habitat for the Northern Quoll consists of rocky areas for denning, with dens typically in rock crevices, tree hollows or termite mounds, in close proximity to vegetated habitats and a permanent water source.

Field assessments of the Project Area in 2022 identified potential suitable habitats, in the form of rocky areas, to the south-eastern corner of the Project Area in the plateau with eucalypt woodland and open forests. These habitats were considered suitable for foraging, breeding and denning purposes. Habitat mapping for the Project Area identified 226.7 ha of potential Northern Quoll habitat. Therefore, as suitable habitat is located within the Project Area, the Northern Quoll is considered to have a potential to occur. The species was not recorded during the 2022 field surveys.

4.4.8.9 Yellow-bellied Glider (South-eastern)

Species Profile

The Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*) is currently listed as Vulnerable under the EPBC Act, effective 2 March 2022.

Being the second largest arboreal marsupial (DAWE, 2022d), the Yellow-bellied Glider (south-eastern) ranges in size from 240 mm – 310 mm and exhibits a long tail ranging from 380 mm – 470 mm. On average, male individuals average 470 – 725 g in weight, whilst females average 435 – 660 g.

Yellow-bellied Gliders (south-eastern) feature a greyish-brown colouration, with a black stripe down their back and tail, and exhibit a white to yellow belly colouration, with the yellow developing with age (DAWE, 2022d). Their tail is generally black with grey edging.

The Yellow-bellied Glider (south-eastern) is endemic to eastern Australia. The species distribution spans from south-eastern Queensland to southern South-Australia, in altitudes ranging from sea level to 1400 m above sea level. Within south-east Queensland, Yellow-bellied Glider (south-eastern) occur in a patchy distribution (DAWE, 2022d). Although patchily distributed, in Queensland there are two known important populations of the species, including:

- Carnarvon Range (Inland population; Qld); and
- Blackdown Tableland (Inland population; Qld).

Species Threats

As per the conservation advice for the Yellow-bellied Glider (south-eastern) (DAWE, 2022d), the threats include:

- Habitat clearing and fragmentation;
- Extensive severe bushfires;
- Prescribed burns;
- Increased temperatures and changes to precipitation patterns;
- Timber harvesting;
- Predation by feral cats (*Felis catus*) and European red foxes (*Vulpes vulpes*);
- Habitat degradation from feral deer; and
- Entanglement in barbed wire fencing.

Species Occurrence in the Broader Area

A search of the ALA database identified three (3) historical known records of the Yellow-bellied Glider (south-eastern) within 10 km of the Project Area. These records are all located within Cherwondah State Forest, located south-east of the Project Area, and were recorded in 2009. Additional records of the Yellow-bellied Glider (south-eastern) exist in Gurulmundi State Forest, approximately 15 km south-east of the Project Area, and were all recorded in 2008. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

Habitat critical to the survival of Yellow-bellied Glider (south-eastern) can be defined as areas containing the following features (DAWE, 2022d):

- “Floristically diverse eucalypt forests, dominated by winter-flowering and smooth-barked eucalypts, including mature living hollow-bearing trees and sap trees;
- Areas identified as refuges under future climate change scenarios;

- *Short or long-term post-fire refuges (i.e., unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas;*
- *Habitat corridors required to facilitate dispersal of the subspecies between fragmented habitat patches and/or that enable recolonization or movement away from threats. yellow-bellied gliders (south-eastern) have a glide ratio (horizontal distance/height dropped) of around 2.0, and corridors spanning gaps larger than the distance gliders are likely to be able to travel should be considered critical to the survival. There is not enough evidence to define the canopy and width characteristics of appropriate corridors. In the absence of such information, a precautionary approach should be taken to maximise dispersal by considering all habitat corridors in the species' range to be habitat critical to the survival; and*
- *Areas in which some trees have evidence of use for sap extraction by yellow-bellied glider (south-eastern)."*

Yellow-bellied Glider (south-eastern) typically resides in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests. Within their favourable habitats, Yellow-bellied glider (south-eastern) show a preference for large patches of mature old growth forests (typically 100 years in age) as these provide suitable trees for foraging and shelter.

More specifically, breeding and denning habitat for Yellow-bellied Glider (south-eastern) consists of Eucalypt dominated woodlands and forests with hollow-bearing trees, primarily in living, smooth-barked eucalypts. Stags, being standing dead trees, are also used for denning purposes, however these only account for two percent of den trees in certain forest types.

Field surveys conducted across the Project Area in 2022 identified potential foraging and denning habitat, in the form of wooded plateaus, in the south-eastern corner of the Project Area. Although potential foraging and denning habitat is present, no sap feeding scars or individuals were observed during field surveys. Additionally, no evidence of characteristic feeding scars were detected on potential feed trees within the Project Area. The species is unlikely to occur in the cleared and fragmented landscape across the north of the Project Area. The wooded plateau in the southeast is connected to suitably large areas of remnant woodland with potential feed trees. Habitat mapping for the Project Area identified 145.8 ha of potential Yellow-bellied Glider (south-eastern) habitat and as such, the Yellow-bellied Glider (south-eastern) is considered to have a potential to occur.

4.4.8.10 Collared Delma

Species Profile

The Collared Delma (*Delma torquata*) is currently listed as Vulnerable under the EPBC Act, effective 16 July 2000. The Collared Delma is the smallest legless lizard, measuring a maximum total length of 19 cm (peck & Hobson, 2007). The Collared Delma exhibits a brown to reddish-brown colouration along the main body, a pale belly, black bands across the head and nape with four cream-yellow stripes, and a grey to bluish-grey tail colouration (DEWHA, 2008g).

The Collared Delma occurs from northern New South Wales to Central Queensland, with the species main populations located in the western suburbs of Brisbane and the following localities:

- Bunya Mountains;
- Blackdown Tableland National Park;
- Bullyard Conservation Park;
- D'Aguilar Range National Park;
- Expedition National Park;
- Naumgna and Lockyer Forest Reserves; and
- Western Creek near Millmerran and the Toowoomba Range.

Species Threats

As per the conservation advice for the Collared Delma (DEWHA, 2008g), the threats include:

- Habitat loss;
- Habitat modification from urban and agricultural development;
- Removal of surface rocks (critical habitat) during developments;
- Fire; and
- Invasive weeds, particularly Dwarf Lantana (*Lantana montividentis*).

Species Occurrence in the Broader Area

A search of the ALA database did not identify any historical known records of the Collared Delma within 10 km of the Project Area. The closest known records for the Collared Delma are located within Bellington Hut State Forest, approximately 113 km north-west of the Project Area. The species was recorded twice in this location in 2001 and 2020. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

The Collard Delma occurs in eucalypt dominated woodland and open forest habitats, particularly where suitable micro-habitats (e.g., exposed rocky outcrops) are present (DEWHA, 2008g). The species inhabits ground cover dominated by native grasses (e.g., Kangaroo Grass, Barbed Wire Grass, Wiregrass and Lomandra) (Peck & Hobson, 2007).

Field assessments of the Project Area in 2022 identified suitable habitat in the form of abundant litter, rocks and woody debris to occur in a large contiguous area of forest and woodlands associated with escarpment and plateau, particularly within the south-eastern portion of the Project Area. It was noted that the species is unlikely to inhabit the northern areas of the Project Area as woodland fragments are small, narrow and exposed to disturbance. Habitat mapping for the Project Area identified 259.7 ha of potential Collared Delma habitat. Therefore, as suitable habitat is located within the southern portion of the Project Area, the Collared Delma is considered to have a potential to occur. The species was not recorded during the 2022 field surveys.

4.4.8.11 Dunmall's Snake

Species Profile

Dunmall's Snake (*Furina dunmalli*) is currently listed as Vulnerable under the EPBC Act, effective 16 July 2000. Dunmall's Snake is a small to medium sized snake, measuring a total length of 60 cm (DoE, 2014a). Dunmall's Snake features a dark grey-brown body, white underbelly (Cogger, 2000), pale blotches on the upper lip scales, smooth body scales and a distinctively large head (DERM, 2007).

Dunmall's Snake occurs from northern New South Wales to Central Queensland. Within Queensland, the species range spans from the regions of Oakey, Glenmorgan and Inglewood in south-western Queensland, north to Yeppoon and the Expedition Range. Within this range, records of the species are observed at altitudes between 200 m and 500 above sea level. The species occurs throughout multiple bioregions, including the Brigalow Belt Bioregion.

Species Threats

As per the conservation advice for the Dunmall's Snake (DoE, 2014a), the threats include:

- Broadscale land clearing;
- Habitat modification for grazing, agriculture and urban development;
- Overgrazing by livestock;

- Swamp drainage; and
- Predation by feral animals.

Species Occurrence in the Broader Area

A search of the ALA database did not identify any historical known records of Dunmall's Snake within 10 km of the Project Area. The closest record of the species is located near Yuleba State Forest, approximately 41 km south-west of the Project Area, recorded in 2009. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

Dunmall's Snake inhabits open forests, dominated by Brigalow (*Acacia harpophylla*), Wattles (*A. burowii*, *A. deanii*, *A. leioclyx*), native Cypress (*Callitris* spp.) and/or Bulloak (*Allocasuarina luehmannii*), and woodlands on floodplains associated with deep, cracking clays and clay loam soils (Covacevich et al., 1988, Cogger et al., 1993). The species is thought to be nocturnal, seeking fallen timber and in soil cracks for shelter.

Field assessments of the Project Area in 2022 identified suitable habitat with abundant litter, rocks and woody debris, limited to the within the south-eastern corner of the Project Area. Habitat mapping for the Project Area identified 259.7 ha of potential Dunmall's Snake habitat. Therefore, as suitable habitat is located within the Project Area, the Dunmall's Snake is considered to have a potential to occur. The species was not recorded during the 2022 field surveys.

4.4.8.12 Grey Snake

Species Profile

The Grey Snake (*Hemiaspis damelii*) is listed as Endangered under the EPBC Act, effective 5 October 2022. The Grey Snake is a small yet venomous species of snake exhibiting front-fangs, a pale-dark grey to olive-grey body, a white/cream or yellow belly with darker flecks and black skin between the scales. In Queensland, Grey snakes have an average snout vent length of 378 mm, with males larger than females (DCCEEW, 2022c).

Species distribution of the Grey Snake occurs continuously from south-eastern Queensland to southern New South Wales. Within Queensland, the species occurs in the Brigalow Belt region, on floodplains from Goondiwindi and Dalby west to Glenmorgan, on the Darling Downs and western Lockyer Valley, on the Darling Riverine Plains near Currawinya and near Rockhampton in central Queensland. Particularly, within south-east Queensland, the Grey Snake is broadly dispersed, with majority of records occurring along the Macintyre and Condamine Rivers.

Across its range, the Grey Snake has been recorded to occur in altitudes from 70 m above sea level to 540 m above sea level (DCCEEW, 2022c), however majority of records exist in regions below 300 m sea level.

Species Threats

As per the conservation advice for the Grey Snake (DCCEEW, 2022c), the threats include:

- Land clearing, pasture improvement and cultivation;
- Water extraction and diversions resulting in hydrological changes to floodplains;
- Contamination from pesticides and herbicides;
- Reduced environmental water flow;
- Poisoning by ingestion of cane toads (*Rhinella marina*);
- Predation from feral pigs (*Sus scrofa*), cats (*Felis catus*) and European red foxes (*Vulpes vulpes*);
- Coal and gas extraction; and

- High frequency of high severity fire.

Species Occurrence in the Broader Area

A search of the ALA database did not identify any historical known records of the Grey Snake within 10 km of the Project Area. The closest known record of the species is located in Barakula State Forest, approximately 52 km east of the Project Area, recorded in 2010. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

As per the species conservation advice, favourable habitat for the Grey Snake consists of Brigalow (*Acacia harpophylla*) and Belah (*Casuarina cristata*) woodlands on heavy, dark brown to black cracking clay soils, particularly in association with water bodies, including small gullies and ditches, ephemeral wetlands, and floodplains (DCCEEW, 2022c).

In Queensland, the Grey Snake favours woodlands dominated by Brigalow (*Acacia harpophylla*) and Belah (*Casuarina cristata*), on cracking clay soils, and in association with water bodies, including small gullies and ditches, ephemeral wetlands, and floodplains (DCCEEW, 2022c). Within these habitats, the species typically seeks shelter in floodplain environments beneath logs, rocks and soil cracks when required (DCCEEW, 2022c).

Additional habitat for the Grey Snake includes Bluegrass (*Dichanthium sericeum*) and/or Mitchell grass (*Astrebla spp.*) grassland on alluvial plains with cracking soils (DCCEEW, 2022c). In the Western Downs regions of south-east Queensland, a particular association between Grey Snakes and red sodosol soils with a strong contrast between the A horizon and sodic B horizon can be observed.

Field surveys undertaken at the Project Area in 2022 identified both Brigalow and Belah present within the northern and far south-eastern portions of the Project Area. Additionally, ephemeral wetlands and creek lines were also observed along with cracking clay soils during the field surveys. Habitat mapping for the Project Area identified 431.2 ha of potential Grey Snake habitat. Therefore, as suitable habitat is located within the Project Area, the Grey Snake is considered to have a potential to occur. Despite the presence of suitable habitat throughout the Project Area, the species was not recorded during the 2022 field surveys.

Additionally, the species has the potential to occur within a number of low ecological value habitat types including:

- Acacia regrowth;
- Eucalypt regrowth;
- Mixed acacia and eucalypt regrowth; and
- Eucalypt and acacia paddock trees.

These areas are slightly intersected or bordered by small gullies which may provide suitable habitat for the species where regrowth is near small gullies and floodplains.

4.4.8.13 Yakka Skink

Species Profile

The Yakka skink (*Egernia rugosa*) is currently listed as Vulnerable under the EPBC Act, effective 16 July 2000. The Yakka Skink is a large, robust lizard that features a pale fawn to dark brown colouration, with a dark stripe extending from the neck to the tail (DES, 2021). The species abdomen and chest are yellow-orange, and the throat is cream-yellow with dark flecks (Cogger, 2000).

The Yakka Skink is endemic to Queensland, occurring in a patchy distribution from St George to Coen and Cape York in Far North Queensland. The species occurs in the Brigalow Belt Bioregion,

specifically from Rockhampton south to St George and inland towards Chesterton Range National Park (DoE, 2014b).

Species Threats

As per the conservation advice for the Yakka Skink (DoE, 2014b), the threats include:

- Inappropriate roadside management;
- Removal of wood debris and rock microhabitat features;
- Ripping of rabbit warrens; and
- Predation by feral animals.

Species Occurrence in the Broader Area

A search of the ALA database did not identify any historical known records of the Yakka Skink within 10 km of the Project Area. The closest known record of the Yakka Skink is located near Gurulmundi State Forest, approximately 28 km south-east of the Project Area, recorded in 1998. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

Suitable habitat for the Yakka Skink is described in the 'Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles' (DSEWPC, 2011) as:

- *"Open-forests to low-woodlands and scrub in QLD RE Land Zones (LZ) 3, 4, 5, 7, 8, 9, 10 and 12 (LZ 8 not considered core habitat; LZ 12 in Wet Tropics bioregion only). Colonies have been found in large hollow logs, cavities or burrows under large fallen trees, tree stumps, logs, stick-raked piles, large rocks and rock piles, dense ground-covering vegetation, and deeply eroded gullies, tunnels and sinkholes."*

The Yakka Skink predominantly inhabits open dry sclerophyll forests and/or woodlands, refuging in cavities under or around surface microhabitats (i.e., beneath rocks, in dense ground vegetation and hollow logs, and soil-bound root systems of fallen trees) (Wilson and Knowles, 1988; Cogger, 2000). Yakka Skink may also occur in cleared habitats, where shelter sites (i.e., tunnel erosion, rabbit warrens and log piles) occur (DoE, 2014b). The species rarely travels far from its shelter site, with presence typically recorded by scat piles near the entrance, as the species use communal defecation sites (Eddie 2012; Wilson 2012). The Yakka Skink further occupy vegetation types including Poplar Box (*E. populnea*), Ironbark (*E. sideroxylon*), Brigalow (*A. harpophylla*), Mulga (*A. aneura*), Bendee (*A. catenulata*), White Cypress Pine (*C. columellaris*) and Lancewood (*A. shirleyi*) woodlands and open forests (DoE, 2014b).

Field assessments of the Project Area in 2022 identified suitable habitat with large logs, rocky outcrops and abundant woody debris to occur in woodland on and around the plateau in the south-eastern corner of the Project Area. Habitat mapping for the Project Area identified 228 ha of potential Yakka Skink habitat. As the Yakka Skink primarily inhabits open dry sclerophyll forests and/or woodlands (DoE, 2014b), which the Project Area encompasses to some extent, the Yakka Skink is considered to have a potential to occur. However, the species was not recorded during the 2022 field surveys.

4.4.8.14 Five-clawed Worm-skink

Species Profile

The Five-clawed Worm-skink (*Anomalopus mackayi*) is currently listed as Vulnerable under the EPBC Act, effective 16 July 2000. The Five-clawed Worm-skink is a medium-sized skink, averaging 27 cm in length. The species exhibits a brown to dark-brown colouration with a pale belly, three fingers and two toes, and is patterned in the northern regions of its distribution and unpatterned in the southern regions (DEWHA, 2008h). For Five-clawed Worm-skink individuals in the north, body patterns consist

of longitudinal rows of dark spots, approximately one per scale over the dorsal and lateral surfaces (Cogger et al., 1993; Cogger, 2000) and rows of dark spots on the ventral surface (Cogger, 2000).

The Five-clawed Worm-skink has a limited distribution, spanning from the western edge of the Great Dividing Range north-eastern NSW and south-eastern QLD (Sadler & Pressy, 1994).

Important populations of the Five-clawed Worm-skink exist in Queensland, anywhere where suitable habitat remains, particularly in the region between Bowenville/Oakey, Pittsworth and Jimbour (Brigalow Belt Reptiles Workshop 2010; Richardson 2006).

Species Threats

As per the conservation advice for the Five-clawed Worm-skink (DEWHA, 2008h), the threats include:

- Clearing and fragmentation of habitat for agriculture and development;
- Habitat degradation from overgrazing;
- Removal of refuge sites and litter;
- Predation by feral cats and foxes; and
- Soil and water pollution.

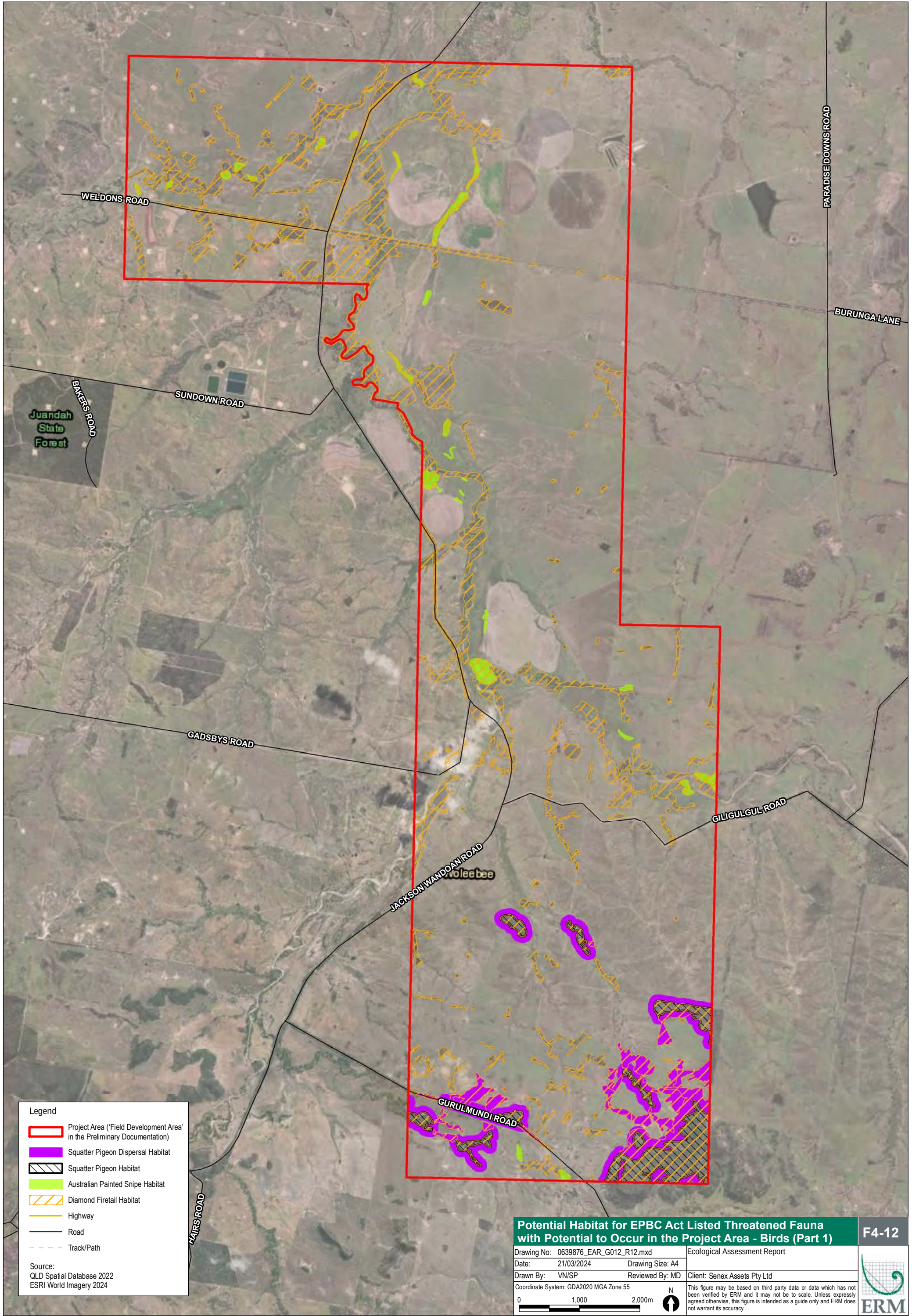
Species Occurrence in the Broader Area

A search of the ALA database did not identify any historical known records of the Five-clawed Worm-skink within 10 km of the Project Area. The closest known record of the species was recorded in 2002, approximately 150 km south-east of the Project Area. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

The Five-clawed Worm-skink inhabits woodlands generally supported by clay-loam soils (Shea et al., 1987), including grassy White Box woodlands, open woodlands and River Red Gum–Coolibah-Bimble Box woodlands (DEWHA, 2008f). Within these woodlands, the species resides in deep burrows and soil cracks. On the surface, the Five-clawed Worm-skink uses fallen logs and timber as sheltering sites (DEWHA, 2008h).

Field assessments of the Project Area in 2022 identified limited areas of potential Five-clawed Worm-skink habitat, with an absence of native grasslands with deep, cracking clays. In few areas of the Project Area, ephemeral wetlands and creek lines are present along with cracking clay soils (limited). Habitat mapping for the Project Area identified 209.6 ha of potential Five-clawed Worm-skink habitat. Therefore, as potentially suitable habitat is located within the Project Area, the Five-clawed Worm-skink is considered to have a potential to occur. The species was not recorded during the 2022 field surveys.

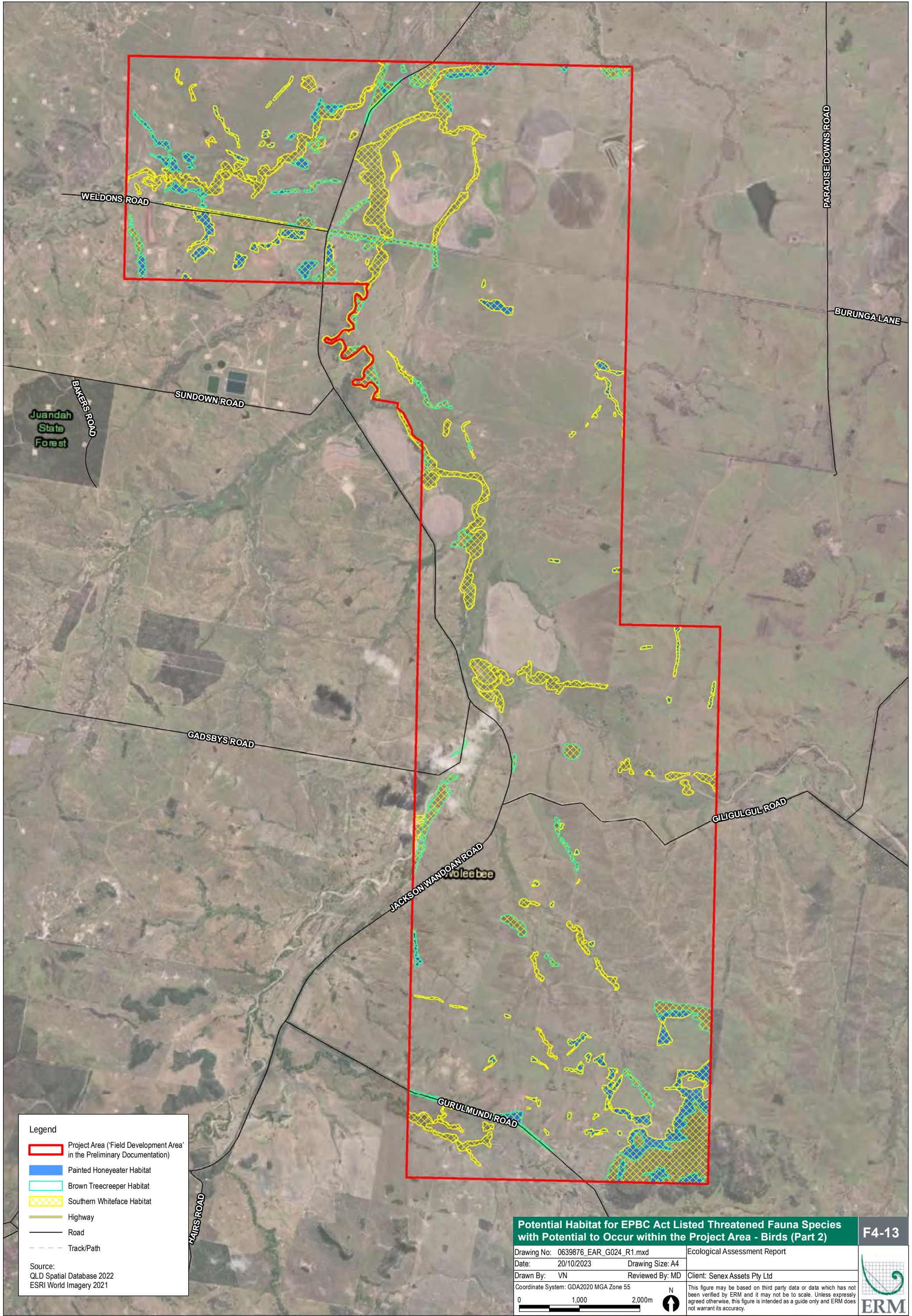


Legend

- Project Area ('Field Development Area' in the Preliminary Documentation)
- Squatter Pigeon Dispersal Habitat
- Squatter Pigeon Habitat
- Australian Painted Snipe Habitat
- Diamond Firetail Habitat
- Highway
- Road
- Track/Path

Source:
QLD Spatial Database 2022
ESRI World Imagery 2024

Potential Habitat for EPBC Act Listed Threatened Fauna with Potential to Occur in the Project Area - Birds (Part 1)		F4-12
Drawing No: 0639876_EAR_G012_R12.mxd		Ecological Assessment Report
Date: 21/03/2024	Drawing Size: A4	
Drawn By: VN/SP	Reviewed By: MD	Client: Senex Assets Pty Ltd
Coordinate System: GDA2020 MGA Zone 55		
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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.		ERM



Legend

- Project Area ('Field Development Area' in the Preliminary Documentation)
- Painted Honeyeater Habitat
- Brown Treecreeper Habitat
- Southern Whiteface Habitat
- Highway
- Road
- Track/Path

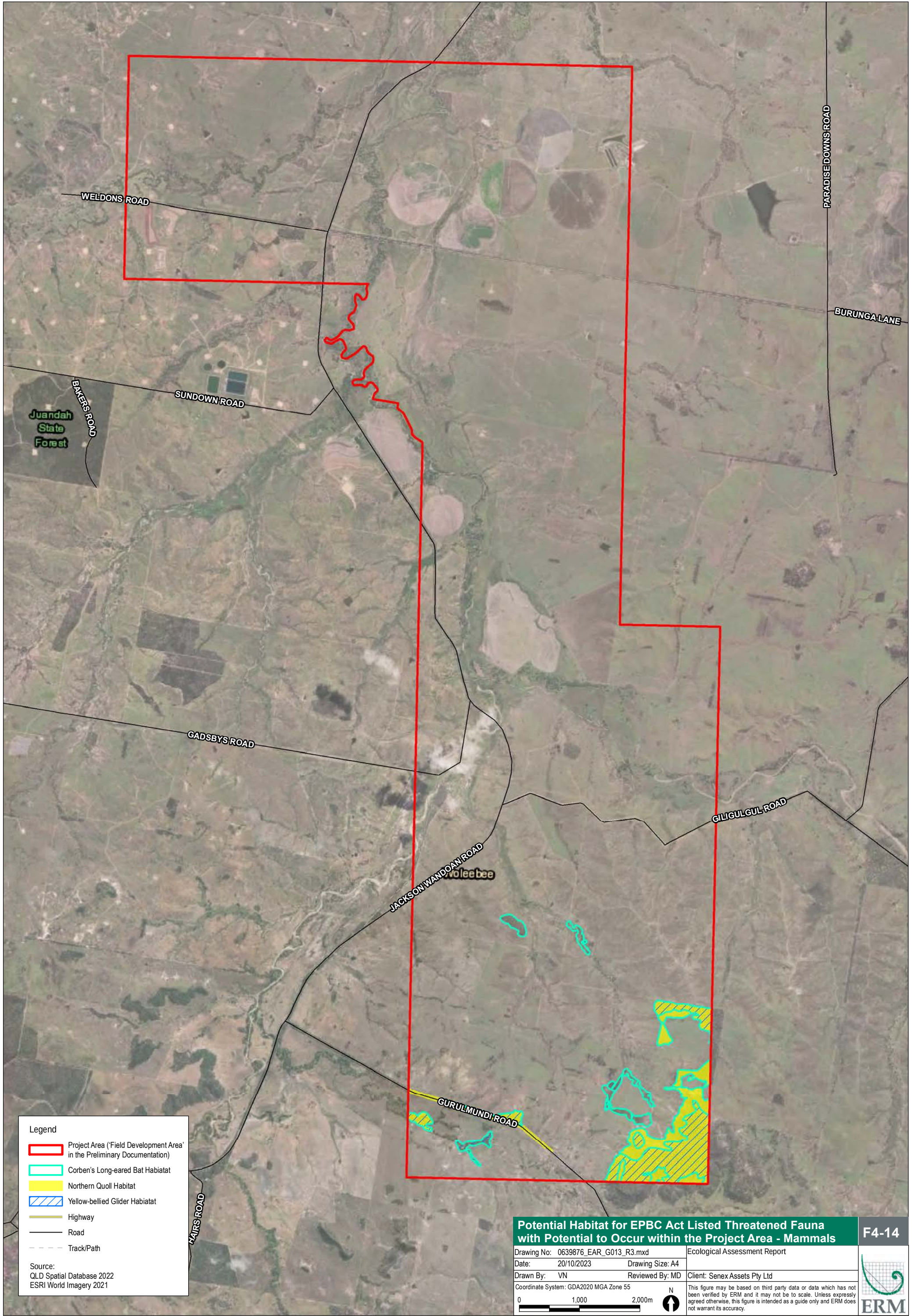
Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

Potential Habitat for EPBC Act Listed Threatened Fauna Species with Potential to Occur within the Project Area - Birds (Part 2)

F4-13

Drawing No: 0639876_EAR_G024_R1.mxd		Ecological Assessment Report		
Date: 20/10/2023	Drawing Size: A4			
Drawn By: VN	Reviewed By: MD	Client: Senex Assets Pty Ltd		
Coordinate System: GDA2020 MGA Zone 55		<p>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</p>		
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Legend

- Project Area ('Field Development Area' in the Preliminary Documentation)
- Corben's Long-eared Bat Habitat
- Northern Quoll Habitat
- Yellow-bellied Glider Habitat
- Highway
- Road
- Track/Path

Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

Potential Habitat for EPBC Act Listed Threatened Fauna with Potential to Occur within the Project Area - Mammals

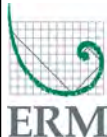
F4-14

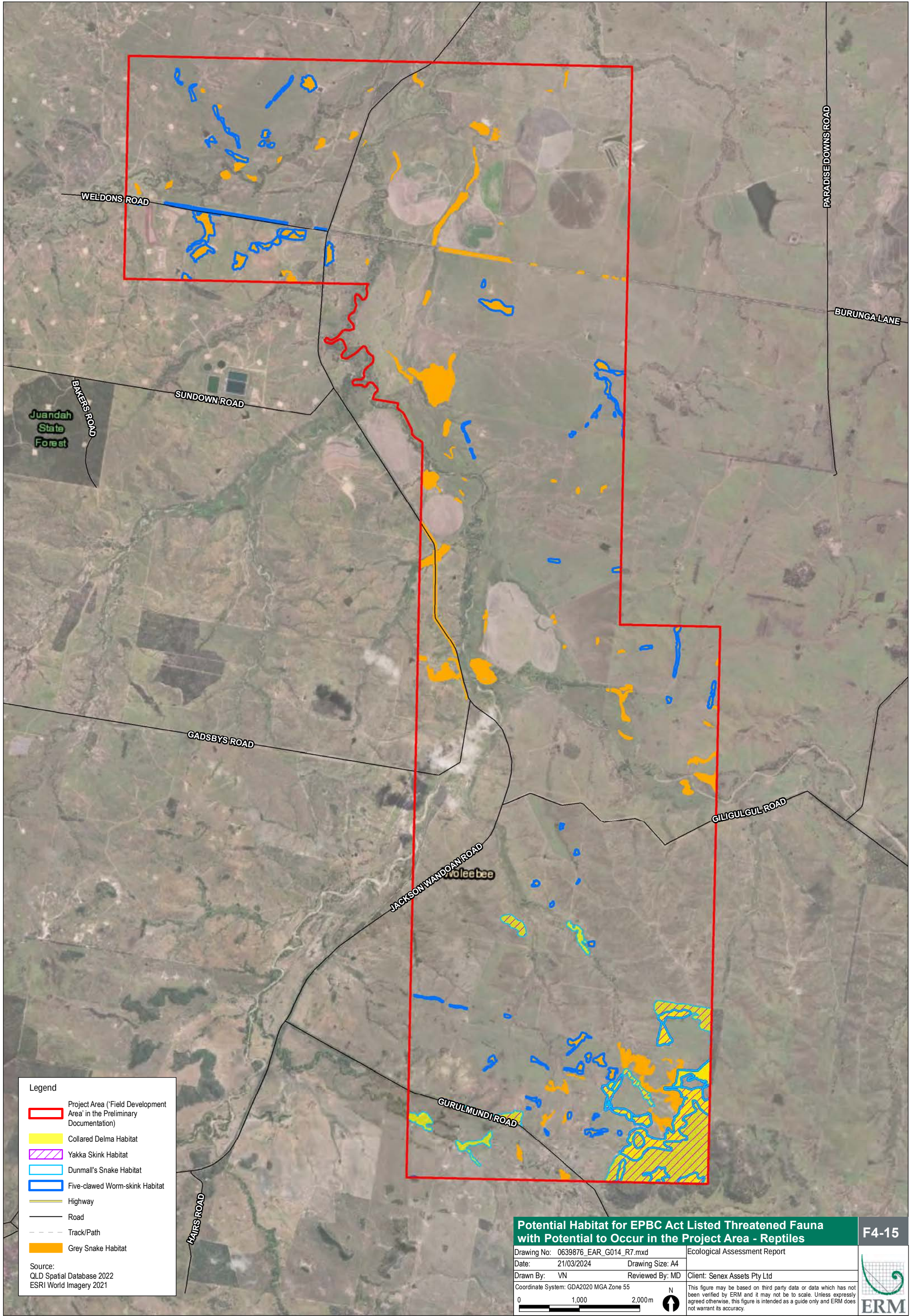
Drawing No: 0639876_EAR_G013_R3.mxd	Ecological Assessment Report	
Date: 20/10/2023	Drawing Size: A4	
Drawn By: VN	Reviewed By: MD	Client: Senex Assets Pty Ltd
Coordinate System: GDA2020 MGA Zone 55		

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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.





Legend

- Project Area ('Field Development Area' in the Preliminary Documentation)
- Collared Delma Habitat
- Yakka Skink Habitat
- Dunmall's Snake Habitat
- Five-clawed Worm-skink Habitat
- Highway
- Road
- Track/Path
- Grey Snake Habitat

Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

Potential Habitat for EPBC Act Listed Threatened Fauna
with Potential to Occur in the Project Area - Reptiles

Drawing No: 0639876_EAR_G014_R7.mxd
Date: 21/03/2024
Drawn By: VN
Reviewed By: MD
Ecological Assessment Report
Client: Senex Assets Pty Ltd

Coordinate System: GDA2020 MGA Zone 55

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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

F4-15



4.4.9 Listed Threatened Terrestrial Fauna Species identified in the RFI but not Known, Likely or Potential to Occur

4.4.9.1 Brigalow Woodland Snail

Species Profile

The Brigalow Woodland Snail is currently listed as Endangered under the EPBC Act, effective 7 December 2016. The Brigalow Woodland Snail features a brownish-yellow shell with reddish bands on the rounded and tightly coiled whorls and is approximately 20 mm in length. The shell is slightly flattened with a low, domed spine (TSSC, 2016b).

The Brigalow Woodland Snail is endemic to south-east Queensland, with populations predominantly occurring in Dalby and Chinchilla. The species occurs in the 'Brigalow (*Acacia harpophylla* dominant and co-dominant)' ecological community, which is currently listed as Endangered under the EPBC Act (TSSC, 2013), however it may also occur in the Coolibah— Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt Bioregions' ecological community, also currently listed as Endangered under the EPBC Act (TSSC, 2011). Species distribution is severely fragmented with an area of occupancy of 76 m² (DotEE, 2016). The mobility, and therefore capacity for dispersal, of this species is very limited (TSSC, 2016b).

Species Threats

As per the conservation advice for the Brigalow Woodland Snail (TSSC, 2016b), the threats include:

- Land clearing;
- Habitat disturbance;
- Predation by rats (*Rattus* spp.), mice (*Mus musculus*) and feral pigs (*Sus scrofa*);
- Invasion of Buffel grass;
- Trampling by cattle and horses; and
- Fire.

Species Occurrence in the Broader Area

A search of the ALA database did not identify any historical known records of the Brigalow Woodland Snail within 10 km of the Project Area. The closest known record of the species was recorded in Gurulmundi State Forest, approximately 15 km south of the Project Area, recorded in 2014. However, this specimen has been misidentified, refer to Appendix I. The next nearest known record is 52.1 km south-east of the Project Area, recorded in 2011. For more information on the description of the habitat in which the record was identified, refer to Appendix H.

Habitat Assessment

The Brigalow Woodland Snail inhabits remnant and scattered brigalow and eucalypt woodland patches, road verges and riparian corridors along the Condamine River floodplain within its distribution (TSSC, 2016b). In these habitats, the snail shelters under logs and leaf litter, however, also requires canopy and on-ground timber cover for survival and breeding (Stanisic et al., 2010). These habitat features maintain adequate humidity levels within the snail's microhabitat.

Field assessments of the Project Area in 2022 identified the Project Area to be highly fragmented, with any present Eucalypt and Brigalow woodland isolated and fragmented in small patches. The Project Area is located outside of the species known distribution and separated from known occurrences by substantial unsuitable habitat barriers. Although, a limited portion of the Project Area is located within the modelled distribution where the species or species habitat may occur, there are no validated / publicly available records of the species within 50 km of the Project Area and the

mobility of this species, and therefore capacity for dispersal, is very limited. As such, the species is considered unlikely to occur within the Project Area.

4.4.10 Aquatic Listed Threatened Fauna Species

A total of 2,192 individual fish from eight species, one species of turtle and three species of frog were recorded. No listed threatened species were identified during the field surveys. Three EPBC Act listed threatened aquatic fauna species were identified in the desktop review to potentially occur in and adjacent to the Project Area, these being:

- White-throated Snapping Turtle (*Elseya albagula*) – Critically Endangered;
- Fitzroy River Turtle (*Rheodytes leukops*) – Vulnerable; and
- Murray Cod (*Maccullochella peelii*) – Vulnerable.

All three species inhabit rivers with a preference for deep, permanent channels. The Project Area lacks rivers and other permanent waterways with deep channels. Only one specimen of Eastern Long-necked Turtle (not a listed threatened species) was recorded during aquatic field surveys. This species can move long distances overland between waterholes, particularly after heavy rainfall.

After completing a likelihood of occurrence and the subsequent field surveys, all three aquatic listed threatened species were considered unlikely to occur within the Project Area (Appendix B).

4.4.11 Listed Migratory Species Likely to Occur

Two EPBC Act listed migratory species, the White-throated Needletail and Fork-tailed Swift have been considered as known and likely to occur within the Project Area respectively.

The White-throated Needletail is a largely aerial species when on migration through Australia, only occasionally stopping to roost in Eucalypt forests (Higgins, 1999). As a result, it is considered unlikely there will be a significant impact. It should be noted that this species is also listed as Vulnerable under the EPBC Act, however due to its aerial nature, it is also unlikely to be significantly impacted by Project activities. This species was further described in Section 4.4.7.5.

4.4.11.1 Fork-tailed Swift

Species Profile

The Fork-tailed Swift (*Apus pacificus*) is currently listed as Marine and Migratory under the EPBC Act. The Fork-tailed Swift is a medium to large migratory bird, measuring a total length of 18-21 cm, with a wingspan of 40-42 cm and weighing approximately 30-40 grams. The migratory bird features a blackish colouration across the body with a white band across the rump, a white patch on the chin and throat.

The Fork-tailed Swift is a non-breeding migratory species in Australia, visiting all states and territories (Higgins, 1999). Within Queensland specifically, the species has scattered records across the Gulf Country and few records in Cape York Peninsula. The Fork-tailed Swift is widespread west of the Great Dividing Range, with the species commonly sighted along the line connecting Chinchilla and Hughenden.

Species Threats

There are currently no known significant threats to the Fork-tailed Swift in Australia. Although potential threats may exist, including habitat destruction and predation by feral animals, these are considered negligible due to the species' widespread distribution (Birdlife International, 2009).

Habitat Assessment

Within Australia, the Fork-tailed Swift is almost exclusively aerial, particularly over inland plains, above foothills and coastal areas (Higgins, 1999). The species predominantly occurs over dry, open habitats, particularly riparian woodlands, tea-tree swamps, low scrub, heathland and/or saltmarsh. Foraging habitat for the Fork-tailed Swift consists of remnant, regrowth and non-remnant vegetation.

The species was not recorded during the 2022 field surveys, however as it is almost exclusively aerial, it is considered likely to fly aerially over the Project Area, particularly during the migratory months as occasional flocks in spring and summer. Although likely to occur, the Fork-tailed Swift is unlikely to rely on any terrestrial habitats within the Project Area.

4.4.12 Listed Migratory Species with Potential to Occur

Seven listed migratory species have been determined as having the potential to occur within the Project Area (likelihood of occurrence found in Appendix B). There were no signs or observations of the species within the Project Area based on targeted field investigations across the field survey events using survey techniques aligned with survey guidelines, including:

- Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (Department of Environment, Water, Heritage and the Arts [DEHWA], 2017);
- Draft referral guidelines for 14 birds listed as migratory species under the EPBC Act (DoE, 2015b); and
- Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (DoEE, 2017).

The potential occurrence conclusion for these species was therefore based off presence of suitable habitat only, and/or the presence of records in the adjoining areas. Potential habitat for these species is largely associated with waterbodies and drainage features (predominately farm dams), that may occasionally be used. Therefore, even though no records for these species occur within the Project Area, they have been conservatively concluded as potentially occurring based on adjoining area records and/or the presence of habitat requirements.

The migratory species that have the potential to occur and their habitat within the Project Area are listed in Table 4-11. These include species that just have the potential to fly aerially overhead, and species, such as the common sandpiper, Latham's Snipe and Sharp-tailed Sandpiper, that have the potential to stop over within the Project Area in very limited suitable habitat (ephemeral wetlands on drainage lines and farm dams) which are mapped in Figure 4-12.

Table 4-11: EPBC Act Listed Migratory Species with Potential to Occur within the Project Area

Species Name	Common Name	EPBC Act Status	Potential Habitat within the Project Area*
<i>Actitis hypoleucos</i>	Common Sandpiper	Mi	■ Individuals may sometimes occur in the Project Area. However, there is very limited suitable habitat in the Project Area (ephemeral wetlands on drainage lines and farm dams), and this would only support occasional transient visitors.
<i>Gallinago hardwickii</i>	Latham's Snipe	Mi	■ Individuals may sometimes occur in the Project Area. However, there is very limited suitable habitat in the Project Area (ephemeral wetlands on drainage lines and farm dams), and this would only support occasional transient visitors.
<i>Cuculus optatus</i>	Oriental Cuckoo	Mi	■ There are limited areas of potential habitat in the form of remnant woodlands and non-remnant patches of native vegetation, within the Project Area.
<i>Rhipidura rufifrons</i>	Rufous Fantail	Mi	■ There is some limited potential habitat present in the form of remnant and non-remnant woodlands within the Project Area.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Mi	■ There is some limited potential habitat present in the form of remnant and non-remnant woodlands within the Project Area.
<i>Calidris acuminata</i>	Sharp-Tailed Sandpiper	Mi	■ Individuals may sometimes occur in the Project Area. However, there is very limited suitable habitat in the Project Area (ephemeral wetlands on drainage lines and farm dams), and this would only support occasional transient visitors.

Status listing per EPBC: E=Endangered, V=Vulnerable and Mi =Migratory.

For the full reasoning for the likelihood of occurrence conclusions for these species, refer to Appendix B.

*Information on potential habitat sourced from Appendix C (BOOBOOK, 2022).

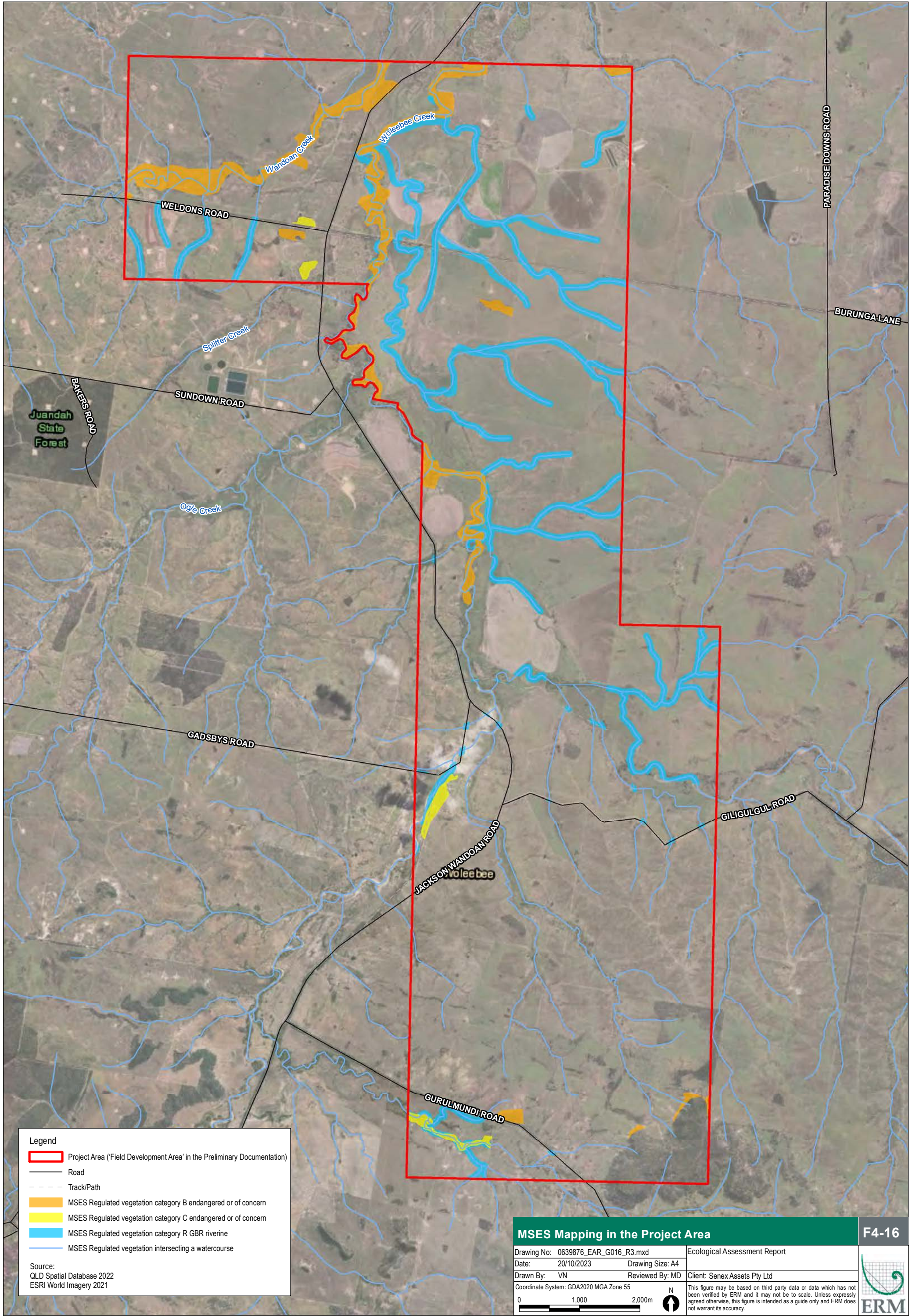
5.1 Matters of State Environmental Significance (MSES)

MSES are defined within the *Queensland Environmental Offsets Policy 2014* (QLD Offset Policy) for Significant Residual Impacts (SRI) (Department of State Development, Infrastructure and Planning, 2014) and prescribed activities assessable under the *Sustainable Planning Act 2009* (SPA). SPA has been superseded by the *Planning Act 2016*, but the QLD Offset Policy only references the SPA at this time. The MSES relevant to the Project Area considered as part of this assessment are summarised in Table 4-12. MSES requiring assessment include Regulated Vegetation and protected wildlife habitat and are further detailed in this Section. MSES in the Project Area, based on desktop mapping supported by ground-truthing of representative locations, are presented on Figure 4-16.

Table 4-12: MSES within the Project Area

Prescribed Matter	Relevance to the Proposed Action	Assessment
Regulated Vegetation	<ul style="list-style-type: none"> ■ Category B remnant vegetation – there is 334.8 ha of Endangered and Of Concern remnant vegetation present within the Project Area. ■ Category C high value regrowth – there is 38.4 ha of high value regrowth within the Project Area. ■ Category R GBR riverine regrowth – there is 595.4 ha of Great Barrier Reef riverine vegetation within the Project Area. ■ Defined distance of a watercourse – watercourses intersect with regulated vegetation within the Project Area. ■ Wetlands – no regulated vegetation is within 100m of a Vegetation Management Wetland within the Project Area. ■ Essential Habitat – there is 96.3 ha of essential habitat present within the Project Area. 	1-4 and 6 required
Connectivity Areas	Connectivity areas within the Project Area are comprised chiefly of vegetation associated with watercourses, including Woleebee Creek. The main connectivity areas within the adjoining areas (10 km buffer of Project Area) are located to the south and east and will not be affected by the proposed development.	Not required
Wetlands and Watercourses	In accordance with the Development Assessment Mapping Systems (DAMS) mapping, there are no wetlands or watercourses mapped as high ecological significance, or high ecological value, within the Project Area.	Not required
Designated Precincts in Strategic Environmental Areas	In accordance with the DAMS mapping, no Strategic Environmental areas are recorded over the Project Area. This mapping is in accordance with the <i>Regional Planning Interests Act 2014</i> which governs the framework for Strategic Environmental Areas.	Not required
Protected Wildlife Habitat	<p>Habitat for eight listed threatened species (five fauna and one flora) and one Near Threatened fauna species were considered known or likely to occur within the Project Area:</p> <ul style="list-style-type: none"> ■ Central Greater Glider listed as Vulnerable (528 ha habitat); ■ Dulacca Woodland Snail listed as Vulnerable (666.3 ha habitat); ■ South-eastern Glossy Black-cockatoo listed as Vulnerable (1,003 ha habitat); 	Required

Prescribed Matter	Relevance to the Proposed Action	Assessment
	<ul style="list-style-type: none"> ■ Koala listed as Endangered (698.5 ha preferred breeding and foraging habitat and 9,072.6 ha general dispersal habitat); ■ Pale Imperial Hairstreak listed as Vulnerable (180.2 ha habitat); ■ Ooline listed as Vulnerable (118.7 habitat); ■ Short-beaked Echidna listed as Special Least Concern (9,772 ha habitat); ■ White-throated Needletail listed as Vulnerable (no habitat mapped as aerial flyover visitor only to the Project Area). 	
Protected Areas	There are no Protected Areas within the Project Area.	Not required
Declared Fish Habitat Areas and Highly Protected Zones of State Marine Parks	In accordance with DAMS mapping, there are no declared fish habitat areas within the Project Area.	Not required
Waterways Providing for Fish Passage	In accordance with DAMs mapping, there are a number of waterways defined by the Fisheries Act, that are noted as high and major risk waterways of potential impacts from the development in the Project Area. Any works will be in accordance with the Fisheries Act and relevant waterway barrier codes as per QLD legislation.	Not required
Marine Plants	There are no marine plant communities within the Project Area.	Not required
Legally Secured Offset Areas	There are no legally secured offset areas within the Project Area.	Not required



Legend

- Project Area ('Field Development Area' in the Preliminary Documentation)
- Road
- Track/Path
- MSES Regulated vegetation category B endangered or of concern
- MSES Regulated vegetation category C endangered or of concern
- MSES Regulated vegetation category R GBR riverine
- MSES Regulated vegetation intersecting a watercourse

Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

MSES Mapping in the Project Area		F4-16
Drawing No: 0639876_EAR_G016_R3.mxd		Ecological Assessment Report
Date: 20/10/2023	Drawing Size: A4	Client: Senex Assets Pty Ltd
Drawn By: VN	Reviewed By: MD	
Coordinate System: GDA2020 MGA Zone 55		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
<div style="display: flex; align-items: center;"><div style="flex: 1;"><div style="width: 100px; height: 10px; background: linear-gradient(to right, black 49%, white 49%, white 51%, black 51%);"></div><div style="display: flex; justify-content: space-between; width: 100px;">01,0002,000m</div></div><div style="text-align: center; margin-left: 10px;">N ↑</div></div>		

5.1.1 Regional Ecosystems

The VM Act distinguishes between vegetation that is Endangered, Of Concern, or Least Concern REs. REs are Queensland vegetation communities found within a particular bioregion that have a consistent combination of geology, landform, and soil type and vegetation characteristics, as determined by the Queensland Herbarium.

There are 16 REs mapped within the Project Area that account for a total of 678.3 ha of native vegetation. Seven of these REs are classed under the VM Act as Endangered or Of Concern. The dominant vegetation communities identified in desktop searches and verified by field surveys were RE 11.3.25. *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines and RE 11.9.5. *Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks.

REs ground-truthed within the Project Area are listed in Table 4-13 and mapped polygons which are based on desktop mapping supported by ground-truthing of representative locations are presented in Figure 4-17.

Table 4-13: Ground-truthed Regional Ecosystems within the Project Area.

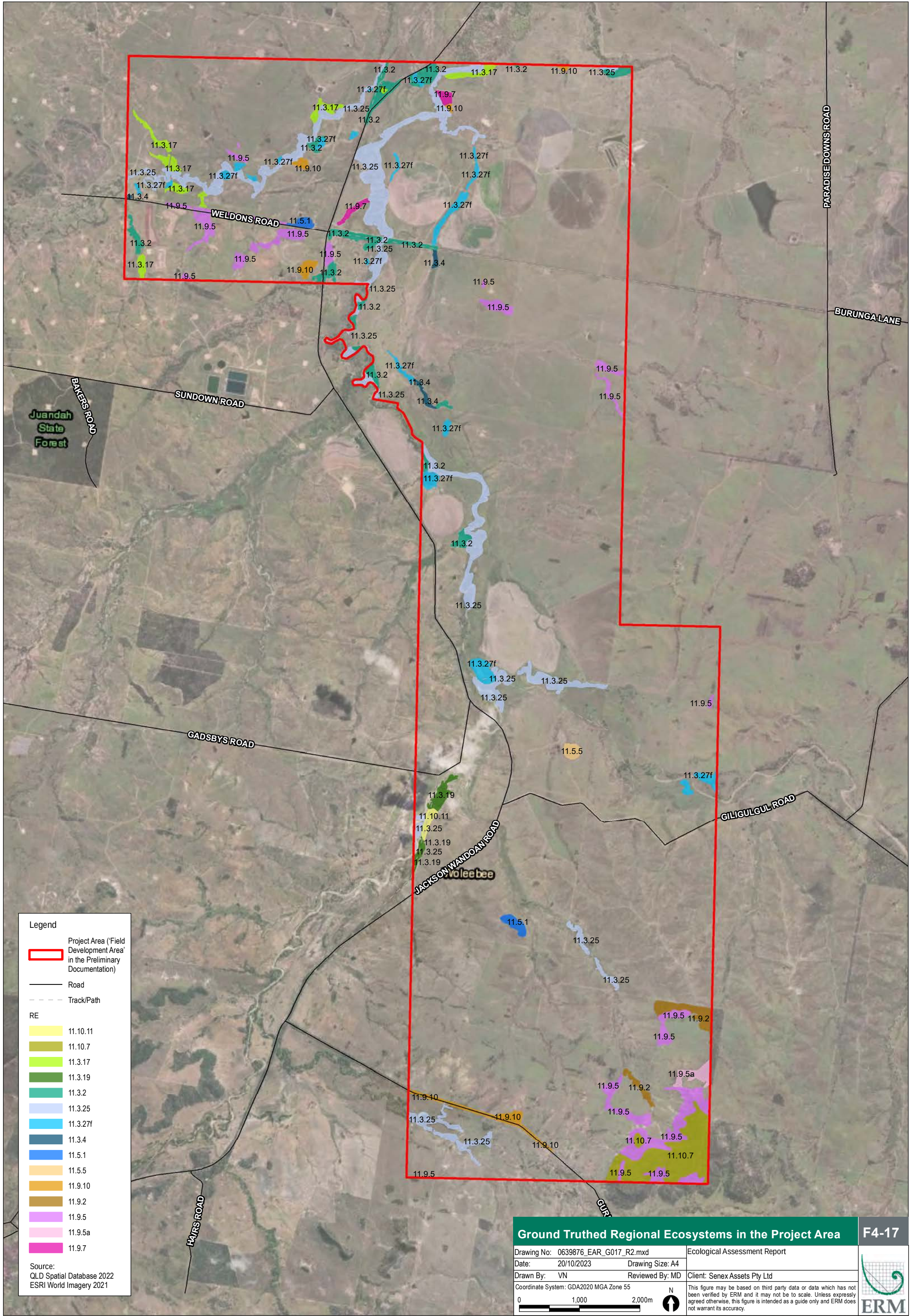
RE Code	Description	Structure Category	VM Act Class	Biodiversity Status	Area within Project Area (ha)	% of Project Area
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	Mid-dense	E	E	8.2	0.08
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	Sparse	OC	OC	77.8	0.79
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains	Sparse	OC	OC	5.4	0.06
11.3.17	<i>Eucalyptus populnea</i> woodland with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> on alluvial plains	Sparse	OC	E	41.1	0.42
11.3.19	<i>Callitris glaucophylla</i> , <i>Corymbia</i> spp. and/or <i>Eucalyptus melanophloia</i> woodland on Cainozoic alluvial plains	Sparse	LC	NC	14.2	0.14
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	Sparse	LC	OC	322.5	3.29
11.3.27f	Freshwater wetlands: <i>Eucalyptus coolabah</i> and/or <i>E. tereticornis</i> open woodland to woodland fringing swamps	Other	LC	OC	58.2	0.59
11.3.39	<i>Eucalyptus melanophloia</i> +/- <i>E. chloroclada</i> open woodland on undulating plains and valleys with sandy soils	Sparse	LC	NC	4.6	0.05

RE Code	Description	Structure Category	VM Act Class	Biodiversity Status	Area within Project Area (ha)	% of Project Area
11.5.1	<i>Eucalyptus crebra</i> and/or <i>E. populnea</i> , <i>Callitris glaucophylla</i> , <i>Angophora leiocarpa</i> , <i>Allocasuarina luehmannii</i> woodland on Cainozoic sand plains and/or remnant surfaces	Sparse	LC	NC	11.6	0.12
11.5.5	<i>Eucalyptus melanophloia</i> , <i>Callitris glaucophylla</i> woodland on Cainozoic sand plains and/or remnant surfaces. Deep red sands	Sparse	LC	NC	7.3	0.07
11.9.2	<i>Eucalyptus melanophloia</i> +/- <i>E. orgadophila</i> woodland to open woodland on fine-grained sedimentary rocks	Sparse	LC	NC	25.3	0.26
11.9.5	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks	Mid-dense	E	E	190.0	1.94
11.9.5a	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks: with <i>Cadellia pentastylis</i> and <i>Brachychiton</i> spp. as emergent or dominant in some places, a dense tall shrub layer and a more open low shrub layer of Semi-evergreen vine thicket species, occurring on undulating plains and rises.	Mid-dense	E	E	11.4	0.12
11.9.7	<i>Eucalyptus populnea</i> , <i>Eremophila mitchellii</i> shrubby woodland on fine-grained sedimentary rocks	Sparse	OC	OC	8.1	0.08
11.9.10	<i>Eucalyptus populnea</i> open forest with a secondary tree layer of <i>Acacia harpophylla</i> and sometimes <i>Casuarina cristata</i> on fine-grained sedimentary rocks	Mid-dense	OC	E	29.5	0.30
11.10.7	<i>Eucalyptus crebra</i> woodland on coarse-grained sedimentary rocks	Sparse	LC	NC	103.7	1.06

RE Code	Description	Structure Category	VM Act Class	Biodiversity Status	Area within Project Area (ha)	% of Project Area
11.10.11	<i>Eucalyptus populnea</i> , <i>E. melanophloia</i> +/- <i>Callitris glaucophylla</i> woodland on coarse-grained sedimentary rocks	Sparse	LC	NC	7.7	0.08

VM Act Status Listing: E = Endangered, OC = Of Concern and LC = Least Concern.

Biodiversity Status: E = Endangered, OC = Of Concern and NC = No Concern at Present.



Legend

Project Area ('Field Development Area' in the Preliminary Documentation)

Road

Track/Path

RE

11.10.11

11.10.7

11.3.17

11.3.19

11.3.2

11.3.25

11.3.27f

11.3.4

11.5.1

11.5.5

11.9.10

11.9.2

11.9.5

11.9.5a

11.9.7

Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

Ground Truthed Regional Ecosystems in the Project Area

F4-17

Drawing No: 0639876_EAR_G017_R2.mxd

Date: 20/10/2023

Drawn By: VN

Coordinate System: GDA2020 MGA Zone 55

Drawing Size: A4

Reviewed By: MD

Ecological Assessment Report

Client: Senex Assets Pty Ltd

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

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5.1.2 Regulated Vegetation

A vegetation clearing permit will be required for any disturbance to Category B Regulated Vegetation, while Category C will be required to be avoided. However, disturbance to Of Concern and Endangered REs will likely also require an assessment against the Significant Residual Impact Guidelines (2014) with the potential to trigger offsets if impact thresholds are exceeded. Where disturbance to Least Concern REs occurs that is also regarded as habitat for listed threatened species, the *Queensland Environmental Offsets Policy – Significant Residual Impact Guideline 2014* (SRI Guideline) will apply (also applies to MSES, regulated under the VM Act and NC Act).

The Project Area contains patches of both Category B and Category C Regulated Vegetation based on the current Queensland Regulated Vegetation Map version 6.01 (4th October 2022), as shown in Figure 4-16. There is approximately 334.8 ha of Category B and 38.4 ha of Category C Regulated Vegetation within the Project Area. There is also 595.4 ha of Category R GBR riverine regrowth and 96.3 ha of Essential Habitat mapped within the Project Area. This Regulated Vegetation Map is the regulatory dataset used by the Queensland Government to map MSES, as opposed to the ground-truthed RE mapping used for ESAs and threatened species habitat mapping presented in this EAR.

5.1.3 Environmentally Sensitive Areas

There are no Category A ESA within the Project Area. Category B ESA within the Project Area are ground-truthed Endangered RE (Biodiversity Status), which consists of patches of the following REs: 11.3.17, 11.9.5, 11.9.5a and 11.9.10.

Category C ESA within the Project Area includes ground-truthed habitat for EVNT species listed under the NC Act, and ground-truthed remnant and regrowth vegetation within government mapped areas of Regulated Vegetation that is essential habitat or 'essential regrowth habitat', and Of Concern RE (Biodiversity Status), which comprises the following RE: 11.3.2, 11.3.4, 11.3.25, 11.3.27f and 11.9.7.

ESA in the north of the Project Area include the extensive riparian corridors along Wandoan Creek and Woleebee Creek (Category C). ESA in the north also comprise small fragments of Brigalow and/or Belah woodland, including areas with co-dominant Poplar Box, either fringing riparian corridors or scattered across the surrounding undulating downs (Category B). ESA in the south of the Project Area also include scattered fragments of Brigalow/Belah dominant and codominant woodland on rolling downs and around the plateau area in the southeast (Category B) along with a riparian corridor along Hellhole Creek (Category C). ESA in the south also comprises a mapped area of essential habitat (Category C), for the Short-beaked Echidna and Glossy-black Cockatoo covering part of the wooded plateau in the southeast of the Project Area, including areas of RE 11.10.7 Narrow-leaved Ironbark open forest.

Koala dispersal habitat is defined by DCCEEW pursuant to the EPBC Act; however, dispersal habitat does not meet the criteria for 'essential habitat' under the VM Act. Essential habitat is defined as Category A (declared, offset or exchange area), Category B (remnant) or Category C (regrowth) areas of regulated vegetation on the regulated vegetation management map, that have at least three (3) essential habitat factors for the protected wildlife. This must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database; or in which the protected wildlife, at any stage of its life cycle, is located.

Ground-truthed ESAs are mapped in Appendix C attached to this EAR.

5.1.3.1 Terrestrial habitat

The vegetation conditions of eight REs, that represented the major vegetation types in the northern part of the Project Area, were assessed using the BioCondition methodology of Eyre *et al.* (2015). All BioCondition sites (one site for seven REs and two sites for RE 11.3.25) were in remnant vegetation, resulting in a total of nine Assessment Units (AUs) being assessed (AU defined by a combination of RE and growth status (remnant or regrowth)).

All AUs received moderate (0.40 – 0.60) to high (0.60 – 0.80) BioCondition scores, reflecting:

- Significant disturbance and consequent loss of ecosystem integrity relative to intact areas of each RE; and/or
- landscape level fragmentation with small patch size, low connectivity and a low proportion of remnant and regrowth vegetation in the surrounding landscape.

Terrestrial BioCondition site characteristics and scores are summarised in Section 3.2.2 in Appendix C.

5.1.3.2 Aquatic habitat

Full descriptions of physical parameters and habitat for each site assessed in March 2022 field surveys are provided in Appendix D. The availability and quality of aquatic habitat is strongly influenced by water permanency. Twenty-three of the 32 sites held water in March 2022 while all other sites were dry. The habitat bioassessment only included twenty-four sites as the approach is not applicable to drainage features (five sites) and wetlands (three sites). Instream habitat was mostly found to be in 'fair' condition across all sites sampled (18 of the 24 sites). The remaining sites were determined to be in 'good' condition.

Further information is provided in Section 4.4 of the Aquatic Ecology Report provided in Appendix D.

5.1.4 Terrestrial Flora Species

The field surveys recorded 124 flora species, including one threatened flora species listed under the NC Act, Ooline. Ooline, which is also an EPBC Act listed threatened flora species, is addressed in Section 4.4.2.1 and habitat is mapped in Figure 4-4. This species grows on undulating plains, valley slopes, hillsides and scarps, often in association with Brigalow and SEVT communities (DEWHA, 2008a). During field surveys, Ooline was recorded in isolated stands or clumps in the south-eastern part of the Project Area in Brigalow woodlands. Stands of Ooline reached up to 35 m high in Brigalow woodland on the foot slopes and mid-slopes outside the Project Area to the south. There is 118.2 ha of Ooline habitat and 3,231.7 ha of areas of potential Ooline occurrence that has been mapped within the Project Area.

5.1.4.1 Terrestrial Flora Species with the Potential to Occur

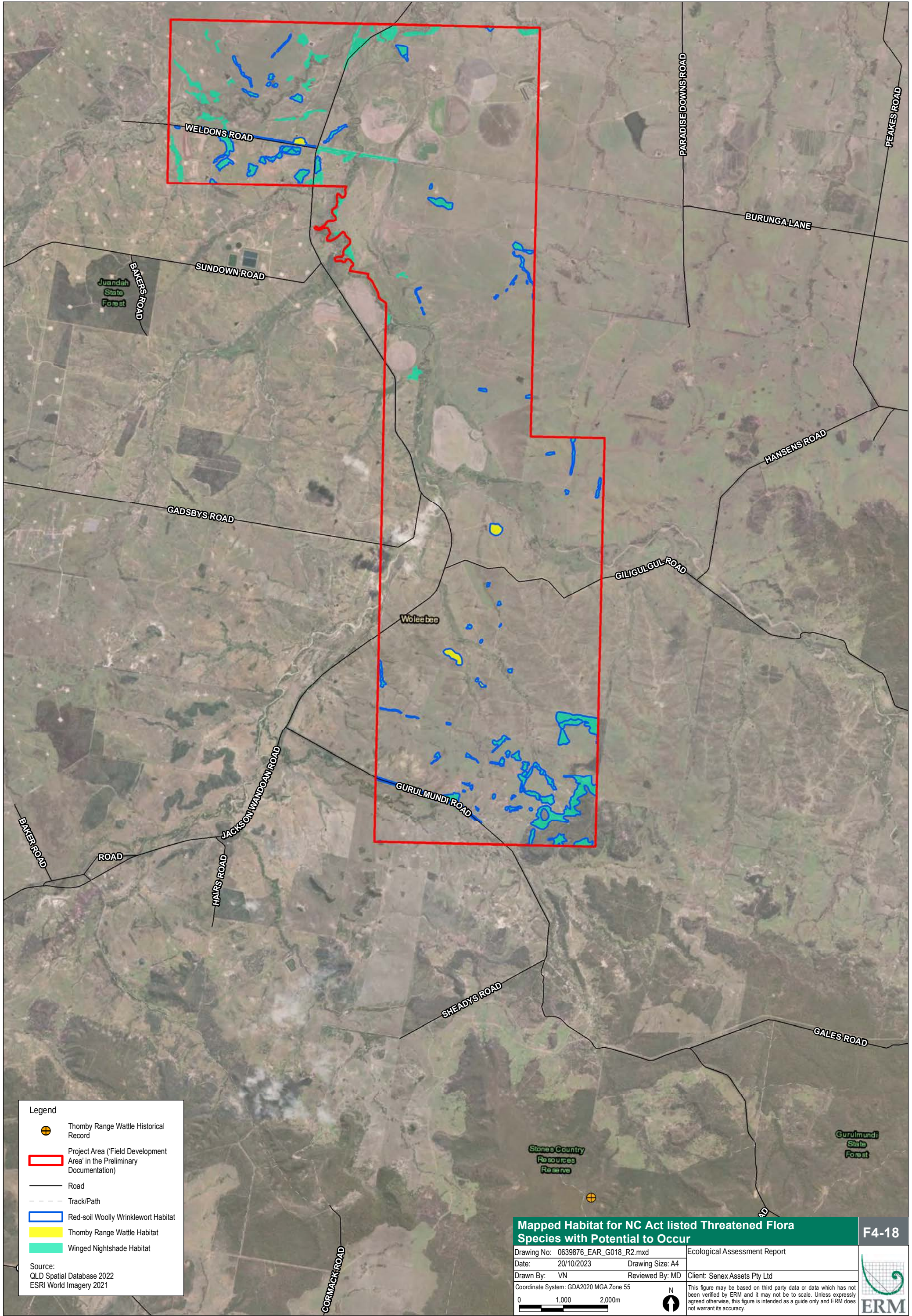
Based on the likelihood of occurrence assessment, five additional NC Act listed threatened flora species, are considered as having potential to occur within the Project Area (Appendix B). A summary of listed threatened terrestrial flora species that have the potential to occur within the Project Area, is provided in Table 4-14 and their potential habitat mapped in Figure 4-18.

Table 4-14: NC Act Listed Threatened Terrestrial Flora with Potential to Occur within the Project Area

Scientific Name	Common Name	Status	Likelihood of Occurrence	Potential Habitat within the Project Area*
		NC Act		
<i>Homopholis belsonii</i>	Belson's Panic	VU	Potential	<ul style="list-style-type: none"> ■ Potential habitat for this species includes the broad habitat types of Eucalypt dominated woodlands mainly of <i>E. crebra</i>, <i>E. populnea</i> and <i>E. melanophloia</i> and Acacia woodlands dominated by Brigalow (<i>Acacia harpophylla</i>). ■ 366 ha of potential habitat has been mapped within the Project Area.
<i>Rutidosia lanata</i>	Red-soil Woolly Wrinklewort	NT	Potential	<ul style="list-style-type: none"> ■ Potential habitat for this species is ecotonal transitions of the broad habitat types of Eucalypt dominated woodlands mainly of <i>E. crebra</i>, <i>E. populnea</i> and <i>E. melanophloia</i> and Acacia woodlands dominated by Brigalow (<i>Acacia harpophylla</i>). ■ 271.8 ha of potential habitat has been mapped within the Project Area.
<i>Vincetoxicum forsteri</i>	Slender Tylophora	EN	Potential	<ul style="list-style-type: none"> ■ Potential habitat for this species includes Eucalypt dominated woodlands mainly of <i>E. crebra</i>, and <i>E. melanophloia</i>. ■ 122.6 ha of potential habitat has been mapped within the Project Area.
<i>Acacia wardellii</i>	Thomby Range Wattle	NT	Potential	<ul style="list-style-type: none"> ■ Potential habitat is comprised of small amounts of the Eucalypt dominated woodlands mainly of <i>E. crebra</i>, <i>E. populnea</i> and <i>E. melanophloia</i>. ■ 18.8 ha of potential habitat has been mapped within the Project Area.
<i>Solanum stenopterum</i>	Winged Nightshade	VU	Potential	<ul style="list-style-type: none"> ■ Potential habitat includes the broad habitat types of Eucalypt dominated woodlands mainly of <i>E. crebra</i>, <i>E. populnea</i> and <i>E. melanophloia</i> and Acacia woodlands dominated by Brigalow (<i>Acacia harpophylla</i>). ■ 380 ha of potential habitat has been mapped within the Project Area.

Status listing per the NC Act: EN = Endangered, VU = Vulnerable, NT = Near Threatened.

*Information on potential habitat sourced from BOOBOOK, 2022 in Appendix C.



Legend

Thomby Range Wattle Historical Record

Project Area ('Field Development Area' in the Preliminary Documentation)

Road

Track/Path

Red-soil Woolly Winklewort Habitat

Thomby Range Wattle Habitat

Winged Nightshade Habitat

Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

Mapped Habitat for NC Act listed Threatened Flora Species with Potential to Occur

F4-18

Drawing No: 0639876_EAR_G018_R2.mxd

Date: 20/10/2023

Drawn By: VN

Coordinate System: GDA2020 MGA Zone 55

Drawing Size: A4

Reviewed By: MD

0 1,000 2,000m

Ecological Assessment Report

Client: Senex Assets Pty Ltd

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

5.1.4.2 Invasive Flora Species

Five species of weeds (invasive plants) proscribed as Category 3 restricted matter under the Biosecurity Act were detected during field surveys within the Project Area:

- Velvety Tree Pear (*Opuntia tomentosa*) — common throughout the Project Area occurring at low to moderate density in remnant and regrowth woodland and in non-remnant pasture;
- Common Pest Pear (*O. stricta*) — common throughout the Project Area occurring at low to moderate density in remnant and regrowth woodland and in non-remnant pasture;
- Tiger Pear (*O. aurantiaca*) — moderately common in a single patch of Brigalow woodland;
- Harrisia Cactus (*Harrisia martinii*) — low density in two locations in the north of the Project Area; and
- Mother-of-millions (*Bryophyllum delagoensis*) — detected in two locations, each of which are in Poplar Box woodland on floodplains with numerous shallow drainage channels (BOOBOOK, 2022).

Opuntia species recorded are classified as WoNS and is described in Section 4.4.5. Other weeds of management interest detected within the Project Area include:

- Willows Cactus (*Cereus uruguayanus*) — occurring in Narrow-leaved Ironbark woodland in the central part of the Project Area;
- African Lovegrass (*Eragrostis curvula*) — occurring on sandy soils in the central and southern part of the Project Area; and
- Brazilian Nightshade (*Solanum seaforthianum*) — occurring in riparian woodland, Brigalow woodland and in SEVT in the south of the Project Area (BOOBOOK, 2022).

5.1.5 Aquatic Flora Species

Across all sites, aquatic macrophyte diversity was relatively poor with the highest diversity recorded in a billabong adjacent to Wandoan Creek. Four floating attached macrophyte species and 15 emergent macrophyte species were recorded across all sites. Floating attached macrophytes were recorded at only five sites and no submerged or floating attached macrophyte species or species listed under state legislation as threatened was considered likely to occur (Freshwater Ecology, 2022). Further information is provided in Section 4.5 of Appendix D.

5.1.6 Terrestrial Fauna Species

Four reptiles, 13 mammals, 123 birds and three butterfly non-NC Act listed species were located in the Project Area during field surveys. Seven NC Act listed species are considered as known or likely to occur within the Project Area: Dulacca Woodland Snail, Koala, Greater Glider, Glossy Black-cockatoo, Golden-tailed Gecko, Pale Imperial Hairstreak, Short-beaked Echidna and White-throated Needletail (Appendix B). A summary of listed threatened species that are known or considered likely to occur and their associated preferred and general habitat within the Project Area per the SRI Guidelines, is provided in Table 4-15.

Habitat mapping is provided for the Koala in Figure 4-8, for the Greater Glider in Figure 4-9, for the South-eastern Glossy Black-cockatoo in Figure 4-10, for the Golden-tailed Gecko in Figure 4-19, and the Pale Imperial Hairstreak in Figure 4-20. No habitat mapping was prepared for the White-throated Needletail as it is considered to only be a likely transient fly-over visitor to the Project Area. Additionally, no mapping was prepared for the Short-beaked Echidna as its habitat is likely to be present for the whole Project Area.

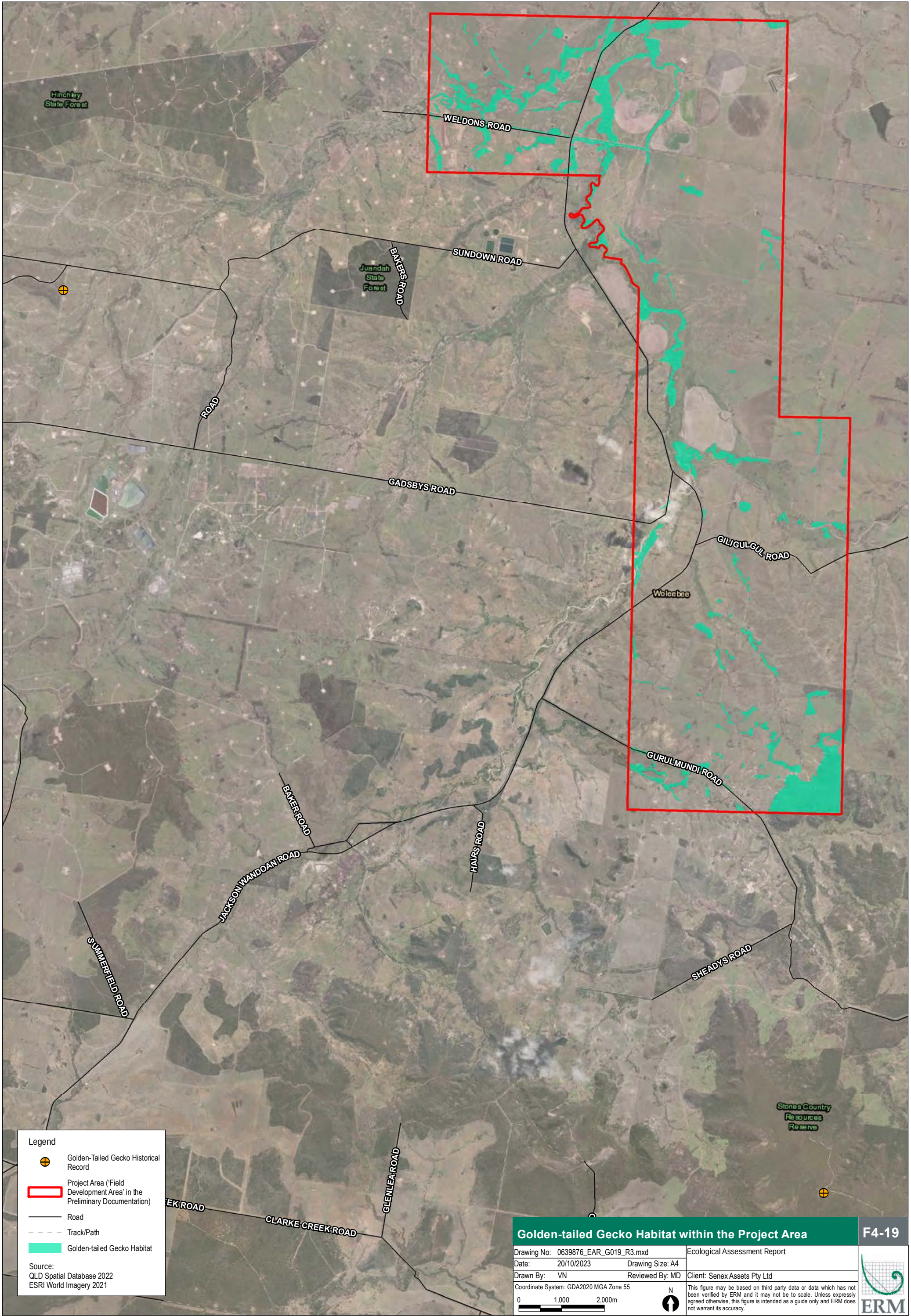
Table 4-15: NC Act Listed Threatened Fauna Species Known or Likely to Occur within the Project Area

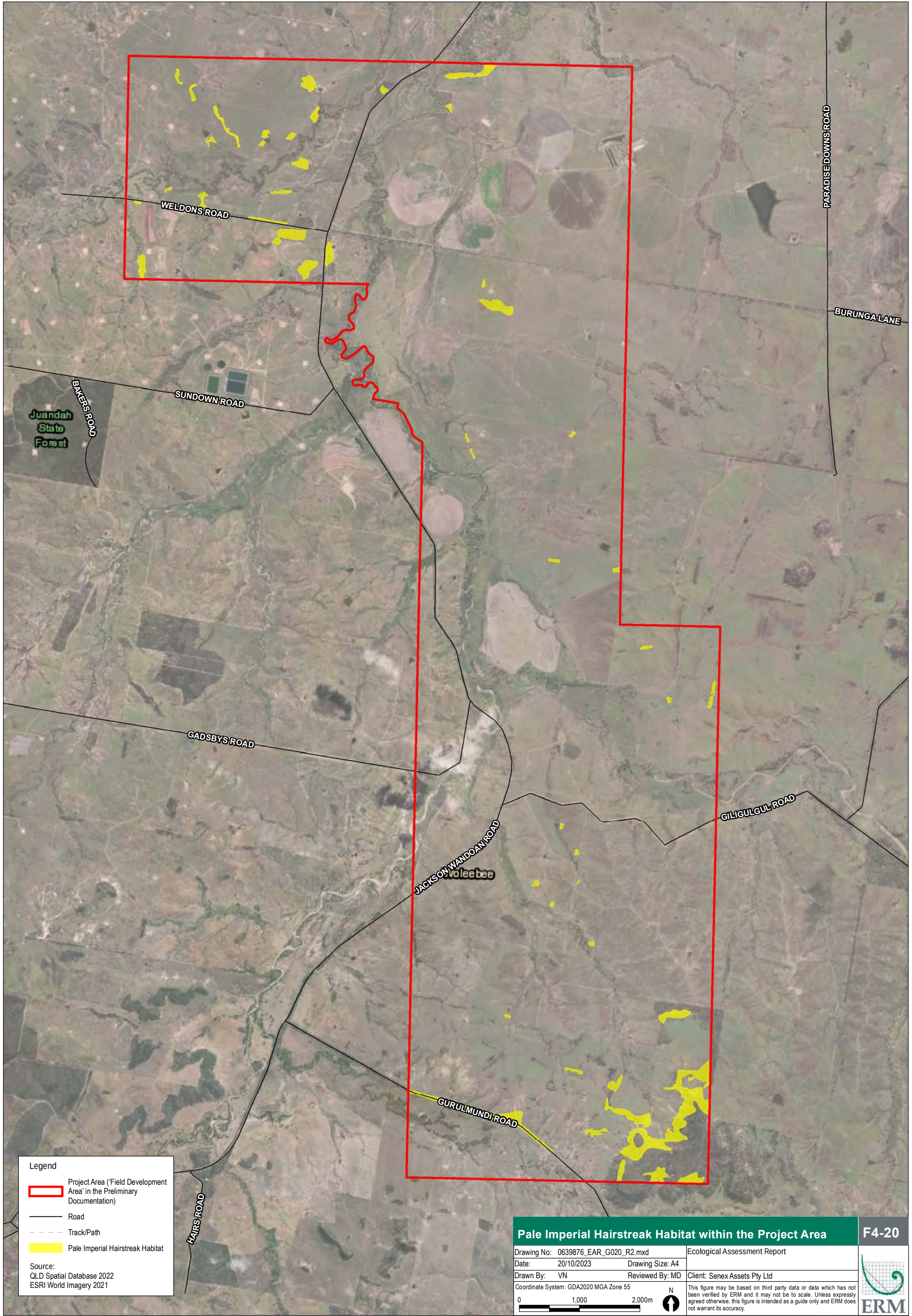
Scientific Name	Common Name	Status	Likelihood of Occurrence	Habitat Definition, Records and Regional Importance of the Species
		NC Act		
<i>Adclarkia dulacca</i>	Dulacca Woodland Snail	EN	Likely	<ul style="list-style-type: none"> ■ The Dulacca Woodland Snail has been recorded within the adjoining areas to the Project Area (a 10 km buffer) in Brigalow woodland areas (ALA, 2022). Suitable habitat of woodland consisting of <i>Brigalow woodlands dominated by Acacia harpophylla</i> is present within the Project Area. It has therefore been concluded as likely to occur within the Project Area. ■ Figure 4-11 identifies the habitat for the Dulacca Woodland Snail in the Project Area. The total amount of habitat for this species within the Project Area is 666.3 ha.
<i>Calyptorhynchus lathami lathami</i>	South-eastern Glossy Black-cockatoo	VU	Likely	<ul style="list-style-type: none"> ■ The South-eastern Glossy Black-cockatoo has previously been recorded within the Project Area (BOOBOOK 2021a, DES 2022a), and two recent sightings (2009) have been reported within the adjoining areas of the Project Area). This is a specialised feeder dependent on seeds of <i>Casuarinaceae</i> (She-oak) trees. Breeding pairs nest in large hollows generally high up in large eucalypt trees or stags near water and food sources (Pavey et al. 2016). The species is capable of moving among isolated trees and small habitat patches within fragmented landscapes (Pavey et al. 2016, Holmes 2012). <i>Casuarinaceae</i> food trees are abundant within the Project Area including Belah (<i>Casuarina cristata</i>), which occurs throughout the Project Area and Bull Oak (<i>Allocasuarina luehmannii</i>), which occurs in scattered woodland patches on sandy soils, however no evidence of feeding (chewed cones) was observed during field surveys. Potential nest trees also occur in remnant Eucalypt woodland and forest and in well-developed riparian corridors across the Project Area (BOOBOOK, 2022). ■ Figure 4-10 identifies the habitat for the South-eastern Glossy Black-cockatoo in the Project Area. The total amount of preferred habitat for this species within the Project Area is 1,003 ha.

Scientific Name	Common Name	Status	Likelihood of Occurrence	Habitat Definition, Records and Regional Importance of the Species
		NC Act		
<i>Strophurus taenicauda</i>	Golden-tailed Gecko	NT	Likely	<ul style="list-style-type: none"> The Golden-tailed Gecko has been recorded within the adjoining areas to the Project Area (a 10 km buffer) in woodland and regrowth areas. (ALA, 2022). Suitable habitat of woodland consisting of Acacia spp. are present within the Project Area. Figure 4-19 identifies the potential habitat for the Golden-tailed Gecko in the Project Area. The total amount of preferred habitat for this species within the Project Area is 906.7 ha.
<i>Petauroides armillatus</i> (<i>Petauroides volans</i>)	Greater Glider	EN	Known	<ul style="list-style-type: none"> The species was detected in Queensland Blue Gum woodland in the north of the Project Area, in the remnant riparian corridors along Wandoan Creek and Woleebee Creek. The species is likely to occur wherever large trees with hollows occur in woodland connected with these corridors and also in the extensively wooded in the south of the Project Area. Figure 4-9 identifies the habitat Greater Glider in the Project Area. The total amount habitat for this species within the Project Area is 528 ha.
<i>Phascolarctos cinereus</i>	Koala	EN	Likely	<ul style="list-style-type: none"> The field investigations conducted throughout 2022 did not directly record an individual Koala, however evidence of potential Koala scratches have been recorded in the Project Area on riparian Queensland Blue Gum (<i>Eucalyptus tereticornis</i>) trees in several locations along Wandoan Creek, Woleebee Creek and a tributary of Hellhole Creek. The Koala is generally found in a range of temperate to tropical forests as well as woodlands and semi-arid communities dominated by <i>Eucalyptus spp.</i> (Martin & Handasyde, 1999). Koalas are also known to inhabit regrowth habitat. Figure 4-8 identifies the preferred and general habitat for the Koala in the Project Area. The total amount of foraging and breeding habitat for this species within the Project Area is 698.5 ha, and general habitat for the species is 9,072.6 ha. It is noted that Koala habitat that is mapped as foraging and breeding is preferred habitat, and the dispersal habitat is regarded as general habitat, per the SRI Guidelines.

Scientific Name	Common Name	Status	Likelihood of Occurrence	Habitat Definition, Records and Regional Importance of the Species
		NC Act		
<i>Jalmenus eubulus</i>	Pale Imperial Hairstreak (Butterfly)	VU	Likely	<ul style="list-style-type: none"> ■ The Pale Imperial Hairstreak has been recently recorded in the nearby Gurulmundi State Forest. ■ Occurs in Poplar box and Casuarina woodland, as well as grassland in clay and loam soils. Distributed across the Darling Downs region. The species has been recorded from the Condamine floodplain around Dalby, Chinchilla and Condamine and also from two localities along Tchanning Creek (ALA 2022). ■ Figure 4-20 identifies the potential habitat for the Pale Imperial Hairstreak in the Project Area. The total amount of preferred habitat for this species within the Project Area is 180.2 ha.
<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	SLC	Likely	<ul style="list-style-type: none"> ■ Recent records are present for this species in the adjoining areas. This species can be found across a wide range of habitats, including open woodland, semi-arid and arid areas as well as in agricultural areas (Aplin et al., 2016). Their foraging requirements include ant nests and termite mounds (Nicol et al., 2011). ■ The total amount of habitat for this species within the Project Area is 9,814 ha. This habitat has not been mapped as the species will inhabit the entire of the Project Area.
<i>Hirundapus caudacutus</i>	White-throated Needletail	VU	Known	<ul style="list-style-type: none"> ■ A flock of eight birds were observed flying low near Weldons Road on 24 November 2022, during field surveys after those conducted for the current project. ■ Species likely only to fly aerially over the Project Area (through September to April on its migration), which contains no rainforest vegetation. The Project Area does not contain habitat in the form of elevated Eucalypt forests or wooded ridges to act as foraging and roosting habitat for the species. ■ Habitat mapping has therefore not been undertaken for this species as it is only likely to fly aerially over the Project Area.

Status listing per the NC Act: EN= Endangered, VU = Vulnerable and NT = Near Threatened.





Legend

Project Area ('Field Development Area' in the Preliminary Documentation)

Road

Track/Path

Pale Imperial Hairstreak Habitat

Source:

QLD Spatial Database 2022

ESRI World Imagery 2021

Pale Imperial Hairstreak Habitat within the Project Area

F4-20

Drawing No: 0639876_EAR_G020_R2.mxd

Date: 20/10/2023

Drawn By: VN

Coordinate System: GDA2020 MGA Zone 55

Drawing Size: A4

Reviewed By: MD

01,0002,000m

Ecological Assessment Report

Client: Senex Assets Pty Ltd

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

5.1.6.1 Terrestrial Fauna Species with Potential to Occur

Based on the likelihood of occurrence, ten NC Act fauna species are considered to have the potential to occur within the Project Area (Appendix B). In essence, because part of these species' distributions overlaps with the Project Area, their presence cannot be ruled out. This is despite no signs or observations of these species within the Project Area during field surveys using survey techniques aligned with survey guidelines. In accordance with the precautionary principle, 'potential habitat' for species with habitat present was mapped.

Table 4-16 presents these ten species with potential to occur, and their general and/or preferred habitat mapped within the Project Area, in accordance with the requirements within the MSES SRI Guideline. Mapping for all species but the Common Death Adder has been presented in the MNES Section, where the Common Death Adder is mapped as part of Figure 4-21.

Table 4-16: NC Act Listed Threatened Fauna Species with Potential to Occur within the Project Area

Species Name	Common Name	NC Act Status	Potential Habitat Mapped within the Project Area*
Birds			
<i>Rostratula australis</i>	Australian Painted Snipe	EN	<ul style="list-style-type: none"> 69.7 ha of potential habitat is present within the Project Area. Potential habitat includes small areas of ephemeral wetland habitat within the Project Area; however these may only periodically provide temporary refuges for this species. These areas correspond with riparian with riparian woodlands. This aligns with the broad habitat type of Riparian and wetland Eucalypt woodlands dominated by <i>E. tereticornis</i>.
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (south-eastern)	VU	<ul style="list-style-type: none"> 272.1 ha of potential habitat is present within the Project Area. Potential habitat includes dry open eucalypt forests and woodlands with an open, grassy understorey and fallen timber. These areas should be subjected to a form of ongoing disturbance (i.e., historically Indigenous burning practices) to be favourable for the species.
<i>Stagonopleura guttata</i>	Diamond Firetail	VU	<ul style="list-style-type: none"> 1,287.4 ha of potential habitat is present within the Project Area. Potential habitat includes grassy understoreys of open woodlands dominated by <i>Eucalypt</i> spp., <i>Acacia</i> spp., and/or <i>Casuarina</i> spp. <i>Eucalyptus</i> and <i>Acacia</i> woodlands and forests, occurs throughout the Project Area.
<i>Aphelocephala leucopsis</i>	Southern Whiteface	VU	<ul style="list-style-type: none"> 938.5 ha of potential habitat is present within the Project Area. Potential habitat includes a wide range of open woodlands and shrubland environments dominated

Species Name	Common Name	NC Act Status	Potential Habitat Mapped within the Project Area*
			by <i>Acacia</i> spp. and <i>Eucalyptus</i> spp., particularly where understorey of grasses and/or shrubs are present. Almost all woodland habitats present within the Project Area are considered suitable habitat for the Southern Whiteface.
<i>Grantiella picta</i>	Painted Honeyeater	VU	<ul style="list-style-type: none"> 272.1 ha of potential habitat is present within the Project Area. Potential habitat comprises remnant and regrowth communities with abundant <i>Acacia</i> and <i>Casuarina</i> hosts of Mistletoes. Potential habitat comprises larger contiguous areas of remnant and regrowth woodland and open forest, more specifically with a multi-layered shrubby understorey which the species prefers. This is made up of broad habitat type Eucalypt dominated woodlands mainly of <i>E. crebra</i>, <i>E. populnea</i> and <i>E. melanophloia</i>.
<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern subspecies)	VU	<ul style="list-style-type: none"> 164.3 ha of breeding and foraging habitat and 316 ha of dispersal habitat (up to 2.1 ha of dispersal habitat to be cleared) is present within the Project Area. Potential habitat remains in the southern part of the Project Area (south of Giligulgul road) in grassy woodland with open areas for foraging.
Mammals			
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	VU	<ul style="list-style-type: none"> 259.6 ha of potential habitat is present within the Project Area. Potential habitat is made up of all broad habitat types excluding the cleared exotic pasture and small isolated fragments, narrow corridors and the largely cleared landscape north of Giligulgul Road.
<i>Dasyurus hallucatus</i>	Northern Quoll	LC	<ul style="list-style-type: none"> 226.7 ha of potential habitat is present within the Project Area. Potential habitat comprises contiguous areas of remnant and regrowth woodland and forest within 5 km of cliffs and rocky scarps and connected to these refuges by continuous native vegetation. This includes all broad habitat types excluding cleared exotic pasture.
<i>Petaurus australis australis</i>	Yellow-bellied Glider (south-eastern subspecies)	VU	<ul style="list-style-type: none"> 145.9 ha of potential habitat is present within the Project Area.

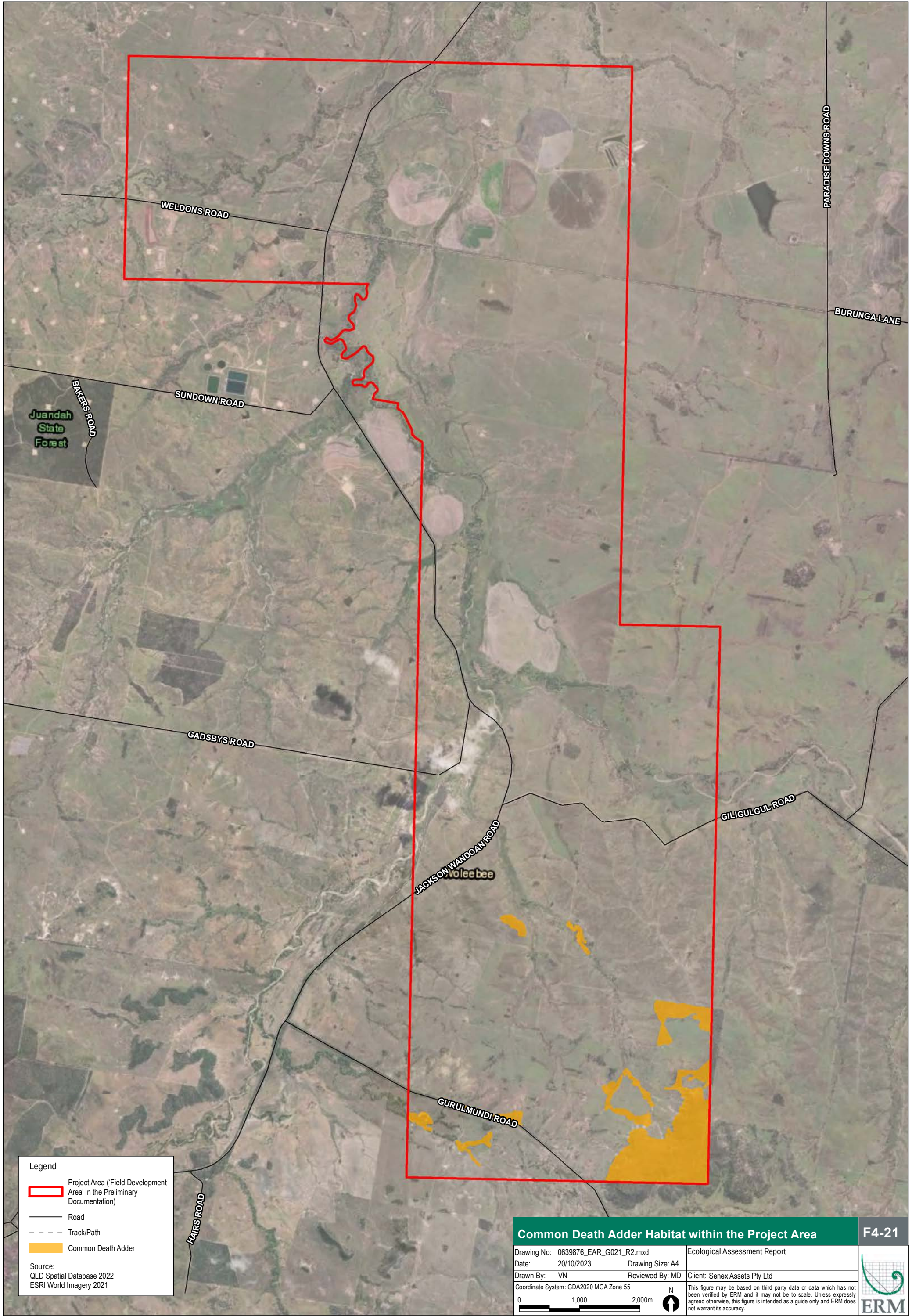
Species Name	Common Name	NC Act Status	Potential Habitat Mapped within the Project Area*
			<ul style="list-style-type: none"> Potential habitat is comprised of large contiguous areas of remnant only Eucalypt woodland and open forests, including some riparian dominated woodlands. This is because the species requires large hollow-bearing trees for dens and preferred feed tree species (selected Eucalypts).
Reptiles			
<i>Delma torquata</i>	Collared Delma	VU	<ul style="list-style-type: none"> 259.7 ha of potential habitat is present within the Project Area. Potential habitat comprises large logs, rocky outcrops and abundant woody debris occurs in the large contiguous area of forest and woodland associated with the escarpment and plateau in the south-eastern corner of the Project Area. This includes all broad habitat types except for the cleared exotic pasture as well as small, isolated fragments, narrow corridors and the largely cleared landscape north of Giligulgul Road.
<i>Acanthophs antarcticus</i>	Common Death Adder	VU	<ul style="list-style-type: none"> 259.7 ha of potential habitat is present within the Project Area. Potential habitat comprises large logs, rocky outcrops and abundant woody debris occurs in the large contiguous area of forest and woodland associated with the escarpment and plateau in the south-eastern corner of the Project Area. This includes all broad habitat types except for the cleared exotic pasture as well as small, isolated fragments, narrow corridors and the largely cleared landscape north of Giligulgul Road.
<i>Furina dunmalli</i>	Dunmall's Snake	VU	<ul style="list-style-type: none"> 259.7 ha of potential habitat is present within the Project Area. Potential habitat comprises large logs, rocky outcrops and abundant woody debris occurs in the large contiguous area of forest and woodland associated with the escarpment and plateau in the south-eastern corner of the Project Area. This includes all broad habitat types except for the cleared exotic pasture as well as small, isolated fragments, narrow corridors and the largely cleared landscape north of Giligulgul Road.
<i>Strophurus taenicauda</i>	Golden-tailed Gecko	NT	<ul style="list-style-type: none"> 906.7 ha of potential habitat is present within the Project Area.

Species Name	Common Name	NC Act Status	Potential Habitat Mapped within the Project Area*
			<ul style="list-style-type: none"> Potential habitat is where there is abundant decorticated trees, stags and woody debris (RE with abundant tall <i>Acacia</i> spp. and/or <i>Callitris</i>). This includes all broad habitat types except for the cleared exotic pasture as well as small, isolated fragments, narrow corridors and the largely cleared landscape north of Gilgul Road.
<i>Hemiaspis damelii</i>	Grey Snake	EN	<ul style="list-style-type: none"> 431.2 ha of potential habitat is present within the Project Area. Potential habitat includes Brigalow (<i>Acacia harpophylla</i>) and Belah (<i>Casuarina cristata</i>) woodlands on heavy, dark brown to black cracking clay soils, particularly in association with water bodies. Both woodlands were observed within the Project Area, along with suitable ephemeral wetlands.
<i>Egernia rugosa</i>	Yakka Skink	VU	<ul style="list-style-type: none"> 228 ha of potential general habitat is present within the Project Area. Potential habitat is comprised of larger contiguous areas of remnant and regrowth woodland and open forest. The species requires loamy soils with large logs, accumulations of woody debris and/or rocky outcrops. This includes all broad habitat types with the above microhabitat features, excluding cleared exotic pasture and riparian Eucalypt woodlands.
<i>Anomalopus mackayi</i>	Five-clawed Worm-skink	EN	<ul style="list-style-type: none"> 209.6 ha of potential habitat is present within the Project Area. Potential habitat includes woodlands generally supported by clay-loam soils, including grassy White Box woodlands, open woodlands and River Red Gum–Coolibah-Bimble Box woodlands. Limited areas of potential Five-clawed Worm-skink habitat are present within the Project Area.

Status listing per EPBC: EN = Endangered; VU = Vulnerable; Mi = Migratory; LC = Least Concern.

For the full reasoning for the potential outcomes for such species, refer to Appendix B.

*Information on potential habitat sourced from Appendix C (BOOBOOK, 2022)



Legend

- Project Area ('Field Development Area' in the Preliminary Documentation)
- Road
- Track/Path
- Common Death Adder

Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

Common Death Adder Habitat within the Project Area

F4-21

Drawing No: 0639876_EAR_G021_R2.mxd		Ecological Assessment Report	
Date: 20/10/2023	Drawing Size: A4		
Drawn By: VN	Reviewed By: MD	Client: Senex Assets Pty Ltd	
Coordinate System: GDA2020 MGA Zone 55		<div>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</div>	
<div>01,0002,000m</div>			



5.1.6.2 Invasive Fauna Species

Evidence of pest fauna detected within the Project Area included infrequent Rabbit (*Oryctolagus cuniculus*) latrines, frequent Dingo or Dog (*Canis familiaris*) tracks, and Pig (*Sus scrofa*) scats and diggings. These species are listed as Category 3, 4, 5, 6 or Category 3, 4, 6 Restricted Matters under the Biosecurity Act.

Locations for Biosecurity Act listed pest fauna recorded within the Project Area are shown in Appendix G of Appendix C (BOOBOOK, 2022).

5.1.7 Aquatic Fauna Species

A total of two 2,192 fish from eight species, one species of turtle and three species of frog were recorded. No listed threatened species were identified during the field surveys. Two EPBC Act listed threatened aquatic fauna species were identified in the desktop review to potentially occur in and adjacent to the Project Area, these being:

- White-Throated Snapping Turtle— Critically Endangered; and
- Fitzroy River Turtle – Vulnerable.

After completing a likelihood of occurrence and the subsequent field surveys, both species were considered unlikely to occur within the Project Area (Appendix B).

5.1.7.1 Invasive Aquatic Fauna Species

One introduced species, Tilapia (*Oreochromis mossambicus*), was recorded as juveniles at a single site. Tilapia is a restricted noxious fish under the Biosecurity Act.

5.1.8 Watercourses And Wetlands

The Project Area is located within the upper Dawson River catchment in the Fitzroy River Basin. The largest watercourse that passes through the Project Area is Woleebee Creek which drains into Juandah Creek approximately 15 kilometres to the north of the Project Area, before entering the Dawson River approximately 55 kilometres north of the Project Area. Watercourses present within the Project Area are ephemeral, flowing after rainfall periods. (Freshwater Ecology, 2022). Several watercourses (stream orders 2— 5) intersect the Project Area. Named watercourses include:

- Woleebee Creek runs south – north through the Project Area on the western boundary of the PL 445 and PL 209;
- Conloi Creek feeds into Woleebee creek from the southeastern boundary of the Project Area;
- Hellhole creek runs from the south through the southwestern boundary of the Project Area south of Gurulmundi Road, feeding into Woleebee creek; and
- Wandoan Creek runs from the northwestern boundary, meandering to the northern boundary of the Project Area, west of Jackson – Wandoan Road.

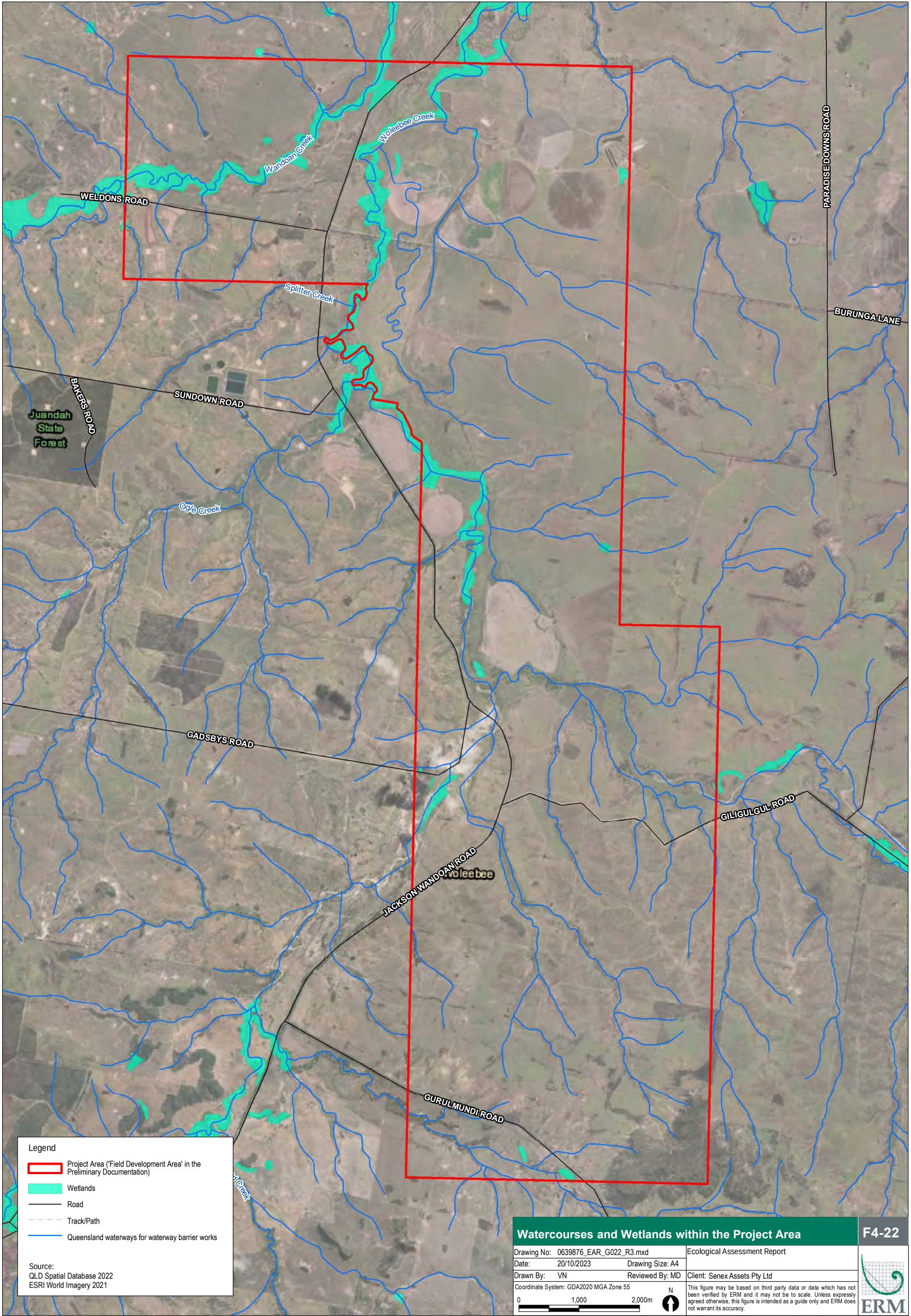
The Project Area contains watercourses mapped under the VM Act. The VM Act protects riparian vegetation associated with watercourses (Riparian Protection Zone [RPZ]), with the level of protection afforded dependent on the stream order:

- RPZ includes 10 m from the defining bank of a Stream Order 1 or 2 watercourse or drainage feature;
- RPZ includes 25 m from the defining bank of a Stream Order 3 or 4 watercourse or drainage feature; or
- RPZ includes 50 m from the defining bank of a Stream Order 5 or higher, watercourse of drainage feature.

The Project Area contains stream orders 2-5 watercourses. The Project Area contains watercourses mapped under the VM Act.

There are no Wetland Protection Areas or High Ecological Value (HEV) Wetlands mapped within the Project Area. There are no HEV Waterways that occur in the Project Area.

Figure 4-22 shows the relevant drainage features and wetlands mapped within the Project Area.



6. POTENTIAL IMPACTS

Activities associated with the Project have the potential to cause both direct and indirect impacts to MNES and MSES, with the level of impact depending on the type and location of the activity proposed.

As previously described, the Project activities include the development of up to 151 gas wells and associated well site facilities; gas and water gathering systems for the producing wells; access tracks for operational purposes; brine and produced water storage; borrow pits; and ancillary supporting facilities.

Risks to biodiversity values associated with these activities include:

- Clearing of native vegetation and habitat for threatened and migratory species and threatened ecological communities;
- Introduction and/or spread of weed species;
- Disturbance or displacement to fauna species from foraging or roosting habitat, or breeding places;
- Degradation of threatened species habitats or threatened ecological communities as a result of dust, erosion or accidental release of hazardous materials;
- Habitat fragmentation;
- Inhibiting the ability of ecological communities or species to adapt and survive predicted climate change effects (for example through impeding migration pathways or inhibiting access to refuge areas); and
- Fauna injury during construction activities and movement of machinery/vehicles.

These potential impacts are further described in Table 6-1.

The vast majority of the Project Area is already disturbed (8,844.3 ha of the 9,772 ha area is non-remnant vegetation) and the total maximum disturbance limit will be approximately up to 530 ha and is located to avoid remnant vegetation (potential habitat for listed threatened species).

Table 6-1: Potential Impacts to MNES and MSES in the Project Area

Potential Impact	Stage of Development	Relevance to the Proposed Action
Clearing of native vegetation and habitat for threatened and migratory species and threatened ecological communities, leading to disturbance or displacement of fauna species from foraging or roosting habitat, or breeding place.	Construction	<p>Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, except for Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). The areas of potential habitat for MNES that are known to, likely or potentially occur within the Project Area are:</p> <ul style="list-style-type: none"> ■ Australian Painted Snipe – 69.7 ha; ■ Belson's Panic – 366.3 ha; ■ Brown Treecreeper (south-eastern) – 272.1 ha; ■ Collared Delma – 259.7 ha; ■ Common Sandpiper – 29.5 ha; ■ Corben's Long-eared Bat – 259.6 ha; ■ Diamond Firetail – 1,287.4 ha; ■ Dulacca Woodland Snail – 666.3 ha;

Potential Impact	Stage of Development	Relevance to the Proposed Action
		<ul style="list-style-type: none"> ■ Dunmall's Snake – 259.7 ha; ■ Five-clawed Worm-skink – 209.6 ha; ■ Fork-tailed Swift – aerial only (no impacts); ■ Grey Snake – 431.2 ha; ■ Greater Glider (southern and central) – 528 ha; ■ Koala – 698.5 ha foraging and breeding habitat and 9,072.6 ha of dispersal habitat (up to 530 ha of dispersal habitat to be cleared); ■ Latham's Snipe – 29.5 ha; ■ Northern Quoll – 226.7 ha; ■ Ooline – 118.7 ha habitat (no impact to 118.7 ha of habitat and surveys will be done in all areas of proposed disturbance to enable avoidance to all stands and isolated trees (if present)); ■ Oriental Cuckoo – 896.7 ha; ■ Painted Honeyeater – 272.1 ha; ■ Rufous Fantail – 604.2 ha; ■ Satin Flycatcher – 687.5 ha; ■ Sharp-tailed Sandpiper – 29.5 ha; ■ Slender Tylophora – 122.7 ha; ■ South-eastern Glossy Black-cockatoo – 1,003 ha; ■ Southern Squatter Pigeon – 164.3 ha of breeding and foraging habitat, and 316 ha of dispersal habitat (up to 2.1 ha of dispersal habitat to be cleared); ■ Southern Whiteface – 938.5 ha; ■ White-throated Needletail – aerial only (no impacts); ■ Yakka Skink – 228 ha; and ■ Yellow-bellied Glider (south-eastern) – 145.8 ha. <p>The areas of potential habitat for additional species which are MSES that are known to, likely or potentially occur within the Project Area are:</p> <ul style="list-style-type: none"> ■ Common Death Adder – 259.7 ha; ■ Golden-tailed Gecko – 906.7 ha; ■ Pale Imperial Hairstreak – 180.2 ha; ■ Short-beaked Echidna – 9,772 ha of habitat (up to 530 ha of habitat to be cleared); ■ Thomby Range Wattle – 18.8 ha; and ■ Winged Nightshade – 380.8 ha. <p>The maximum area to be disturbed represents a small portion of the overall Project Area (4.3%). A maximum of 5.8% of the previously cleared Koala dispersal habitat and 0.7% of the Southern Squatter Pigeon dispersal habitat will be disturbed. Areas of potential habitat for Ooline will be</p>

Potential Impact	Stage of Development	Relevance to the Proposed Action
		<p>surveyed and only disturbed after surveys for individual plants have been completed.</p> <p>The final disturbance footprint will avoid impacts to any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species (except for Koala and Southern Squatter Pigeon dispersal habitat) and further refinements will be made in accordance with the implementation of the Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [OPS-ATLS-EN-PLN-001]. This is further discussed in Section 7.</p> <p>The Project is not expected to create a significant impact on a MNES TEC or listed threatened species as the Project will be developed on previously disturbed land, and TECs and potential habitat for MNES threatened species, except for Koala and Southern Squatter Pigeon dispersal habitat, will be avoided.</p>
Degradation of threatened species habitats or threatened ecological communities as a result of dust, erosion or accidental release of hazardous materials (indirect impacts).	Construction, Operation and Decommissioning	<p>Disturbances from construction, operation, and decommissioning, such as noise and dust, have the potential to negatively impact adjacent vegetation communities and habitats.</p> <p>Noise disturbances have the potential to influence breeding, roosting or foraging behaviour of native fauna. Studies suggest that the consistency of noise is more important than volume, with irregular and unpredictable noise being more disruptive to wildlife (Jones et al. 2015), as may be emitted during construction. For the general native fauna community, individuals may relocate to adjacent areas during times of noise disturbance. It is noted that noise associated with the Project principally relates to well drilling which on average is completed in 3 days per well.</p> <p>Dust generated by vehicle and machinery movements has the potential to smother vegetation directly adjacent to the works and inhibit plant growth and palatability for native fauna. There are measures available to limit dust generation and dispersion.</p> <p>Without suitable mitigation measures, dust deposition resulting from the Project's construction activities has the potential to lead to degradation of fauna habitat. Additionally, reduced vegetation cover can lead to restricted fauna movement between foraging and breeding habitat. Unmanaged dust can lead to the smothering of native vegetation and an increase in invasive flora within the area.</p> <p>Increased erosion within the Project Area has the potential to lead to the loss of topsoil and soil fertility, in turn reducing native plant species within the area due to reduced optimal soil conditions if not suitably controlled. Erosion can further</p>

Potential Impact	Stage of Development	Relevance to the Proposed Action
		<p>lead to an increase of invasive plants on disturbed soils or result in a decrease in ecosystem biodiversity.</p> <p>Erosion has the potential to impact aquatic ecosystems with increased sediment runoff, leading to a reduction in habitat quality for aquatic species. Additionally, soil erosion contributes to longer ecosystem recovery times following soil disturbance.</p> <p>The accidental release of hazardous materials (including chemical contaminants, metals, machinery and equipment fluids etc.) could result in air and water pollution, and soil contamination. Such aspects affect wildlife behaviours directly and indirectly. Direct impacts of hazardous materials can lead to changes in species physiology, behaviour, reproduction and/or survival. The release of chemicals into aquatic environments results in habitat degradation of wetland and river systems, and poor fish health or death.</p> <p>The disturbance footprint will be designed to limit the number of watercourse crossings, and all remnant vegetation will be avoided. The existing aquatic habitat features within the Project Area are generally heavily disturbed drainage features. Given the limited extent, water features relative to the Project Area and the typically dry nature of the area, impacts are expected to be minimal. However, there are measures detailed within the Environmental Management Plan Atlas Stage 3 Gas Project [SENEX-ATLAS-EN-PLN-015] to limit erosion and potential sedimentation during rainfall events that produce overland flows.</p> <p>The Project is unlikely to degrade species habitat as Senex will implement appropriate erosion and sediment controls, implement robust environmental monitoring, and implement appropriate environmental management measures. The Project will also avoid MNES TECs and potential habitat for MNES listed threatened species (except for Koala and Southern Squatter Pigeon dispersal habitat).</p>

Potential Impact	Stage of Development	Relevance to the Proposed Action
Introduction and/or spread of weed species (indirect impacts).	Construction and Operation	<p>The Project Area is predominantly cleared land for agricultural purposes. The production wells will be located in cleared land, avoiding all potential habitat for MNES threatened species (except for Koala and Southern Squatter Pigeon dispersal habitat), and with appropriate weed management measures implemented throughout the Project lifecycle, the Project is unlikely to impact the overall structure of the vegetation communities present.</p> <p>Weeds have the potential to increase the frequency and intensity of fires, by degrading the landscape and reducing tree densities. However, the risk of this impact to occur within the Project Area is negligible with the implementation of stringent weed washdown procedures, and the Project Area being predominantly cleared land for agriculture. Therefore, there will be no impact on fire frequency.</p> <p>Uncontrolled transport and operation for construction vehicles and machinery has the potential to introduce invasive weeds to the Project Area, and as such, management measures, including weed seed hygiene will be implemented to minimise these risks. Management measures will be implemented throughout the clearing, construction and operational phases of the Project to minimise the introduction of weed species within the Project Area.</p> <p>The majority of the Project Area and surrounding areas is cleared, pastoral property and introduced flora are common. Three WoNS species were recorded within the Project Area: tiger pear, common pest pear and velvety tree pear. Three additional species are considered potential to occur due to records within the buffered Project Area: parthenium weed, fireweed and madeira vine.</p> <p>Two additional species prescribed as Category 3 restricted matters under the Biosecurity Act, Harrisia Cactus and Mother-of-millions; and three other weeds of management interest, willows cactus, African Lovegrass and Brazilian Nightshade, were detected within the Project Area during field surveys.</p> <p>With the implementation of appropriate weed management and monitoring measures, as well as the avoidance of MNES TECs and potential habitat for MNES threatened species (except for Koala and Southern Squatter Pigeon dispersal habitat) the Project is unlikely to cause the introduction and/or spread of weed species within the Project Area.</p>
Fauna injury during construction, operation and decommissioning	Construction, operation and decommissioning	<p>The operation of vehicles and machinery within the Project Area has potential to lead to direct mortality or injury of resident fauna.</p>

Potential Impact	Stage of Development	Relevance to the Proposed Action
activities and movement of machinery/vehicles.		<p>Peak traffic period will be during the construction period with operational vehicle movements likely to be minimal. It is noted that well pad construction generally involves small crews with minimal truck movements and drill crews travel to site and stay on site whilst drilling.</p> <p>While many fauna groups are highly mobile (e.g., birds) and are likely to move when machinery and vehicles approach other less mobile groups (e.g., reptile and amphibians) are more vulnerable to this impact.</p> <p>Similarly, there will be trenches excavated during construction and as required for maintenance of underground infrastructure which may provide a trapping hazard for some fauna groups (e.g., amphibians, small reptiles, small mammals).</p> <p>During Project construction, maintenance and decommissioning, there will be an increase in vehicle and machinery traffic throughout the Project Area, although this is considered a temporary impact. The Project will implement effective vehicle management measures (i.e., reduced speed limits, limited traffic during operations etc.) to minimise the risk of fauna injury or mortality from vehicles and machinery. Additionally, the Project will adopt management measures to minimise the risk of trapped fauna within trenches (e.g., daily inspections of all open excavated trenches). A qualified fauna spotter catcher will conduct a search immediately prior to clearing of woody vegetation for the presence of fauna species.</p> <p>With the appropriate management measures implemented, it is considered unlikely the Project will have a significant impact on fauna through injury and mortality.</p>

Potential Impact	Stage of Development	Relevance to the Proposed Action
Habitat fragmentation.	Construction	<p>The Project Area is located in a largely cleared landscape with limited tracts of vegetation to facilitate ecosystem connectivity.</p> <p>Dispersal opportunities within the remainder of the Project Area are largely restricted to riparian areas, primarily in association with Wandoan and Woleebee Creeks. The cleared, non-remnant areas are considered likely to impede dispersal for most (less common) reptiles, amphibians, small ground mammals and arboreal mammals, with the exception of the koala. The ability for Koalas (and birds) to disperse across the broader landscape will remain during construction, due to phased development in smaller discrete work packs.</p> <p>Well pad size (typically 0.6 ha) and distance between pads and flexibility in their locations as well as flexibility in the alignment of gathering so that gathering right-of ways will cross watercourses perpendicularly. Also, as the majority of the Project Area is made up of previously cleared land, the disturbance footprint will be able to be designed to avoid almost all vegetated corridors with high dispersal opportunity. Consequently, the proposed action is unlikely to have a substantial impact on connectivity and fragmentation.</p>
Inhibiting the ability of ecological communities or species to adapt and survive predicted climate change effects.	Construction and Operation	<p>Climate change is a listed threatening process for many ecological communities and species as the associated increase in temperature increases the potential for bushfires to occur. Additionally, temperature changes limit available habitat through removal of optimal conditions. Potential impacts include impeding migration pathways or inhibiting access to refuge areas for listed species or restricting areas for threatened ecological community succession. The Project is not predicted to exacerbate these potential impacts of climate change as Project infrastructure has been designed to avoid all forested areas, MNES TECs and potential habitat for MNES threatened species (except for Koala and Southern Squatter Pigeon dispersal habitat), including all important fauna movement corridors along Wandoan Creek and Woleebee Creek.</p>
Loss of habitat, or degradation in vegetation quality from impacts associated with changes to groundwater hydrology.	Construction and operation	<p>Groundwater Dependent Ecosystems (GDEs) have been mapped and identified within and adjoining the Project Area. These GDEs occur within the riparian zones of Wandoan Creek and Woleebee Creek and utilise alluvial sources of groundwater. There is potential for the drilling and gas extraction activities to impact on GDEs during construction and operation phases.</p> <p>Reaches of Woleebee Creek within the PL 209 area were assessed during the Senex field verification program in June/July 2018 (KCB, 2018). The assessment was</p>

Potential Impact	Stage of Development	Relevance to the Proposed Action
		<p>conducted during the dry season and no flow was observed within the area surveyed. Pools of water were encountered in the lower reaches of Woleebee Creek which were considered to be rainfall derived surface water, based on their non-clear appearance and field water quality (547 $\mu\text{S}/\text{cm}$). The field verification identified that there is unlikely to be significant baseflow provided to this creek, however it is likely that during some periods, groundwater levels in the alluvium will rise into the sandy base of the creek. The field verification also concluded that based on the difference between the alluvial groundwater and surface water major ion chemistry signatures, and groundwater chemistry signatures from the Surat Basin units, groundwater within the alluvium is not considered to be sourced by the underlying Surat Basin unit (Westbourne Formation or Springbok Formation). Nonetheless, Senex have committed to ongoing monitoring of groundwater as there remains a level of uncertainty about connectivity between the alluvium and the Springbok Formation close to the northern boundary of the Project.</p> <p>Terrestrial GDEs mapped in the vicinity of the Project Area (DES, 2018) are also considered to source groundwater from the shallow alluvium, rather than the underlying Surat Basin units. However no significant impacts to GDEs are likely to occur as a result of the Project (KCB, 2024).</p>

7. MITIGATION AND MANAGEMENT MEASURES

Senex will implement an Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001] as is implemented for all Senex development in Queensland. The protocol guides infrastructure siting that considers biodiversity values and environmental constraints when selecting preferential locations, aligning with planning principles to avoid, minimise, mitigate and then manage potential environmental impacts.

Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, except for Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). Prior to undertaking activities that result in significant disturbance to land, an ecological survey to confirm on-ground biodiversity values will be undertaken by a suitably qualified person.

Other measures to be implemented will include:

- Atlas Stage 3 Gas Project Significant Species Management Plan;
- Implementing the Senex Queensland Fauna and Stock Management Procedure [SENEX-CORP-EN-PRC-021];
- Weed and pest management measures through the implementation of the Senex Biosecurity Management Plan Queensland Operations [SENEX-QLDS-EN-PLN-001] and Senex Queensland Weed Hygiene Procedure [SENEX-QLD-EN-PRC-023];
- Environmental Management Plan Atlas Stage 3 Gas Project [SENEX-ATLS-EN-PLN-015];
- Rehabilitation Plan Atlas Stage 3 Gas Project [SENEX-ATLS-EN-PLN-018];
- ATP 2059 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-013];
- PL 445 and PL 209 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-014];
- Atlas Stage 3 Water Monitoring and Management Plan [SENEX-ATLS-EN-PLN-017];
- Delineation of 'no-go' areas clearly indicated for avoidance;
- Restricting access tracks to only low-level traffic with restricted speed;
- Erosion and sediment control measures;
- Dust management; and
- Appropriate storage and handling of fuel, oil and chemicals and appropriate spill response equipment.

These mitigation measures, relevant to each of the potential impacts, are further described in Table 7-1.

Table 7-1: Management and Mitigation Measures for the Project Area

Potential Impacts	Relevant Stage	Key Management and Mitigation Measures
Clearing of native vegetation and habitat for threatened and migratory species and threatened ecological communities, leading to disturbance or displacement to fauna species from foraging or roosting habitat, or breeding place.	Construction	<ul style="list-style-type: none"> ■ The Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001] will be implemented. ■ There will be no clearing of any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, except for Koala and Southern Squatter Pigeon dispersal habitat. ■ Vegetation will not be cleared unless authorised under a Senex Access to Work (ATW) permit. The ATW will be

Potential Impacts	Relevant Stage	Key Management and Mitigation Measures
		<p>approved prior to any vegetation clearance or disturbance occurring.</p> <ul style="list-style-type: none"> ■ All infrastructure will be located preferentially in pre-disturbed areas of land. ■ Where the gathering infrastructure crosses Woleebee Creek within PL 1037, the pipeline will be constructed using horizontal directional drilling method to avoid the requirement to clear vegetation and habitats in these areas. ■ Targeted surveys will be undertaken for threatened flora species Belson's Panic, Ooline, and Slender Tylophora, so that disturbance will be avoided, if they are found to occur, or in the case of Belson's Panic (a grass known to recolonise in cleared or highly disturbed areas (Menkins, 1998)) avoided, relocated or reinstated. ■ Habitat assessment will be undertaken for threatened fauna where infrastructure is proposed, and habitat is potentially present. ■ Maximum RoW width will not exceed 18 m for gathering (and 24 m for trunklines). ■ To prevent unnecessary land and vegetation disturbance, vehicles and equipment will be retained within the approved work zone. ■ 'No-go' areas will be GPS located and clearly marked e.g., with signage, bunting, flagging tape. ■ Reinstatement of areas which are not required for ongoing operational purposes. ■ A qualified fauna spotter catcher will conduct a search immediately prior to clearing of woody vegetation for the presence of fauna species. Where fauna is detected, the spotter catcher will assess and implement the most appropriate method to avoid or minimise impacts on that fauna as a result of clearing.
Degradation of threatened species habitats or threatened ecological communities as a result of dust, erosion or accidental release of hazardous materials (indirect impacts)	Construction and Operation	<ul style="list-style-type: none"> ■ The Senex Queensland Fauna Stock Management Procedure will be implemented. ■ Staff and contractors will be made aware through general site induction and training of the potential to generate dust emissions and mitigation and management measures that should be implemented. ■ Vehicles, plant and machinery will comply with site-specific speed limits to minimise dust generation. ■ Dust suppression may be used where deemed to be appropriate. ■ Erosion and sediment control to be managed in accordance with the Queensland Erosion and Sediment Control Plan and Contractor's erosion and sediment control procedures. ■ Appropriate erosion and sediment control measures are to be installed at watercourse crossing points to adequately

Potential Impacts	Relevant Stage	Key Management and Mitigation Measures
		<p>stabilise soils to prevent erosion and as per the Queensland Erosion and Sediment Control Procedure [SENEX-QLDS-EN-PRC-003].</p> <ul style="list-style-type: none"> ■ RoW construction period in waterways will be undertaken in accordance with the timeframes of applicable waterway barrier works permits. ■ Construction activities must not interfere or block natural drainage e.g., disturbing channel contours.
Habitat fragmentation	Construction	<ul style="list-style-type: none"> ■ Infrastructure will be located preferentially avoiding, then minimize isolating, fragmenting, edge effects or dissecting tracts of native vegetation. ■ Pipeline infrastructure will maximize co-location. ■ Maximum RoW width will not exceed 18 m for gathering (and 24 m for trunklines). ■ Gathering lines are all below ground. ■ No felled vegetation windrows to be more than 50 m. ■ RoW rehabilitated to 6m wide access track post construction and all rehabilitated at end of project (unless landholder requests it to be retained for ongoing use purposes).
Inhibiting the ability of ecological communities or species to adapt and survive predicted climate change effects (for example through impeding migration pathways or inhibiting access to refuge areas)	Construction and Operation	<ul style="list-style-type: none"> ■ All infrastructure will be located preferentially in pre-disturbed areas of land or low ecological value land. ■ The Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001] will be implemented to avoid habitat fragmentation. ■ Where the gathering infrastructure crosses Woleebee Creek within PL 1037, the pipeline will be constructed using horizontal directional drilling method to avoid impeding this extant wildlife corridor. ■ Maximum RoW width will not exceed 18 m for gathering (and 24 m for trunklines) ■ Reinstatement of areas which are not required for ongoing operational purposes.
Fauna injury during construction activities and movement of machinery/vehicles	Construction and Operation	<ul style="list-style-type: none"> ■ The Senex Queensland Fauna Stock Management Procedure will be implemented. ■ Excavations and trenches must be inspected for trapped fauna on a daily basis during construction. ■ Measures to prevent fauna entrapment and facilitate escape must be implemented within open trenches. ■ A qualified fauna spotter catcher will conduct a search immediately prior to clearing of vegetation for the presence of fauna species. Where fauna is detected, the spotter catcher will assess and implement the most appropriate method to avoid or minimise impacts on that fauna as a result of clearing.

Potential Impacts	Relevant Stage	Key Management and Mitigation Measures
Introduction and/or spread of weed species	Construction and Operation	<ul style="list-style-type: none"> ■ The Senex Queensland Weed Hygiene Procedure will be implemented. ■ Implementation of the Senex Biosecurity Management Plan Queensland Operations [SENEX-QLDS-EN-PLN-001] and Senex Queensland Weed Hygiene Procedure [SENEX-QLD-EN-PRC-023] which includes requirements for weed washdowns, certification and record keeping for all Project vehicles and machinery. ■ Project development will be planned to minimise vehicle, plant and equipment movements between properties that would otherwise require weed washdowns and certification prior to those movements. ■ Access to a landholder's property will not occur unless authorised under a Senex Authority to Work permit. Site specific weed management requirements will be defined prior to access to any property or work site. ■ Weed management and control methods will depend upon the location, weed species identified, the degree of the infestation, relevant landholder agreement or conduct and compensation agreements provisions, and local, state and national regulatory requirements. ■ Imported material able to transport weed seed will be assessed to ensure they are free of contamination, disease and invasive weeds. Landowner approval may also be required for imported soils and gravel.

8. IMPACT ASSESSMENTS

8.1 MNES Impact Assessment

The significance of impacts to MNES are determined against the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (SIG 1.1) (DoE, 2013), assuming the controls and mitigation measures in Section 6 are implemented. Eight MNES were identified as part of this Ecological Assessment to have a potential for a significant impact due to known or likely presence within the Project Area. These eight MNES, including two TEC, one listed threatened flora species and five listed threatened fauna species have been assessed against SIG 1.1 criteria. A summary of the results of the significant impact assessments are provided below in Table 8-1, with the full assessment against SIG 1.1 criteria included in Appendix F.

Impact assessments have been completed for species and species habitat concluded as known, likely and potential to occur within the Project Area.

8.1.1 Threatened Ecological Communities

Disturbance within areas mapped as being Potential Habitat for TEC within Figure 4-3 will be avoided except where detailed site ecology surveys provide finer scale habitat mapping which confirms that no TEC is present in the location proposed to be disturbed.

The detailed site ecology surveys and habitat mapping refinement will be undertaken in accordance with the Senex Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001].

8.1.2 MNES Flora Species

Disturbance within areas mapped as being habitat for Ooline in Figure 4-4 will be avoided. Additional targeted flora surveys for Ooline, Belson's Panic, and Slender Tylophora, will be conducted within and immediate surrounding (e.g., 30 m buffer) the disturbance footprint as part of the preclearance surveys. Senex has committed to avoiding all individual Ooline plants and any individual Slender Tylophora plants (should any be found to occur within proposed disturbance footprints), as well as avoiding, relocating or reinstating any individual Belson's Panic plants (a grass that is known to recolonise in cleared or highly disturbed areas (Menkins, 1998) should any be found to occur within proposed disturbance footprints). Additionally, as stated, the Project will preferentially be located within previously cleared areas.

8.1.3 MNES Fauna Species

Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, except for Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land).

Disturbance within these areas of identified habitat for MNES areas may occur and not be accounted within the maximum disturbance limits where detailed site ecology surveys (undertaken in accordance with the Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001]) provide finer scale habitat mapping which confirms that there is in fact no habitat actually present within the proposed disturbance location.

Although the placement of wells and gathering provides good flexibility to help avoid habitat areas, it is recognised that in a small number of circumstances the Project's linear infrastructure may not be able to totally avoid traversing mapped potential habitat areas due to other constraints (such as cultural heritage sites or artifacts, geological features, landholder/livestock/agricultural requirements and existing or planned landholder, utility or community infrastructure).

Senex recognises that some disturbance of threatened fauna species habitat may be required to accommodate such potential circumstances. As such, with the exclusion of locations where site

ecology surveys verify that habitat is in fact not present, Senex commits to the following maximum disturbance limits:

- Up to 530 ha of Koala dispersal habitat as shown in Figure 4-8; and
- Up to 2.1 ha of Southern Squatter Pigeon dispersal habitat as shown in Figure 4-12.

It is noted that impacts within Koala dispersal habitat will be minimised using the Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001] but will, at times, require the unavoidable disturbance of open areas and removal of individual juvenile and non-juvenile trees and seedlings which are located within a predominantly cleared landscape. It is noted that impacts to dispersal habitat will be largely temporary in terms of RoW will be constructed and then rehabilitated. Application of the Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001] means that individual juvenile and non-juvenile trees and seedlings will be avoided unless unavoidable due to other constraints, e.g., environmental features and values, cultural heritage values, geological features, landholder/livestock/agricultural requirements and existing or planned landholder, utility or community infrastructure).

Table 8-1: MNES Significant Impact Assessment Summary

MNES	Project Area (ha)	Maximum Disturbance Limit (ha)	Comments	Impact Significance
Brigalow TEC	95.8 ha	0 ha	The Brigalow TEC was confirmed to occur within the Project Area (BOOBOOK, 2022). As a result of the Project design and inclusion of avoidance measures, there will be no clearing or disturbance of any areas mapped as this TEC in Figure 4-3, and therefore no significant impact will occur.	Not significant
Poplar Box TEC	32.3 ha	0 ha	The Poplar Box TEC was confirmed to occur within the Project Area (BOOBOOK, 2022). As a result of the Project design and inclusion of avoidance measures, there will be no clearing or disturbance of any areas mapped as this TEC in Figure 4-3, and therefore no significant impact will occur.	Not significant
Australian Painted Snipe	69.7 ha	0 ha	The disturbance footprint will result in no clearing of potential Australian Painted Snipe habitat within the Project Area (as mapped within Figure 4-12).	Not significant
Belson's Panic	366.3 ha	0 ha	A total of 366.3 ha of Belson's Panic potential habitat is scattered throughout the Project Area (Figure 4-6), of which, all will be avoided by the Project. Senex has committed to preferentially avoiding any areas confirmed with Belson's Panic individuals or areas confirmed as habitat for the threatened species, as well as relocating or reinstating any individual Belson's Panic (grass) plants (should any be found to occur within proposed disturbance footprints).	Not significant
Brown Treecreeper (south-eastern)	272.1 ha	0 ha	The disturbance footprint will result in no clearing of potential Brown Treecreeper habitat within the Project Area (as mapped within Figure 4-13).	Not significant
Collared Delma	259.7 ha	0 ha	The disturbance footprint will result in no clearing of potential Collared Delma habitat within the Project Area (as mapped within Figure 4-15).	Not significant

MNES	Project Area (ha)	Maximum Disturbance Limit (ha)	Comments	Impact Significance
Corben's Long-eared Bat	259.6 ha	0 ha	The disturbance footprint will result in no clearing of potential Corben's Long-eared Bat habitat within the Project Area (as mapped within Figure 4-14).	Not significant
Diamond Firetail	1,287.4 ha	0 ha	The disturbance footprint will result in no clearing of potential Diamond Firetail habitat within the Project Area (as mapped within Figure 4-12).	Not significant
Dulacca Woodland Snail	666.3 ha	0 ha	The disturbance footprint will result in no clearing of potential Dulacca Woodland Snail habitat within the Project Area (as mapped within Figure 4-12). The Dulacca Woodland Snail is considered likely to occur within the Project Area (BOOBOOK, 2022). As a result of Atlas CSG Project design and inclusion of avoidance measures, there will be no direct impact to potential Dulacca Woodland Snail habitat (as mapped within Figure 4-11). Micro siting will occur at any disturbance location and any identified population avoided and indirect impacts minimised and therefore no significant impact will occur.	Not significant
Dunmall's Snake	259.7 ha	0 ha	The disturbance footprint will result in no clearing of potential Dunmall's Snake habitat within the Project Area (as mapped within Figure 4-15).	Not significant
Five-clawed Worm-skink	209.6 ha	0 ha	The disturbance footprint will result in no clearing of potential Five-clawed Worm-skink habitat within the Project Area (as mapped within Figure 4-15).	Not significant
Greater Glider (southern and central)	528 ha	0 ha	The Project will result in will result in no clearing of the mapped extent of Greater Glider habitat as illustrated in Figure 4-9.	Not significant
Grey Snake	431.2 ha	0 ha	The disturbance footprint will result in no clearing of potential Grey Snake habitat within the Project Area (as mapped within Figure 4-15).	Not significant

MNES	Project Area (ha)	Maximum Disturbance Limit (ha)	Comments	Impact Significance
Koala	Foraging and breeding habitat 698.5 ha Dispersal habitat 9,072.6 ha	Up to 530 ha for dispersal habitat	<p>The Koala is considered as known to occur within the Project Area, given the presence of signs of the Koala during field surveys. Due to the indirect observations of the Koala in the form of scratch marks in the Project Area, it has been conservatively concluded that habitat critical to the survival of the species does occur within the Project Area. Habitat has been classified and mapped based on recent habitat guidance for the species (Youngentob, K.N, et al, 2022). In this case the vegetated areas of the Project Area containing Koala food trees (e.g., <i>E. tereticornis</i>, <i>E. populnea</i>, <i>E. crebra</i>, <i>E. longirostrata</i>, <i>E. melanophloia</i>, <i>E. exserta</i> and <i>Corymbia citriodora subsp. variegata</i>) were mapped as Koala foraging and breeding habitat.</p> <p>The disturbance footprint will result in no clearing of potential Koala breeding and foraging habitat within the Project Area (as mapped within Figure 4-8).</p> <p>There will be a removal of up to 530 ha of dispersal habitat for the Koala (5.8% of the total dispersal habitat available in the Project Area. This impact is not likely to result in a significant impact to the species since they will predominantly be temporary and short-term disturbances that will not impede the koala in its ability to traverse and move across the landscape.</p>	Not significant
Northern Quoll	226.7 ha	0 ha	The disturbance footprint will result in no clearing of potential Northern Quoll habitat within the Project Area (as mapped within Figure 4-14).	Not significant
Ooline	118.7 ha of habitat	0 ha of habitat Stands and isolated patches of Ooline in areas of potential occurrence, if present, will be avoided.	<p>The Project Area provides 118.7 ha of habitat for Ooline which is associated with relatively narrow remnant and regrowth patches in the far south of the Project Area. During field surveys, Ooline was observed in the adjoining areas (10 km buffer) and in addition, the desktop searches showed four additional records within the Project Area and another six within the 10 km buffer adjoining areas. Ooline habitat areas are shown on Figure 4-4.</p> <p>The Project will not result in any impact to Ooline habitat. Additionally, as stated, the Project will preferentially be located within previously cleared areas and pre-clearance surveys will be completed within all proposed disturbance areas as part of the application of the Project's mitigation measures to ensure that if any individual plants are present, they can be avoided.</p>	Not significant

MNES	Project Area (ha)	Maximum Disturbance Limit (ha)	Comments	Impact Significance
Painted Honeyeater	272.1 ha	0 ha	The disturbance footprint will result in no clearing of potential Painted Honeyeater habitat within the Project Area (as mapped within Figure 4-13).	Not significant
Slender Tylophora	122.7 ha	0 ha	A total of 122.7 ha of Slender Tylophora is scattered throughout the Project Area (Figure 4-6), of which, all will be avoided by the Project. Senex has committed to avoiding any individual Slender Tylophora plants (should any be found to occur within proposed disturbance footprints).	Not significant
South-eastern Glossy Black-cockatoo	1,003 ha	0 ha	The disturbance footprint will result in no clearing of potential Glossy Black-cockatoo habitat within the Project Area (as mapped within Figure 4-12).	Not significant
Southern Squatter Pigeon	164.3 ha breeding and foraging habitat 316 ha of dispersal habitat	up to 2.1 ha of dispersal habitat	The disturbance footprint will result in no clearing of Southern Squatter Pigeon breeding and foraging habitat within the Project Area (as mapped within Figure 4-12). There will be a removal of up to 2.1 ha of dispersal habitat for the Southern Squatter Pigeon. This impact is not likely to result in a significant impact to the species since clearing will occur in previously cleared land. Additionally, clearing will be temporary and short-term disturbances that will not impede the Southern Squatter Pigeon in its ability to traverse and move across the landscape.	Not significant
Southern Whiteface	938.5 ha	0 ha	The disturbance footprint will result in no clearing of potential Southern Whiteface habitat within the Project Area (as mapped within Figure 4-13).	Not significant
White-throated Needle-tail	0 ha	0 ha	The White-throated Needle-tail has been identified as known to occur within the Project Area. The White-throated Needle-tail was not observed during field investigations for the current Project, however, was observed within the Project Area during subsequent field surveys for Senex on 24 November 2022 (Cunningham, M pers. comm.). A flock of eight birds were observed flying low near Weldons Road.	Not significant

MNES	Project Area (ha)	Maximum Disturbance Limit (ha)	Comments	Impact Significance
			This species was conservatively concluded to be an important population in the Project Area and the surrounding landscape due to the following reasons. Firstly, there is an absence of detailed population data for the Project Area it was recorded within the Project Area in 2022. However, as the White-throated Needletail is a largely aerial species, and the lack of habitat in the Project Area, a significant impact to this species is considered unlikely.	
Yakka Skink	228 ha	0 ha	The disturbance footprint will result in no clearing of potential Yakka Skink habitat within the Project Area (as mapped within Figure 4-15).	Not significant
Yellow-bellied Glider (south-eastern)	145.8 ha	0 ha	The disturbance footprint will result in no clearing of potential Yellow-bellied Glider (south-eastern) habitat within the Project Area (as mapped within Figure 4-14).	Not significant

8.1.4 Cumulative Impacts

The Atlas Stage 3 Gas Project (the Project) will be serviced by the ARC Pipeline proposed by ARC Pipeline Pty Ltd. Potential impacts of the ARC Pipeline, as detailed in the ARC Pipeline EPBC Act MNES Ecological Assessment Report (e2m, 2024), are the subject of a separate referral under the EPBC Act.

To address cumulative impacts of the Atlas Stage 3 Gas Project (the Project) and the ARC pipeline projects on MNES, consideration has been given to the combined impact of both projects on known and likely-to occur MNES identified in this report. An assessment of cumulative impacts on these MNES, based on information contained in the ARC Pipeline EPBC Act MNES Ecological Assessment Report, is provided below.

As indicated in the ARC Pipeline EPBC Act MNES Ecological Assessment Report (e2m, 2024), the ARC Pipeline has the potential to result in direct and indirect impacts to MNES known and likely to occur. As per the ARC Pipeline EPBC Act MNES Ecological Assessment Report (e2m, 2024) a suite of planning and management actions will be implemented to avoid, minimise and mitigate potential impacts from the ARC Pipeline on those matters.

Assessment against the SIG 1.1 Criteria was conducted which determined that the ARC Pipeline is unlikely to result in a significant residual impact on MNES.

As part of this Atlas Stage 3 Gas Project (the Project), Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, except for Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). With the implementation of the proposed controls and mitigation measures, the Atlas Stage 3 Gas Project (the Project) is unlikely to result in any significant indirect impacts to any MNES. Given the above and noting that the ARC Pipeline is unlikely to result in a significant impact on MNES (having regard to the scale, context and intensity of direct impacts on MNES), it is unlikely that Atlas Stage 3 Gas Project (the Project) and the ARC Pipeline will result in a significant impact on MNES prescribed under the EPBC Act.

8.2 MSES Impact Assessment

MSES within the Project Area have been considered for Significant Residual Impact (SRI) in accordance with the SRI Guideline (DEHP, 2014), with the outcomes summarised in Table 8-2. Appendix G highlights if the proposed development will potentially affect threatened wildlife habitat MSES, within the Project Area to cause an SRI. Outcomes within Table 8-2 assume that controls and mitigation measures in Section 7 are implemented.

Table 8-2: MSES Significant Residual Impact Assessment Summary

Prescribed Matter	SRI Impact Test	Will the Action Cause an SRI
Regulated Vegetation		
Category B- Endangered or Of Concern REs	<p>Table 2.1 of the SRI Guideline states that for clearing for linear infrastructure, clearing in a regional ecosystem that is Endangered or Of Concern will result in an SRI if it is:</p> <ul style="list-style-type: none"> Greater than 25m wide in a grassland (structural category) regional ecosystem; or Greater than 20m wide in a sparse (structural category) regional ecosystem; or 	No

Prescribed Matter	SRI Impact Test	Will the Action Cause an SRI
	<ul style="list-style-type: none"> Greater than 10m wide in a dense to mid-dense (structural category) regional ecosystem. <p>Regulated Vegetation that is Category B is present as 10 patches totalling 317.2 ha (<3.3%) of the Project Area, all of which will be avoided. Thus, no SRI will result.</p>	
Category C – High value regrowth	Regulated Vegetation that is Category C is present as 4 patches totalling 22.6 ha (<0.3%) of the Project Area, all of which will be avoided. No SRI will result.	No
Category R – Great Barrier Reef riverine	Regulated Vegetation that is Category R totals 595.4 ha (<6.2%) of the Project Area, all of which will be avoided. No SRI will result.	No
Essential Habitat	Regulated Vegetation that is Essential Habitat totals 96.3 ha (<1%) of the Project Area, of which all will be avoided. No SRI will result.	No
REs within a defined distance of a watercourse	<p>Table 2.1 of the SRI Guideline states that for a prescribed activity to have an SRI on an RE that is within the defined distance of a watercourse, criteria 1 and 3 must be exceeded. Criteria 1 states that for clearing for linear infrastructure, clearing in a regional ecosystem that is within the defined distance of a watercourse will result in an SRI if it is:</p> <ul style="list-style-type: none"> Greater than 25 m wide in a grassland (structural category) regional ecosystem; or Greater than 20 m wide in a sparse (structural category) regional ecosystem; or Greater than 10 m wide in a dense to mid-dense (structural category) regional ecosystem. <p>All Category B REs will be cleared. Therefore, there will be no SRI to Regulated Vegetation intersecting a watercourse within the Project Area.</p>	No
REs within a defined distance of a wetland	<p>Table 2.1 of the SRI Guideline states that for a prescribed activity to have an SRI on an RE that is within the defined distance of a wetland, criteria 1 and 2 must be exceeded. Criteria 1 states that for clearing for linear infrastructure, clearing in a regional ecosystem that is within the defined distance of a wetland will result in an SRI if it is:</p> <ul style="list-style-type: none"> greater than 25 m wide in a grassland (structural category) regional ecosystem; or greater than 20 m wide in a sparse (structural category) regional ecosystem; or greater than 10 m wide in a dense to mid-dense (structural category) regional ecosystem. <p>Criteria 2 states that an SRI results from clearing within a regional ecosystem that is within 50 m of a mapped wetland. There are no mapped wetlands within the Project Area. Criteria 1 and 2 cannot be exceeded. Therefore, no REs occur within 100 m of a wetland and so no SRI will result.</p>	No

Prescribed Matter	SRI Impact Test	Will the Action Cause an SRI
Protected Wildlife Habitat		
Protected wildlife habitat (EN, VU) – fauna	<p>Section 5.1 of the SRI Guideline states that an action is likely to have a significant impact on Endangered and Vulnerable wildlife if the impact to habitat is likely to:</p> <ul style="list-style-type: none"> ■ Lead to a long-term decrease in the size of a local population; or ■ Reduce the extent of occurrence of the species; or ■ Fragment an existing population; or ■ Result in genetically distinct populations forming as a result of habitat isolation; or ■ Result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat; or ■ Introduce disease that may cause the population to decline, or ■ Interfere with the recovery of the species; or ■ Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species <p>Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, except for Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land), as mapped in Figure 4-8 and Figure 4-12 respectively.</p> <p>No impact to Ooline habitat as mapped in Figure 4-4, and all proposed disturbance areas will be surveyed for individual Ooline plants so that, if present, they can be avoided.</p> <p>Up to 530 ha impact to Short-beaked Echidna habitat (not mapped as includes the entire Project Area) (5.4% of Short-beaked Echidna habitat).</p> <p>No impact to White-throated Needletail as likely only aerial throughout Project Area.</p> <p>Impacts to the size of the population, extent of occurrence, connectivity, contribution to threats, interference with recovery and disruption to ecologically significant locations are considered when assessed against the relevant guidelines. Given the small scale of impacts, as well as the existing disturbance within the Project Area, it is unlikely that there will be an SRI to any of these species.</p>	No SRI triggered

9. CONCLUSION

This EAR was developed to determine the ecological values within the Project Area, and then to assess the potential impacts to these values. BOOBOOK Ecological Consulting undertook terrestrial field ecological surveys via targeted vehicle based and foot traverses of the Project Area, over the periods of 14 – 18 March 2022, 22 – 25 March 2022; 30 April – 5 May 2022, and 9 – 13 June 2022. Additionally, Attexo conducted terrestrial threatened flora surveys foot traverses of the Project Area, over the periods of 31 January – 3 February 2023. Aquatic field ecological surveys were undertaken by Freshwater Ecology over an eight-day period (14 – 21 March 2022). The results from both the terrestrial and aquatic surveys have been incorporated into this EAR. The terrestrial field investigations involved using survey techniques aligned with survey guidelines including vegetation assessments, BioCondition assessment, targeted flora and fauna surveys and habitat assessment. The aquatic field surveys involved aquatic habitat assessments, water quality, macroinvertebrate samples and flora and fauna surveys. The EAR also involved a desktop assessment using several publicly available databases, mapping, and aerial imagery.

Baseline botanical surveys were undertaken to describe dominant flora and vegetation community structure within the Project Area. Ground-truthing of the RE vegetation communities within the Project Area was undertaken using the quaternary level of data collection as described by Neldner *et al.* (2022). The DoR mapping was generally consistent with ground-truthing performed during field investigations.

Management practices have been recommended to avoid and as required, manage the potential indirect impacts to terrestrial and aquatic ecology associated with the proposed activities in the Project Area. It is expected that by implementing the Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001], adherence to the conditions stipulated in the relevant Environmental Authorities, as well as the management practices identified in this EAR, the extent of Koala and Southern Squatter Pigeon dispersal habitat removed and indirect impacts to flora and fauna (including MNES and MSES species) will be minimal. Senex have committed to directly avoiding all MNES fauna habitats and TECs within the Project Area, except for Koala and Southern Squatter Pigeon dispersal habitat (all of which is previously cleared land).

Indirect disturbances to terrestrial and aquatic ecosystems relating to weeds and pests, displacement and degradation of habitat, as well as potential for mortality of fauna, will be able to be effectively managed by implementing the environmental management practices outlined.

For MNES protected under the EPBC Act, two listed TECs, six listed threatened species (5 fauna and one flora) and two listed migratory species were identified as known or likely to occur in the Project Area, due to direct field observations within the Project Area or recent historical records. The TECs were Brigalow (*Acacia harpophylla* dominant and co-dominant) and Poplar Box Grassy Woodland on Alluvial Plains. The listed threatened species were the Dulacca Woodland Snail, Koala, Glossy Black-cockatoo, Greater Glider, Koala, Ooline and White-throated Needletail. The listed migratory species were the White-throated Needletail and Fork-tailed Swift. Additionally, sixteen MNES species were considered to have the potential to occur within the Project Area, including Australian Painted Snipe, Belson's Panic, Brown Tree-creeper (south-eastern), Collared Delma, Corben's Long-eared Bat, Diamond Firetail, Dunmall's Snake, Five-clawed Worm-skink, Grey Snake, Northern Quoll, Painted Honeyeater, Slender Tylophora, Southern Squatter Pigeon, Southern Whiteface, Yakka Skink and Yellow-bellied Glider (south-eastern).

For MSES protected under the NC Act, the Project Area was found to contain Regulated Vegetation as well as NC Act listed threatened species protected wildlife habitat as follows:

- Regulated Vegetation that is Category B (Endangered and Of Concern RE);
- Regulated Vegetation that is Category C – high value regrowth;
- Regulated Vegetation that is Category R – Great Barrier Reef riverine vegetation;
- Regulated Vegetation that is Essential Habitat;
- Regulated Vegetation that is within the defined disturbance of a watercourse; and

- Protected wildlife habitat for listed flora and fauna species which included (in addition to those six listed threatened MNES fauna and flora who were also listed under the NC Act) were:
 - Pale Imperial Hairstreak (*Jalmenus eubulus*); and
 - Short-beaked Echidna (*Tachyglossus aculeatus*).

Potential impacts were identified as part of the Project to include the following:

- Clearing of native vegetation and habitat for threatened and migratory species and threatened ecological communities;
- Introduction and/or spread of weed species;
- Disturbance or displacement to fauna species from foraging or roosting habitat, or breeding places;
- Degradation of threatened species habitats or threatened ecological communities as a result of dust, erosion or accidental release of hazardous materials;
- Habitat fragmentation;
- Inhibiting the ability of ecological communities or species to adapt and survive predicted climate change effects (for example through impeding migration pathways or inhibiting access to refuge areas); and
- Fauna injury during construction activities and movement of machinery/vehicles.

Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). Prior to undertaking activities that result in significant disturbance to land, an ecological survey to confirm on-ground biodiversity values will be undertaken by a suitably qualified person, with particular focus on MNES with a known, likely or potential occurrence. Ooline may propagate in cleared areas and all proposed disturbance footprints will undergo pre-clearance surveys to ensure that any stands or isolated trees of Ooline area will be avoided. All mapped habitat for Ooline (as shown in Figure 4-4) will be avoided. There will also be up to 530 ha of disturbance within Koala dispersal habitat and 2.1 ha of disturbance within Southern Squatter Pigeon dispersal habitat.

Further mitigation measures that will, or have already been implemented as a part of the Project to mitigate any direct or indirect impacts will include:

- Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001];
- Atlas Stage 3 Gas Project Significant Species Management Plan;
- Implementing the Senex Queensland Fauna and Stock Management Procedure [SENEX-CORP-EN-PRC-021];
- Weed and pest management measures through the implementation of the Senex Biosecurity Management Plan Queensland Operations [SENEX-QLDS-EN-PLN-001] and Senex Queensland Weed Hygiene Procedure [SENEX-QLD-EN-PRC-023];
- Environmental Management Plan Atlas Stage 3 Gas Project [SENEX-ATLS-EN-PLN-015];
- Rehabilitation Plan Atlas Stage 3 Gas Project [SENEX-ATLS-EN-PLN-018];
- ATP 2059 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-013];
- PL 445 and PL 209 Coal Seam Gas Water Management Plan [SENEX-ATLS-EN-PLN-014];
- Atlas Stage 3 Water Monitoring and Management Plan [SENEX-ATLS-EN-PLN-017];
- Delineation of 'no-go' areas clearly indicated for avoidance;
- Restricting access tracks to only low-level traffic with restricted speed;

- Erosion and sediment control measures;
- Dust management; and
- Appropriate storage and handling of fuel, oil and chemicals and appropriate spill response equipment.

The significant impact assessments undertaken against the relevant guidelines (SIG 1.1 and SRI Guidelines), assessed the potential impacts as well as the implemented mitigation and management measures, to determine whether or not the Project would result in any significant residual impacts to likely or known MSES and MNES.

MNES Significant Impact Assessment Outcomes:

The follow details the significant impact assessment outcomes for MNES against the SIG 1.1. The outcomes for TECs in the Project Area are as follows:

- Brigalow (*Acacia harpophylla* dominant and co-dominant) is present as 17 patches totalling 95.8 ha (<1%) of the Project Area (as shown in Figure 4-3), all of which will be avoided by the Project; and
- Poplar Box Grassy Woodland on Alluvial Plains is present as 10 patches totalling 32.3 ha (<0.4%) of the Project Area (as shown Figure 4-3), all of which will be avoided by the Project.

The following details the significant impact assessment outcomes for listed threatened and/or migratory MNES that are known or likely to occur:

- Dulacca Woodland Snail totalling 666.3 ha of habitat within the Project Area (as shown Figure 4-11), will be avoided through careful design of the Project such that any direct disturbance to habitat for the species will not occur;
- Glossy Black-cockatoo (south-eastern subspecies) totalling 1,003 ha of habitat within the Project Area (as shown Figure 4-10), will be avoided through careful design of the Project such that any direct disturbance to habitat for the species will not occur;
- Greater Glider totalling 528 ha of habitat within the Project Area (as shown in Figure 4-9 will be avoided through careful design of the Project such that any direct disturbance to habitat for the species will not occur;
- Koala totalling 698.5 ha of foraging and breeding habitat within the Project Area (as shown on Figure 4-8), will be avoided through careful design of the Project such that any direct disturbance to foraging and breeding habitat for the species will not occur. A total of 9,072.6 ha of Koala dispersal habitat occurs within the Project Area and impact upon this habitat will be minimised through careful design of the Project such that any direct disturbance to habitat for the species will not exceed 530 ha; and
- Habitat for Ooline is made up of 118.7 ha of habitat consisting of relatively narrow remnant and regrowth patches in the far south of the Project Area (which will all be avoided by the Project) (habitat mapped on Figure 4-4). Additionally, as stated, the Project will preferentially be located within previously cleared areas and pre-clearance surveys will be completed within all proposed disturbance areas as part of the application of the Project's mitigation measures to ensure that if any individual plants are present, they can be avoided.

It is noted that the White-throated Needletail (*Hirundapus caudacutus*) is known to occur within the Project Area, however it is likely only to be an aerial flyover visitor due to the lack of suitable roosting areas in the Project Area. Therefore, no habitat will be directly or indirectly impacted for this species. Further, the White-throated Needletail along with the Fork-tailed Swift were identified as listed migratory species known and likely to occur respectively. As with the White-throated Needletail, the Fork-tailed Swift was concluded to be an aerial flyover visitor only and so both migratory species were concluded to not be at risk of being significantly impacted by the Project.

With the implementation of the proposed controls and mitigation measures, the Project is unlikely to result in any significant indirect impacts to any MNES.

MSES Significant Impact Assessment Outcomes:

Based on the assessment conducted in this EAR, there was concluded to be no Significant Residual Impact (SRI) to these MSES, based on an assessment against the SRI Guidelines, for the following reasons;

- Regulated Vegetation that is Category B – Regulated Vegetation that is Category B is present as 10 patches totalling 334.8 ha (<3.5%) of the Project Area, all of which will be avoided. The proposed development avoids clearing in remnant vegetation and so in accordance with criteria in the SRI Guideline, no SRI will result;
- Regulated Vegetation that is Category C – Regulated Vegetation that is Category C is present as 4 patches (potentially of RE 11.9.5) totalling 38.4 ha (<0.4%) of the Project Area, all of which will be avoided. No SRI will result;
- Regulated Vegetation that is Category R – Regulated Vegetation that is Category R totals 595.4 ha (<6.2%) of the Project Area, all of which will be avoided. No SRI will result;
- Regulated Vegetation that is Essential Habitat – Regulated Vegetation that is Essential Habitat totals 96.3 ha (<1%) of the Project Area, all of which will be avoided. No SRI will result;
- Regulated Vegetation that is within the defined disturbance of a watercourse— all Category B REs (11.3.25, 11.3.19 and 11.3.2) within the defined distance of a watercourse are avoided. Thus, no SRI will result;
- Protected wildlife habitat for listed fauna – for species known or likely to occur, there will be no SRI because there will be no clearing of habitat (with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land), and habitat for the NC Act special least concern Short-beaked Echidna). Direct habitat disturbance for known and likely threatened and NC Act special least concern fauna species from the Project will be limited to:
 - Dulacca Woodland Snail (666.3 ha habitat – 0 ha of total habitat will be disturbed);
 - Greater Glider (southern and central) (528 ha habitat – 0 ha of total habitat will be disturbed);
 - Koala (698.5 ha preferred breeding and foraging habitat and 9,072.6 ha general dispersal habitat – up to 530 ha or 5.8% of total general dispersal habitat will be disturbed);
 - Pale Imperial Hairstreak (180.2 ha habitat – 0 ha of total habitat will be disturbed);
 - Short-beaked Echidna (9,772 ha habitat – up to 530 ha or 5.4% of total habitat will be disturbed);
 - South-eastern Glossy Black-cockatoo (1,003 ha habitat – 0 ha of total habitat will be disturbed);
 - White-throated Needletail (no habitat mapped as aerial flyover visitor only to the Project Area).

Protected wildlife habitat for listed flora – for the only threatened flora species known or likely to occur in the Project Area, Ooline, there will be no SRI because there will be no direct disturbance within the 118.7 ha of mapped habitat (as shown in Figure 4-4). Additionally, surveys will be undertaken in all other proposed disturbance areas in accordance with the Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001], so that all individual Ooline plants present (if any), are avoided.

With the implementation of the proposed controls and mitigation measures, the Project is unlikely to result in any significant indirect impacts to any MSES.

Environmentally Sensitive Areas

There are no Category A ESA within the Project Area. Category B ESA within the Project Area are ground-truthed endangered RE (Biodiversity Status), which consists of patches of the following RE: 11.3.17, 11.9.5, 11.9.5a and 11.9.10. Category C ESA within the Project Area include ground-truthed habitat for EVNT species listed under the NC Act (Stevens, 2023) and ground-truthed remnant and regrowth vegetation within government mapped areas of 'essential habitat' or 'essential regrowth habitat', and Of Concern RE (Biodiversity Status), which comprises the following REs: 11.3.2, 11.3.4, 11.3.25, 11.3.27f and 11.9.7. It is noted that the Project has committed to avoiding clearing within all ESAs.

Biosecurity Issues

Eight introduced flora and three fauna species signs were recorded during field surveys. The three fauna species are listed as Restricted Invasive animals under the *Biosecurity Act 2014* including Dingo/Wild Dog (*Canis familiaris*), Rabbit (*Oryctolagus cuniculus*) and Pig (*Sus scrofa*). Five flora, Common Pest Pear (*Opuntia stricta*), Tiger Pear (*Opuntia aurantiaca*), Harrisia Cactus (*Harrisia martini*), Mother-Of-Millions (*Kalanchoe delagoensis*) and Velvety Tree Pear (*Opuntia tomentosa*) are listed as Restricted Matter under the *Biosecurity Act 2014*.

Opuntia species recorded are also classified as Weeds of National Significance. As mentioned above, appropriate biosecurity measures will be implemented to ensure that any biosecurity risks are minimised and will not impact MSES and MNES.

Concluding Remark

As most of the Project Area is cleared, the Project will be able to avoid direct impacts to habitat for MNES and MSES species and naturally vegetated habitat areas with the exception of previously cleared areas that still potentially function as Koala and Southern Squatter Pigeon dispersal habitat / habitat for the NC Act special least concern Short-beaked Echidna. The Project's mitigation measures, including Senex's Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development [SENEX-ATLAS-EN-PLN-001] will be used to guide infrastructure siting, minimise direct and indirect disturbances and ensure the Project's total direct disturbance footprint avoids MNES and MSES habitats that are not already cleared.

As detailed in the MNES and MSES impact assessments provided in Appendix F and Appendix G respectively, the Project has been assessed against the relevant Commonwealth and State guidelines and it has been determined that, with the implementation of the proposed controls and mitigation measures, the Project is unlikely to result in any significant direct or indirect impacts to any MNES or MSES.

A separate assessment of cumulative impacts for the Project and the ARC Pipeline (the subject of a separate referral under the EPBC Act) determined that these projects would not result in a significant cumulative impact on MNES.

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