



TERRESTRIAL ECOLOGY ASSESSMENT

VECCO CRITICAL MINERALS PROJECT

PREPARED FOR
VECCO INDUSTRIAL PTY LTD

MAY 2023

Document Control

Project Name:	Vecco Critical Minerals Project
Report Title:	Terrestrial Ecology Assessment
Client:	Vecco Group Pty Ltd
Project Manager:	Gareth Bramston

Version	Comments	Author	Reviewer	Date
Draft issued for client review		LL	GB	18 May 2023
Final issued to client				10/06/2023

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1 Introduction

AARC Environmental Solutions Pty Ltd (AARC) was commissioned by Vecco Group Pty Ltd (the Proponent) to conduct a Terrestrial Ecology Assessment for the Vecco Critical Minerals Project (the Project).

The Project is located approximately 70 km north of Julia Creek township and approximately 515 km west of Townsville in Northwest Queensland (Figure 1).

1.1 Project description

The Project is a proposed greenfield operation that will consist of a shallow, open-cut mine that will process up to 1.9 Mtpa ROM feed to produce up to approximately 5,500 tpa V_2O_5 and 4,000 tpa HPA over an operational life of approximately 26 years. The Project will consist of a mining lease application (MLA) for the mine (Production ML), and a separate mining lease application for the mine access road (Transport ML) and supporting infrastructure (Infrastructure ML). Minor quantities of other REE may present opportunities for saleable bi-products of the process. Ore will be mined to an approximate depth of up to 35m. Processing will occur following on site crushing and screening of the ore. Mineral products will be packed in containers and transported by truck or rail to Townsville, for secondary processing into battery electrolyte or export from the Port of Townsville to international markets.

Key components of the Project include:

- open cut mining of up to 1.9 Mtpa ROM ore over a period of approximately 26 years;
- development of a mine infrastructure area (MIA), including, administration buildings, bathhouse, crib rooms, storage warehouse, workshop, fuel storage, refuelling facilities, wash bay, laydown area, and a helipad;
- development of mine areas (open cut pits) and out-of-pit waste rock emplacements. This includes vegetation and soil stripping;
- development of out-of-pit waste rock emplacements;
- construction and operation of a Mineral Processing Plant (MPP) and ore handling facilities adjacent to the MIA (including ROM ore and product stockpiles and rejects);
- construction of an access road from Punchbowl Road to the MIA;
- construction of an airstrip to provide access for the Royal Flying Doctors Service;
- construction of a 10 MW solar farm and associated energy storage system;
- installation of a raw water supply pumping system and pipeline to connect the MIA to the Saxby River for water harvesting;
- construction of an on-site workers village and associated facilities, including an adjacent sewage treatment plant (STP);
- other associated minor infrastructure, plant, equipment and activities;
- progressive establishment of soil stockpiles, laydown area and borrow pits (for road base and civil works). Material will be sourced from local quarries where required;
- open-cut mining operations using conventional surface mining equipment (excavators, front end loaders, rear dump trucks, dozers);
- strategic disposal of neutralised process rejects within the backfilled mining void;
- continued exploration and resource definition drilling on the MLAs;
- progressive development of internal roads and haul roads including a causeway over the Saxby River (designed for minimum impact on flow events) to enable access and product haulage;

- development of water storage dams and sediment dams, and the installation of pumps, pipelines, and other water management equipment and structures including temporary levees, diversions and drains; and
- progressive rehabilitation occurring at defined milestones through the operational life. All voids will be backfilled to natural surface, ensuring all rehabilitated landforms achieve a sustainable post-mining land use on closure.

Existing regional infrastructure, facilities and services may be used to support Project activities. These include the Townsville Port, the rail networks, electricity networks, local roads and the Flinders Highway.

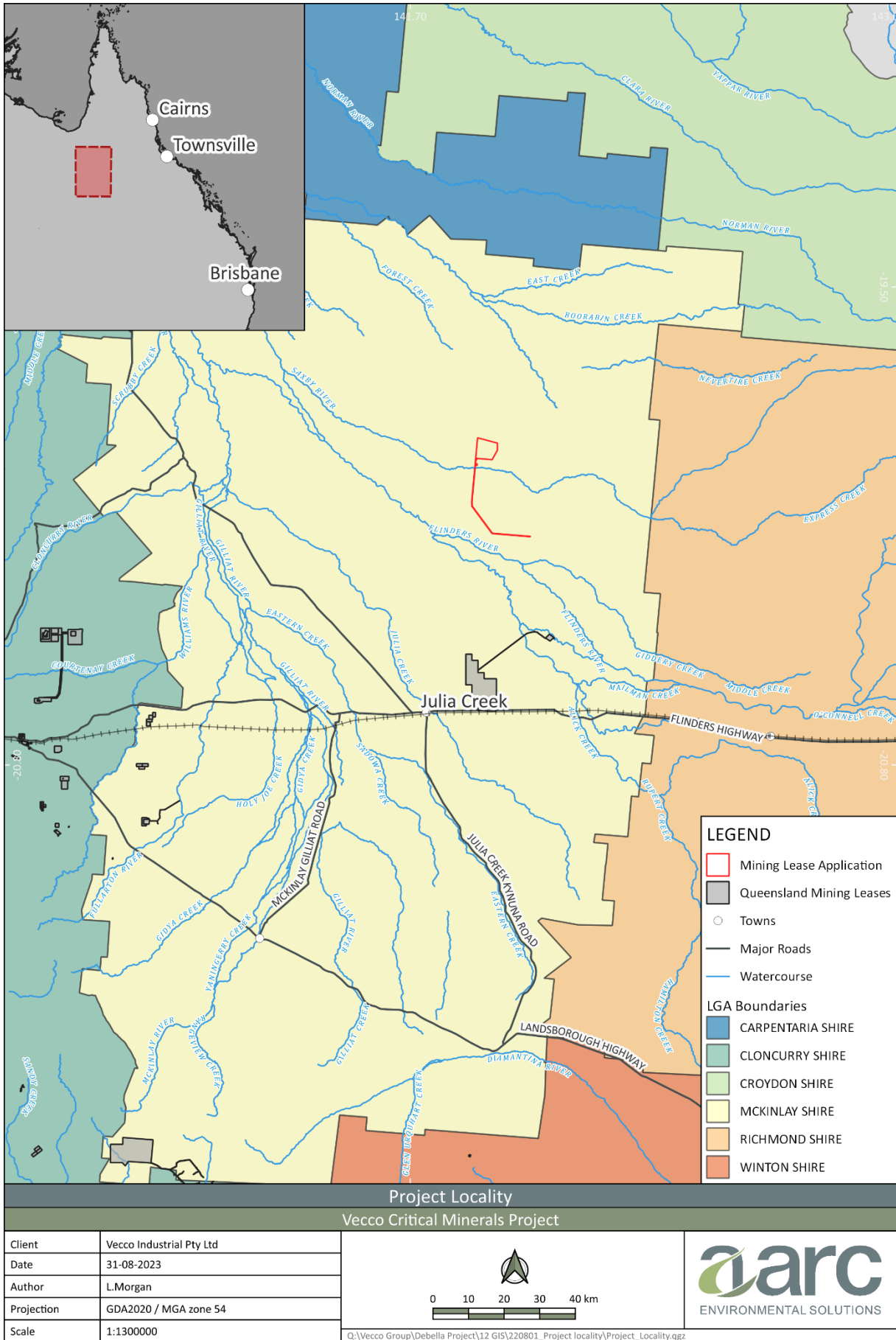


Figure 1: Regional location of the Project

1.2 Study objectives

This report assesses the terrestrial ecological values of the Project area and the potential impacts of the Project. Specifically, this report:

- identifies legislation and policies relevant to the Project and terrestrial flora and fauna;
- describes the desktop assessments conducted for the Project to identify conservation significant species and ecological communities that have potential to occur within the study area;
- describes the seasonal and targeted terrestrial flora and fauna surveys conducted for the Project and the results of the surveys;
- provides comprehensive flora and fauna species lists for the study area;
- provides Regional Ecosystem (RE) mapping in accordance with the 'Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (V5.1)' (Neldner *et al.* 2019);
- identifies the presence of Matters of State Environmental Significance (MSES), Matters of National Environmental Significance (MNES), and assesses the potential for significant impact;
- assesses the potential direct, indirect impacts of the Project on terrestrial species and ecosystems, and proposes measures to avoid, minimise or mitigate the impacts; and
- identifies the likely requirements for any offsets under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) and/or the *Queensland Environmental Offsets Act 2014* (EO Act).

2 Description of the study area and surrounds

The terrestrial ecology study area for the Project covers the extent of all MLA areas (3,536 ha) and adjoining areas. Section 2.1 to Section 2.5 provide an overview of the study area and surrounds.

2.1 Setting

The Project is located within the Gulf Plains Bioregion, which is located in the Gulf of Carpentaria of northern Queensland with a small area (0.7%) in the Northern Territory. The bioregion encompasses approximately 121,000 km² of low-lying country and offshore islands of north-west Queensland and is characterised by extensive alluvial plains and coastal areas. The Project is located inland approximately 20 km north-west of the Mitchell Grass Downs and Gulf Plains bioregion border. The inland vegetation of the Gulf Plains bioregion is dominated by grasslands, Eucalypt woodlands, Melaleuca and Acacia which cover the landscape of plains and river channels comprising clay and alluvial soils (EHP 2015).

2.2 Climate

The regions climate is described as sub-tropical with monsoonal influence, with a winter dry season and summer wet season that can result in alternating periods of inundation over much of the region during the summer. Long-term climate data (2013 to current) were retrieved from SILO/LongPaddock for 141.90 °E, - 19.95 °S (Queensland Government n.d.), presented in Figure 2.

Rainfall records indicate annual rainfall is 480.9 mm/year. The majority of rainfall occurs during rainfall events in the wet season (November to March), with dry conditions persisting for the majority of the year. The mean annual evaporation within the Study Area is 2784.4 mm, approximately six times higher than average rainfall, meaning there is a constant potentially high soil water deficit.

The mean monthly maximum temperature is highest in December (39.3°C), dropping to 28.3°C in June before rising in subsequent months. The mean monthly minimum temperature ranges between 11.4°C to 25.0°C throughout the year, with an annual mean minimum temperature of 19.1°C.

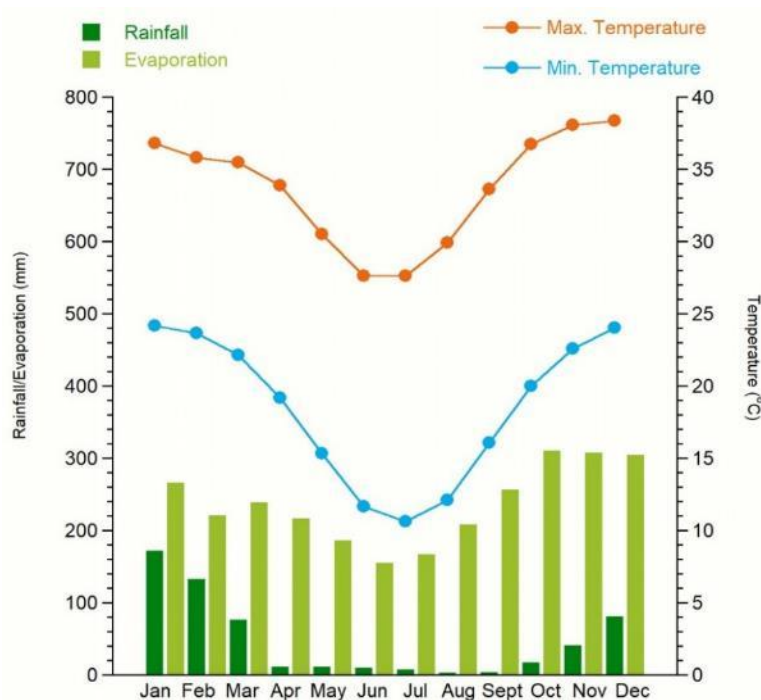


Figure 2 Climate data (2013 to 2023) from SILO/LongPaddock for 141.90 °E, -19.95 °S (Queensland Government n.d.)

2.3 Hydrology

The Project is located within the Flinders Drainage Basin, which encompasses an area of 109,298.1 km² and contains the Cloncurry River, Flinders River and Saxby River sub-catchment areas (DES 2022a). The Project is located within the Saxby River sub-catchment, which covers a total area of 10,091 km² and comprises the catchment of the ephemeral Saxby River. The Saxby River (characterised by a braided channel) is situated approximately 1 km south of the Project footprint, intersecting with the planned access road. The Saxby River is approximately 1,030 km in length and begins at the Norman River and flows south-west for 108 km before turning north-west converging with the Flinders River eventually discharging into the Gulf of Carpentaria.

Periods of flow in the Saxby River are restricted to the wet season events between the months of December to late March (Figure 2). No tributaries are mapped to traverse the Production MLA (Figure 3).

Additional to the Saxby River, there are several man-made open channels within the broader area (Figure 3). These channels provide for the distribution or removal of water for irrigation purposes, or for significant infrastructure functions or are constructed as part of a residential development (DoR 2022).

Several seasonal wetlands are mapped to occur surrounding the Project footprint. One seasonal wetland area is mapped to occur approximately 22 km south of the Production MLA along a section of proposed access road (Figure 7).

2.4 Topography, Land Zones and Soils

The topography of the study area is generally flat to gently undulating, with elevations ranging between 140 m and 150 m Australian Height Datum (AHD). The topography of the study area is representative of the surrounding region.

Three land zones (and associated soil types) occur within the study area:

- Land Zone 3 – Recent Quaternary alluvial systems, including closed depressions, paleo-estuarine deposits currently under freshwater influence, inland lakes, and associated wave-built lunettes (Wilson and Taylor 2012). Land Zone 3 excludes colluvial deposits such as talus slopes and pediments. This Land Zone includes a diverse range of soils predominantly Vertosols and Sodosols (Wilson and Taylor 2012). Land Zone 3 also occurs with Dermosols, Kurosols, Chromosols, Kandosols, Tenosols, Rudosols and Hydrosols; and Organosols in high rainfall areas (Wilson and Taylor 2012).
- Land Zone 4 – Tertiary-early Quaternary clay deposits, usually forming level to gently undulating plains not related to recent Quaternary alluvial systems (Wilson and Taylor 2012). This Land Zone mainly occurs with Vertosols with gilgai microrelief. Land Zone 4 also includes thin sandy or loamy surfaced Sodosols and Chromosols with the same paleo-clay subsoil deposits (Wilson and Taylor 2012).
- Land Zone 5 – Tertiary-early Quaternary loamy and sandy plains and plateaus (Wilson and Taylor 2012). Land Zone 5 consists of extensive, uniform near level or gently undulating plains with sandy or loamy soils and includes dissected remnants of these surfaces. Soils are usually Tenosols and Kandosols, also minor deep sandy surfaced Sodosols and Chromosols (Wilson and Taylor 2012).

2.5 Land use

The study area is located within the Southern Gulf natural resource management (NRM) region. The land surrounding the Project is currently used for low intensity cattle grazing of native pastures and resource exploration activities. The predominant land use of northwest Queensland is low intensity cattle grazing. The land within the study area is currently used for low intensity cattle grazing of native pastures and resource exploration activities. Queensland Land Use Mapping classifies the study area as 'Grazing Native Vegetation'.

The Project Area is wholly located within the Gulf Plains (GUP) bioregion. The bioregion covers 12.7% of Queensland, with a total area of 219,109.4 km². The Gulf Plains bioregion is characterised by extensive alluvial plains and coastal areas. The tropical savanna vegetation comprises mainly eucalypt and tea-tree open woodlands.

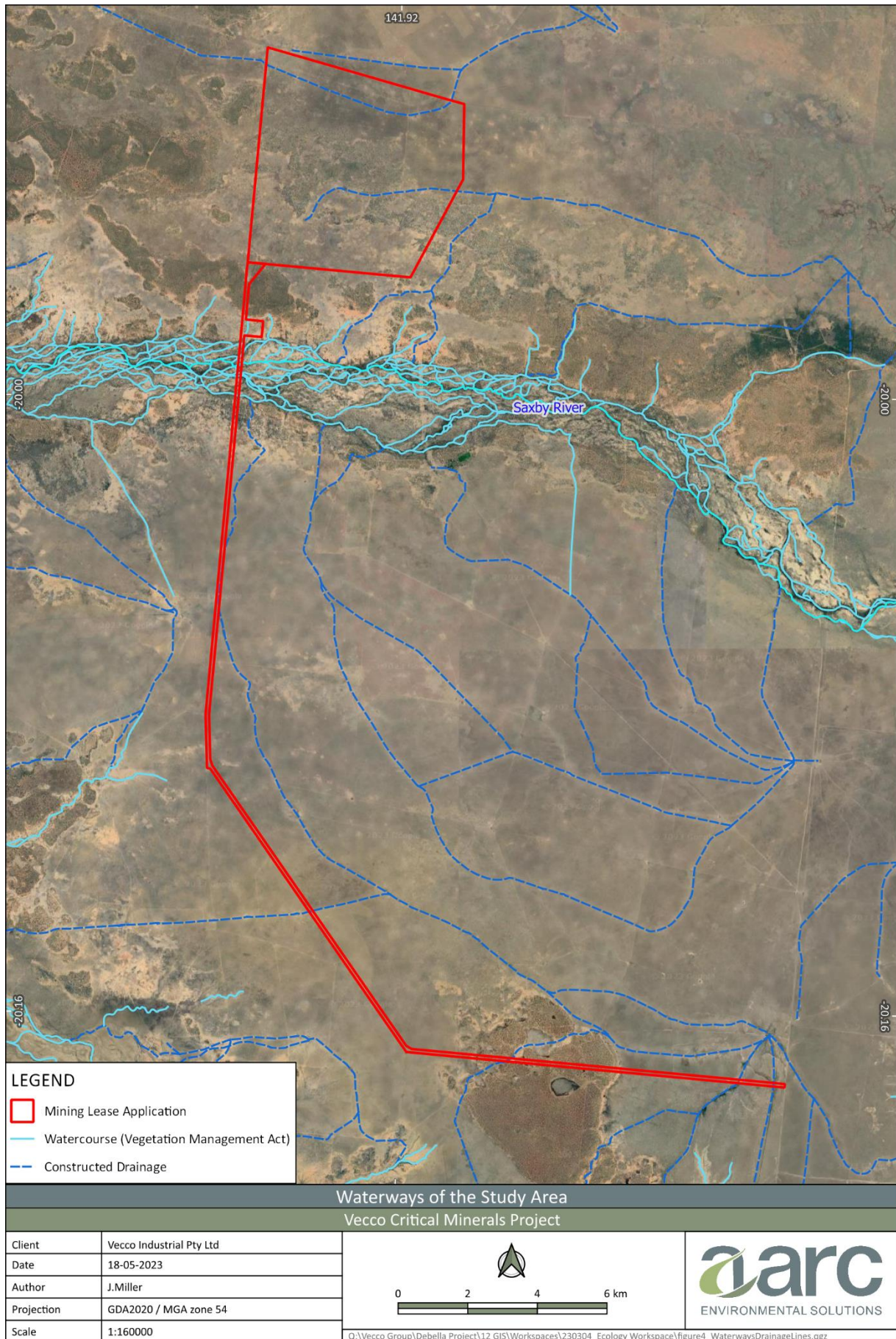


Figure 3: Waterways and drainage in relation to the Project area

3 Relevant legislation and policy

3.1 Commonwealth

3.1.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth EPBC Act provides a framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places, which are defined in the EPBC Act as MNES. The EPBC Act applies to nine MNES:

- 1) world heritage properties;
- 2) national heritage places;
- 3) wetlands of international importance (Ramsar wetlands);
- 4) nationally listed threatened species and ecological communities;
- 5) migratory species;
- 6) Commonwealth marine areas;
- 7) the Great Barrier Reef Marine Park;
- 8) nuclear actions (including uranium mines); and
- 9) a water resource, in relation to coal seam gas development and large coal mining development.

The EPBC Act requires assessment and approval for any activity that has, or is likely to have, a significant impact on a MNES. The relevant controlling provisions for the Project under the Act are:

- nationally listed threatened species and communities (sections 18 and 18A); and
- listed migratory species (sections 20 and 20A).

3.1.2 EPBC Act environmental offsets policy

The 'Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy' (DSEWPaC 2012) outlines the Australian Government's position on the use of environmental offsets. Environmental offsets can be used under the EPBC Act to maintain or enhance the health, diversity and productivity of the environment as it relates to matters protected by the EPBC Act.

Offsets under the EPBC Act are required if residual impacts to MNES are significant (DSEWPaC 2012). The 'Matters of National Significance Significant Impact Guidelines 1.1' provides overarching guidance on determining whether an action is likely to have a significant impact on a matter of national environmental significance protected by the EPBC Act (DoE 2013).

The 'Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy' provides guidance on the role of offsets in environmental impact assessments and how the Department of Climate Change, Energy, the Environment and Water (DCCEEW) considers the suitability of a proposed offset package (DSEWPaC 2012).

3.2 Queensland

3.2.1 Environmental Protection Act 1994

The objective of the *Environmental Protection Act 1994* (Qld) (EP Act) and its associated Regulations and Policies are to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. This is commonly referred to as ecologically sustainable development. The EP Act addresses the following areas that are relevant to the Project:

- notifiable activities, that are listed in Schedule 3 of the EP Act;
- environmental protection policies for water and wetland biodiversity, noise and air which are intended to enhance or protect Queensland's environment and list relevant environmental outcomes and performance criteria;
- Environmental Regulated Activities defined within the EP Act and listed in schedule 2 of the Environmental Protection Regulation 2019;
- Environmental Activities (EAs) which are required to carry out an Environmental Relevant Activity (ERA) including a resource activity, and which will include conditions that will regulate the Project activities; and
- duties of care associated with environmental harm.

The EP Act also prescribes the Environmental Authority application process, which is managed by the Queensland Department of Environment and Science (DES), relevant to the approval of an Environmental Authority for the Project.

3.2.2 Vegetation Management Act 1999

The *Vegetation Management Act 1999* (Qld) (VM Act) is part of the framework for the management of native vegetation across Queensland.

The purpose of the VM Act is to regulate the clearing of vegetation in a way that:

- conserves remnant vegetation that is an Endangered, Of Concern, or Least Concern Regional Ecosystem (RE);
- conserves vegetation in declared areas;
- ensures the clearing does not cause land degradation;
- prevents the loss of biodiversity;
- maintains ecological processes;
- manages the environmental effects of the clearing to achieve the matters mentioned in the above bullet points;
- reduces greenhouse gas emissions; and
- allows for sustainable land use.

Remnant vegetation means vegetation that is either an Endangered, Of Concern, or Least Concern RE and the predominant canopy of the vegetation:

- covers more than 50% of the undisturbed predominant canopy;
- averages more than 70% of the vegetation's undisturbed height; and
- is composed of species characteristic of the vegetation's undisturbed dominant canopy.

The *Vegetation Management Regulation 2014* prescribes the status of each RE identified within Queensland as described in the Regional Ecosystem Description Database (REDD) (V12.1) (DES 2021).

3.2.3 Nature Conservation Act 1992

The Queensland *Nature Conservation Act 1992* (NC Act) and its associated Regulations provide a framework for the creation and management of protected areas (such as National Parks) and for the protection of native and threatened species. The Regulations include the *Nature Conservation (Animals) Regulation 2020* and the *Nature Conservation (Plants) Regulation 2020*.

The *Nature Conservation (Animals) Regulation 2020* and the *Nature Conservation (Plants) Regulation 2020* prescribe the following classes of protected wildlife¹:

- Extinct;
- Extinct in the wild;
- Critically Endangered;
- Endangered;
- Vulnerable;
- Near Threatened; and
- Least Concern.

The *Nature Conservation (Animals) Regulation 2020* prescribes Least Concern wildlife as a Special Least Concern wildlife for the following species:

- Short-beaked Echidna (*Tachyglossus aculeatus*).
- Platypus (*Ornithorhynchus anatinus*).
- A Least Concern bird to which any of the following agreements apply: China-Australia Migratory Bird Agreement, Japan-Australia Migratory Bird Agreement, Republic of Korea-Australia Migratory Bird Agreement or the Convention on the Conservation of Migratory Species of Wild Animals.

Permits and licences are required to authorise impacts to, or the handling of, native flora and fauna and their breeding habitat.

3.2.4 Biosecurity Act 2014

The *Biosecurity Act 2014* (Biosecurity Act (Qld)) provides comprehensive biosecurity measures to safeguard the economy, agricultural and tourism industries, environment, and way of life, from pests, diseases, and contaminants.

Biosecurity matters are separated into two broad categories:

- A 'prohibited matter' is a biosecurity matter that is not found in Queensland but would have a significant adverse impact on our health, way of life, the economy, or the environment if it entered the state. Prohibited matters must be reported to Biosecurity Queensland within 24 hours and all reasonable steps taken to minimise the risks of the prohibited matter and not make the situation worse.
- A 'restricted matter' is a biosecurity matter found in Queensland that has a significant impact on human health, social amenity, the economy, or the environment. There are seven categories whereby specific actions are required to limit the spread and impact of the matter by reducing, controlling, or containing it. Several categories can apply to the one restricted matter. In such cases, the requirements of all the relevant restriction categories would apply.

¹ Under the NC Act the term wildlife refers to any native taxon or species of an animal, plant, Protista, prokaryote or virus.

Everyone is obligated to take all reasonable and practical steps to minimise the risks associated with other biosecurity matters under their control. The Biosecurity Act (Qld) is relevant to the Project in regard to control and management of invasive plant and animal species.

3.2.5 Environmental Offsets Act 2014

The Queensland environmental offsets framework consists of the EO Act, Environmental Offsets Regulation 2014, and the 'Queensland Environmental Offsets Policy (Version 1.13)' (DES 2022b). The offsets framework requires environmental offsets to be delivered where an activity is likely to result in a significant residual impact on a prescribed environmental matter. The 'Significant Residual Impact Guideline' (EHP 2014) is used to assess whether the Project will result in a significant residual impact.

Prescribed environmental matters include:

- matters of national environmental significance (MNES);
- matters of state environmental significance (MSES); and
- matters of local environmental significance (MLES).

These prescribed environmental matters are outlined in the Environmental Offsets Regulation 2014.

MSES comprise:

- regulated vegetation including:
 - Endangered and Of Concern REs listed under the VM Act;
 - REs that intersect areas shown as wetlands on the Vegetation Management Act Wetlands map;
 - REs located within a defined distance from the defining banks of a relevant watercourse or relevant drainage feature; and
 - REs mapped as essential habitat for Endangered and Vulnerable flora and fauna listed under the NC Act;
- areas that provide connectivity and maintain ecosystem functioning;
- wetlands and watercourses, including:
 - a wetland in a wetland protection area;
 - a wetland of high ecological significance shown on the map of Queensland wetland environmental values; and
 - a wetland or watercourse in high ecological value waters.;
- designated precincts in a strategic environmental area under the Regional Planning Interests Regulation 2014;
- protected wildlife habitat;
- protected areas and highly protected zones of State marine parks;
- fish habitat areas;
- waterways providing for fish passage;
- marine plants; and
- legally secured offsets.

4 Desktop assessment

4.1 Government mapping, database searches and literature review

Desktop assessments were conducted to collate information on the terrestrial ecological values within the study area and surrounds. The review informed the terrestrial ecology assessment methods and field survey design, ensuring a robust assessment of conservation significant flora and fauna potentially inhabiting the Project area.

The review of government mapping included:

- **The DES Environmental Report: Matters of State Environmental Significance**, to identify known MSES within the study area and surrounds (DES 2021-2022a) (Appendix A)
- **The DES Environmental Report: Regional Ecosystems Biodiversity Status**, to identify remnant Regional Ecosystems within the study area and surrounds (DES 2021-2022b) (Appendix A)
- **The Department of Resources (DoR) Vegetation Management Report** to identify areas of regulated vegetation, Vegetation Management Regional Ecosystems mapping (VM Act), and essential habitat for protected wildlife (NC Act) within the study area and surrounds (DoR 2021-2022a)
- **The Queensland Government's Wetlands Maps Report**, to identify wetland waterbodies and protected areas within the study area and surrounds (Queensland Wetlands Program 2021-2022)
- **The DES Protected Plants Flora Survey Trigger Map** to identify any high risk areas where NC Act protected plants are present or are likely to be present (searches based on the study area) (DES 2021-2022c) (Appendix A)
- **The DES Modelled Potential Habitat Mapping** to identify threatened flora and fauna species that have been modelled to have pre-clear potential habitat within the study area and surrounds (DES 2021-2022d, DoR 2022)
- **The Queensland Government's Environmentally Sensitive Area mapping** to identify areas mapped as environmentally sensitive within the study area and surrounds (Queensland Government 2021-2022a)
- **The DES Environmental Report: Biodiversity and Conservation Values**, to identify known Biodiversity Planning Assessment areas and Aquatic Conservation Assessment areas within the study area and surrounds (DES 2021-2022e) (Appendix A)
- **The BoM and DoR mapping of GDEs** (study area and surrounds) (BoM 2021-2022, DoR 2021-2022b).

The EPBC Act Protected Matters Search Tool was used to identify MNES with the potential for species or species habitat to occur in the study area or surrounds (searches based on 10 km and 60 km buffers) (DCCEEW 2021-2022). The results of the 60 km search are provided in Appendix A.

Searches of databases were also conducted to identify known species records. These searches included:

- **The DES Wildlife Online search and WildNet Wildlife Records results** to identify Endangered, Vulnerable, Near Threatened (EVNT) and Special Least Concern (SLC) species records (searches based on 10 and 50 km buffer) (Queensland Government 2021-2022b, DES 2021-2022f). The most recent results of the 50 km search are provided in Appendix A.
- **The Atlas of Living Australia Occurrence Records** to further verify EVNT and SLC species records (searches based on 10 and 50 km buffer) (ALA 2021-2022).

Other ecological surveys and assessments undertaken in the area, have been reviewed to identify conservation significant flora and fauna.

The results of the desktop assessment are described in Section 4.2.

4.2 Desktop assessment results

There are no World Heritage areas, national protected areas, or state protected areas (established under the Queensland Nature Conservation Act 1992) within the Project area or within 150 km of the project footprint. There is a State riparian biodiversity corridor mapped along the main channel of the Saxby River (Figure 4). Biodiversity corridors are corridors that connect or improve connectivity through targeted rehabilitation of natural assets, including between existing areas of matters of state environmental significance (MSES) or regional biodiversity values (DoR 2022).

Desktop searches (BoM 2021-2022, DoR 2021-2022b) identified “derived GDEs – moderate potential” (Figure 5). These derived GDEs intersect vegetation that was targeted during the ecology field surveys. While largely confined to the Saxby River, the minor presence of derived GDEs in the Project area corresponds to the edges of government mapped wooded vegetation REs. These REs are discussed in detail in Section 4.2.3.1 and Section 6.1. Any potential impacts to the GDEs are addressed in Section 8.2.7. Further assessment of any potential impacts by the Project on GDEs are discussed in the *Groundwater Assessment* prepared for the Project by JBT Consulting (2023).

The Species Technical Committee (STC) assessed and reclassified the status of 11 fauna species and 15 flora species under the NC Act (1992), including the addition of a previously not listed species (*Euastacus suttoni*). These changes came into effect on 30 June 2023. A desktop assessment of these species using WildNet established that none of the newly assessed or reclassified species are within 50 km of the Project area. The output of this search is included in Appendix A.

4.2.1 Previous terrestrial ecology surveys

Prior to surveys commissioned for the Project, there have been no terrestrial ecology surveys within the planned area of disturbance. However, one recent terrestrial ecological survey has been conducted for the St. Elmo Vanadium Project, located approximately 60 km south of the study area (Epic Environmental 2020).

A key outcome of the St Elmo Vanadium Project was significant impact to Julia Creek Dunnart (*Sminthopsis douglasi*) habitat. Although desktop searches show the Project is located outside of the modelled habitat for the species (DES 2021-2022d, DoR 2022), a stand-alone targeted survey for the threatened Julia Creek Dunnart (*Sminthopsis douglasi*) and potential habitat was undertaken within the study area (Ecosmart Ecology 2023).

No threatened species were identified during the St Elmo study. Of the 118 species identified, five were identified as listed under the EPBC Act as migratory. These five species are also listed under the NC Act as Special Least Concern (SL). These five species are:

- Fork-tailed Swift (*Apus pacificus*)
- Oriental Plover (*Charadrius veredus*)
- Glossy Ibis (*Plegadis falcinellus*)
- Marsh Sandpiper (*Tringa stagnatilis*); and
- Sharp-tailed Sandpiper (*Calidris acuminata*)

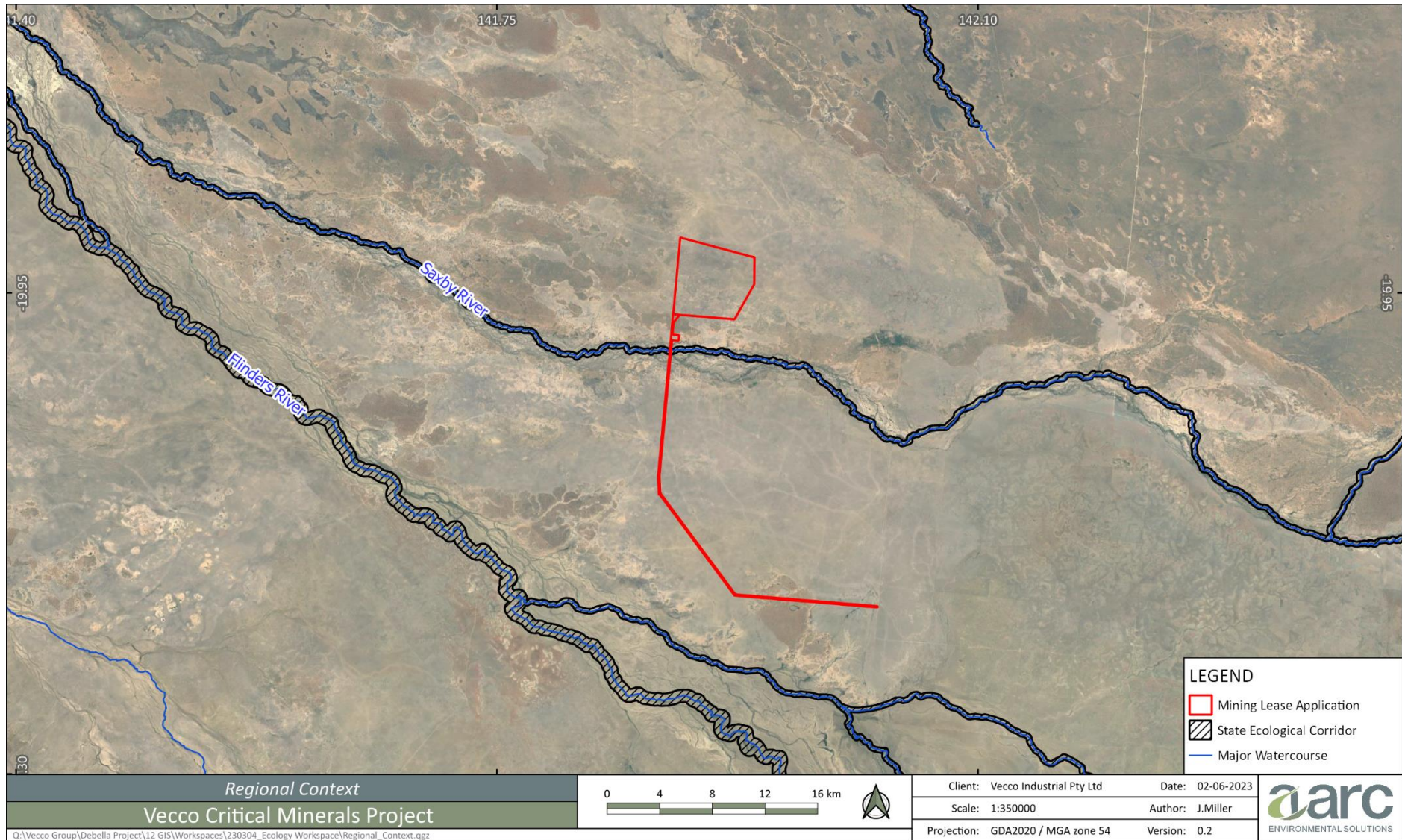


Figure 4: Regional context of the Project Area

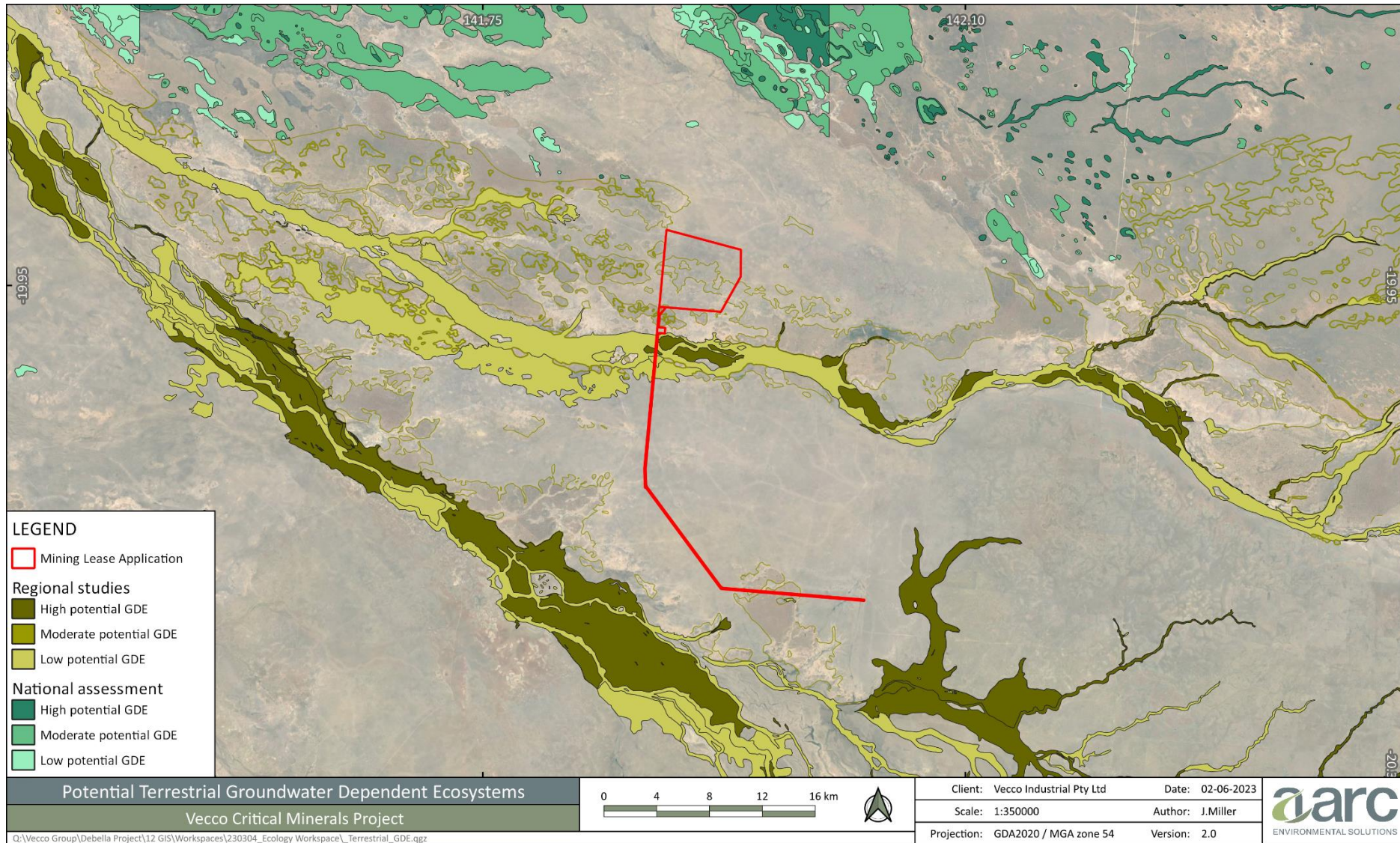


Figure 5: Potential Groundwater Dependent Ecosystems

4.2.2 Matters of National Environmental Significance

4.2.2.1 Threatened ecological communities

Under the EPBC Act, ecological communities can be listed as threatened. These Threatened Ecological Communities (TEC) are categorised as Critically Endangered, Endangered and Vulnerable.

One community listed as Endangered under the EPBC Act was identified as potentially occurring within the study area or surrounds, namely 'The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin'. This TEC is associated with springs within the Great Artesian Basin discharge area that are the natural surface discharge points of aquifers in the Triassic, Jurassic and Cretaceous sedimentary sequence of the Great Artesian Basin (DCCEEW 2021). No springs have been mapped within 15km radius of the study area.

As described in Section 5.2.2, field surveys have been conducted to ground-truth and assess the vegetation and habitat characteristics of the study area to determine the presence and extent of any TECs.

4.2.2.2 EPBC Listed flora and fauna species

One fauna species and no flora species listed as Critically Endangered, Endangered or Vulnerable under the EPBC Act were identified by the desktop assessment as having known records within the region (50 km search area from the Project) (Table 1).

Four species listed as migratory under the EPBC Act were identified by the desktop assessment as having known records within the region (50 km search area from the Project) (Table 1).

An assessment of the likelihood of occurrence for each species of conservation significance (threatened or migratory) is provided in Section 4.3.

Table 1: EPBC Act listed fauna species known records within the region from desktop assessment

Family	Scientific Name	Common Name	EPBC Act Status ^{1,2}
Birds			
Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mi
Scolopacidae	<i>Tringa glareola</i>	Wood Sandpiper	Mi
Scolopacidae	<i>Tringa stagnatilis</i>	Marsh Sandpiper	Mi
Threskiornithidae	<i>Plegadis falcinellus</i>	Glossy Ibis	Mi
Mammals			
Dasyuridae	<i>Sminthopsis douglasi</i>	Julia Creek Dunnart	V

¹ CE - Critically Endangered; E - Endangered; V - Vulnerable; Mi – migratory

² Known records within 50 km of the Project area (refer Appendix B (flora) and Appendix C (fauna))

4.2.3 Matters of State Environmental Significance

4.2.3.1 Regulated Vegetation

Regional Ecosystems

The Queensland Government regulated vegetation map identified all land within the study area as Category B remnant vegetation.

The REs mapped within the study area are listed in Table 2 alongside their conservation status and are shown in Figure 6. All REs mapped within the study area are listed as Least Concern under the VM Act.

Table 2: Government mapped Regional Ecosystems within the study area

RE	RE Short Description ¹	VM Act Status ²	Biodiversity Status ³
2.3.11	<i>Eucalyptus microtheca</i> +/- <i>Excoecaria parvifolia</i> , <i>Atalaya hemiglauca</i> , <i>Grevillea striata</i> low woodland on active Quaternary alluvial plains with cracking clay soils	Least concern	No concern at present
2.3.17a	<i>Eucalyptus microtheca</i> +/- <i>Excoecaria parvifolia</i> , <i>Lysiphyllum cunninghamii</i> , <i>Atalaya hemiglauca</i> woodland fringing channels in fine-textured alluvial systems	Least concern	Of concern
2.3.26b	<i>Eucalyptus camaldulensis</i> +/- <i>Melaleuca spp.</i> woodland fringing sandy, seasonal channels	Least concern	Of concern
2.3.3	<i>Astrelba squarrosa</i> and/or <i>A. elymoides</i> and/or <i>Iseilema spp.</i> tussock grassland on active Quaternary alluvial plains	Least concern	No concern at present
2.3.33a	Seasonal swamps (wooded). <i>Eucalyptus microtheca</i> and/or <i>Acacia cambagei</i> low woodland to woodland, commonly with <i>Excoecaria parvifolia</i> . The ground layer is tussock grasses or sedges. Occurs in closed depressions in Quaternary residual sand sheets overlying Tertiary clay deposits. Cracking clay soils. Palustrine	Least concern	Of concern
2.3.4	<i>Eulalia aurea</i> , <i>Panicum decompositum</i> , <i>Astrelba pectinata</i> and <i>Dichanthium spp.</i> in mixed tussock grasslands on active Quaternary alluvial plains within Tertiary clay deposits	Least concern	No concern at present
2.3.7a	<i>Acacia cambagei</i> +/- <i>Eucalyptus microtheca</i> low woodland on fine-textured Quaternary alluvial plains	Least concern	No concern at present
2.4.2a	<i>Astrelba spp.</i> , <i>Iseilema spp.</i> +/- <i>Aristida latifolia</i> , <i>Eulalia aurea</i> tussock grassland on Tertiary clay deposits	Least concern	No concern at present
2.5.1b	<i>Lysiphyllum cunninghamii</i> , <i>Atalaya hemiglauca</i> and <i>Grevillea striata</i> low woodland on plains on earths and sandy soils	Least concern	No concern at present
2.5.35	<i>Aristida latifolia</i> +/- <i>Enneapogon polyphyllus</i> , <i>Brachyachne convergens</i> , <i>Sporobolus spp.</i> tussock grassland on thin, residual sand deposits overlying Tertiary clay plains	Least concern	No concern at present

¹ Regional Ecosystem Description Database (DES 2021)

² Endangered; Of Concern; Least Concern

³ Endangered; Of Concern; No Concern at Present

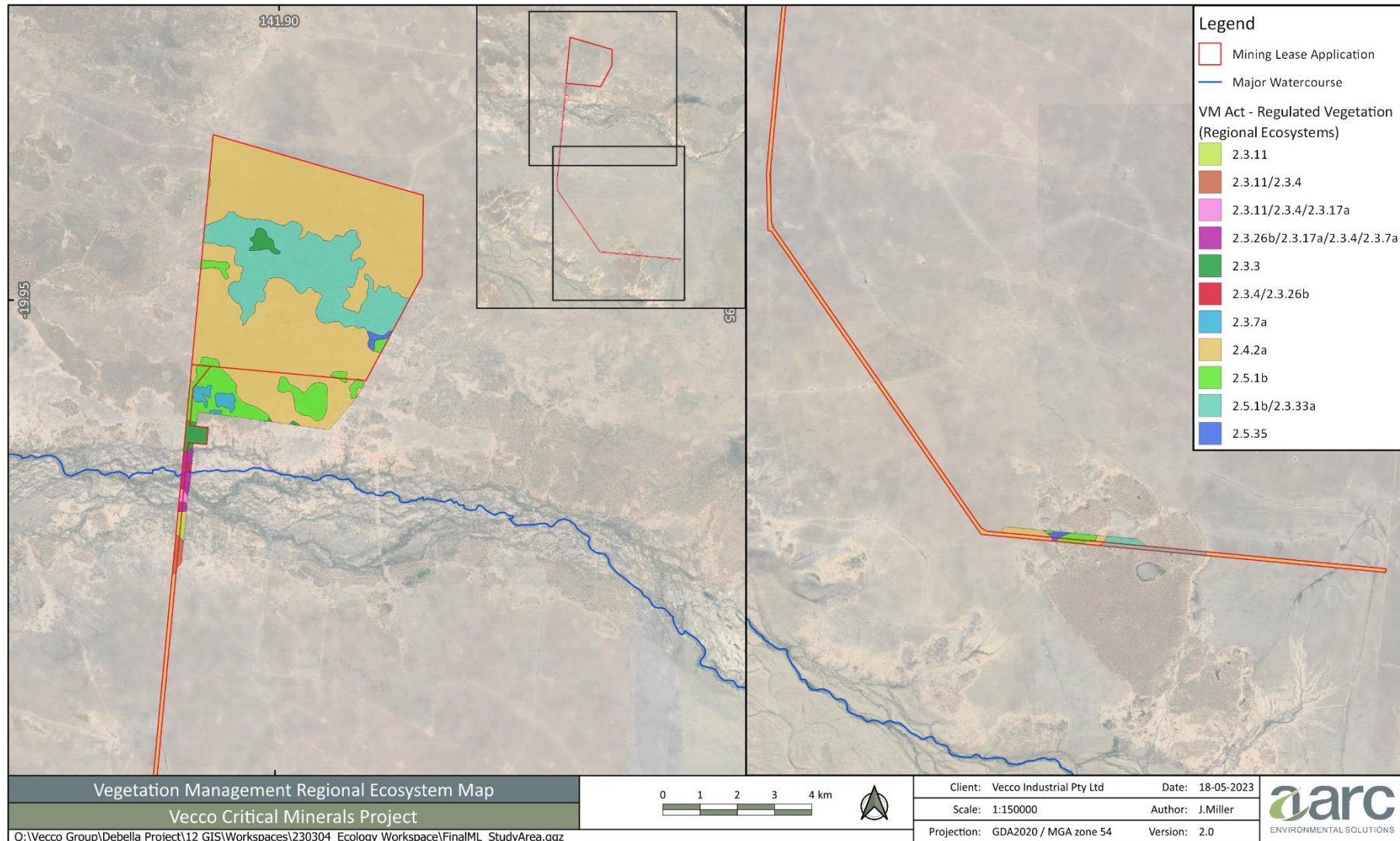


Figure 6: Government mapped Regional Ecosystems within the study area

Vegetation management wetlands

Under the VM Act a wetland is defined as an area of land that supports plants or is associated with plants that are adapted to and dependent on living in wet conditions for at least part of their life cycle (EHP 2014). The vegetation management wetlands map under section 20AA of the VM Act has been developed by the Queensland Government.

Several Vegetation Management wetlands have been identified within the study area, in particular in the vicinity of the transport ML southern section.

As described in Section 3.2.5, clearing of prescribed REs that intersect areas shown as wetlands on the Vegetation Management Wetlands map can trigger an environmental offset under the EO Act.

Vegetation management watercourses

The Queensland Government vegetation management watercourse map shows watercourses defined under the VM Act which are used to regulate vegetation clearing in proximity of watercourses (EHP 2014).

One VM defined watercourse – the Saxby River (characterised by a braided channel) – intersect with the planned access road (Figure 7).

As described in Section 3.2.5, clearing prescribed REs within a defined distance from the defining banks of a relevant watercourse or relevant drainage feature can trigger an environmental offset under the EO Act.

Essential Habitat

Essential habitat is mapped by DES and is defined as regulated vegetation identified as containing at least three essential habitat factors for a species that is Critically Endangered, Endangered, Vulnerable or Near Threatened (EVNT) or habitat in which an EVNT species is located.

As described in Section 3.2.5, clearing prescribed REs in an area of essential habitat on the essential habitat map for an animal that is critically endangered wildlife, endangered wildlife or vulnerable wildlife or a plant that is critically endangered wildlife, endangered wildlife or vulnerable wildlife, can trigger an environmental offset under the EO Act.

No essential habitat has been mapped within the study area.

Referable wetlands

The Map of Queensland wetland environmental values is a state-wide statutory map under the 'Environmental Protection (Water and Wetland Biodiversity) Policy 2019'. The map of referable wetlands includes:

- Wetland Protection Areas (WPAs), which comprise:
 - High Ecological Significance (HES) wetlands within the Great Barrier Reef Catchments; and
 - trigger areas that represent the area of hydrological influence of HES wetlands.

Significant residual impacts on WPAs are required to be offset in accordance with the Queensland Environmental Offsets Framework.

No HES wetlands or their trigger areas are mapped within the study area or within 100 km of the study area.

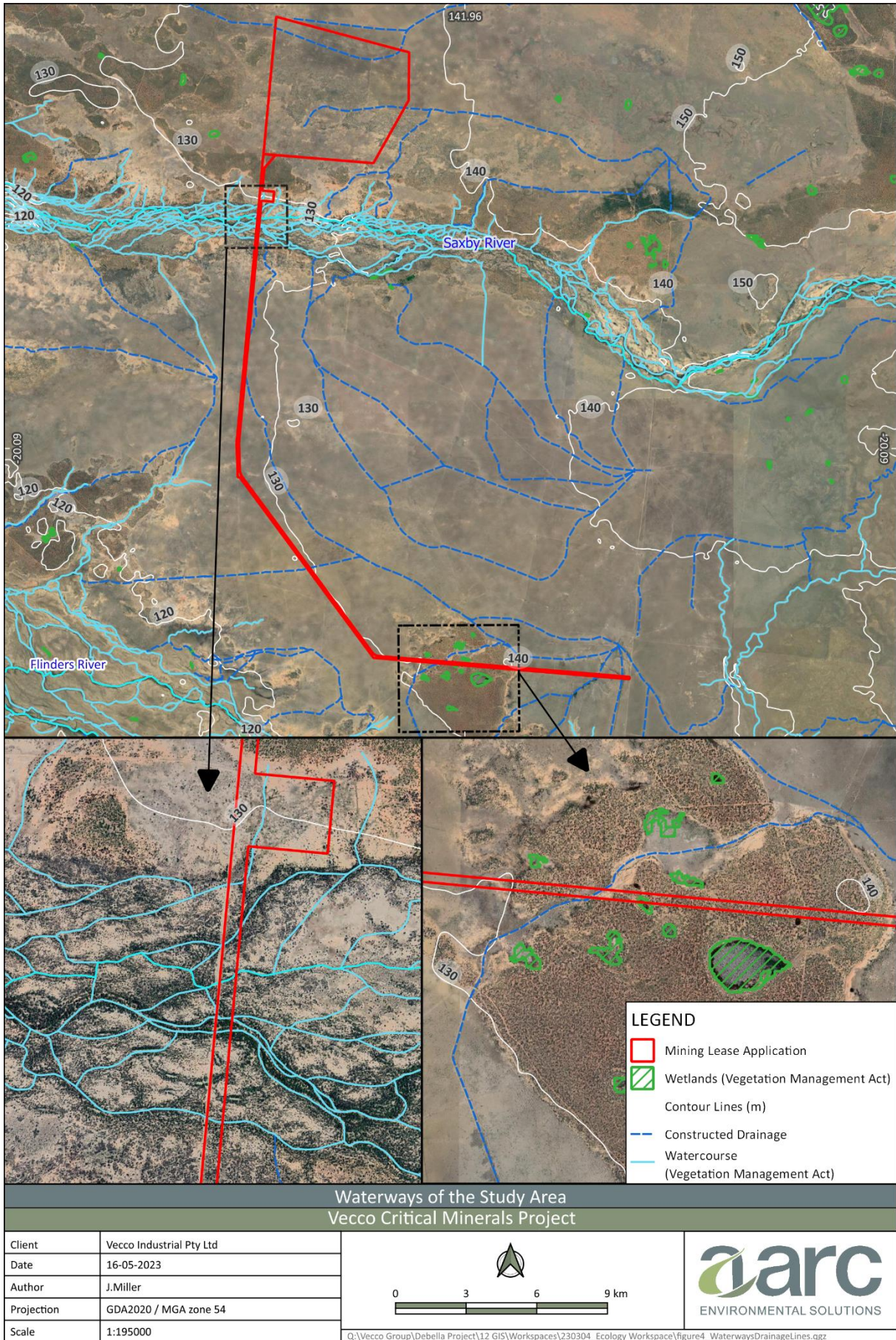


Figure 7: Vegetation Management Act wetlands and watercourses

4.2.3.2 Protected Wildlife habitat

Protected wildlife habitat is defined as an area of habitat for a Critically Endangered, Endangered, Vulnerable or Special Least Concern (non-migratory) species. Habitat is defined as the area occupied (including periodically and occasionally) by any species, population or ecological community, or an area used by species during different stages of their life cycles. Areas mapped as containing Protected Wildlife Habitat are subject to the Queensland offsets legislation.

There is no Protected Wildlife habitat mapped within the study area.

4.2.3.3 Protected Plants Flora Trigger Map

The Protected Plants Flora Survey Trigger Map identifies high-risk areas where Endangered, Vulnerable or Near Threatened flora species are present or are likely to occur. The high-risk areas represent areas of potential habitat for the flora species within a 2 km radius around validated records of Endangered, Vulnerable or Near Threatened flora species.

Areas mapped as high-risk areas on the Protected Plants Flora Survey Trigger Map that are found to contain Endangered or Vulnerable (NC Act) species are subject to the requirements of the Queensland offset framework.

There are no high-risk on areas mapped as high-risk on the Protected Plants Flora Survey Trigger Map within the study area.

4.2.3.4 Conservation significant species

Conservation significant species are species listed as Critically Endangered, Endangered, Vulnerable, Near Threatened or Special Least Concern under the NC Act. Conservation significant species relevant to the study area are discussed in the following sections. A summary of the likelihood of occurrence assessment for each species is provided in Section while full descriptions and likelihood assessments can be found in Appendix D (flora) and Appendix E (fauna).

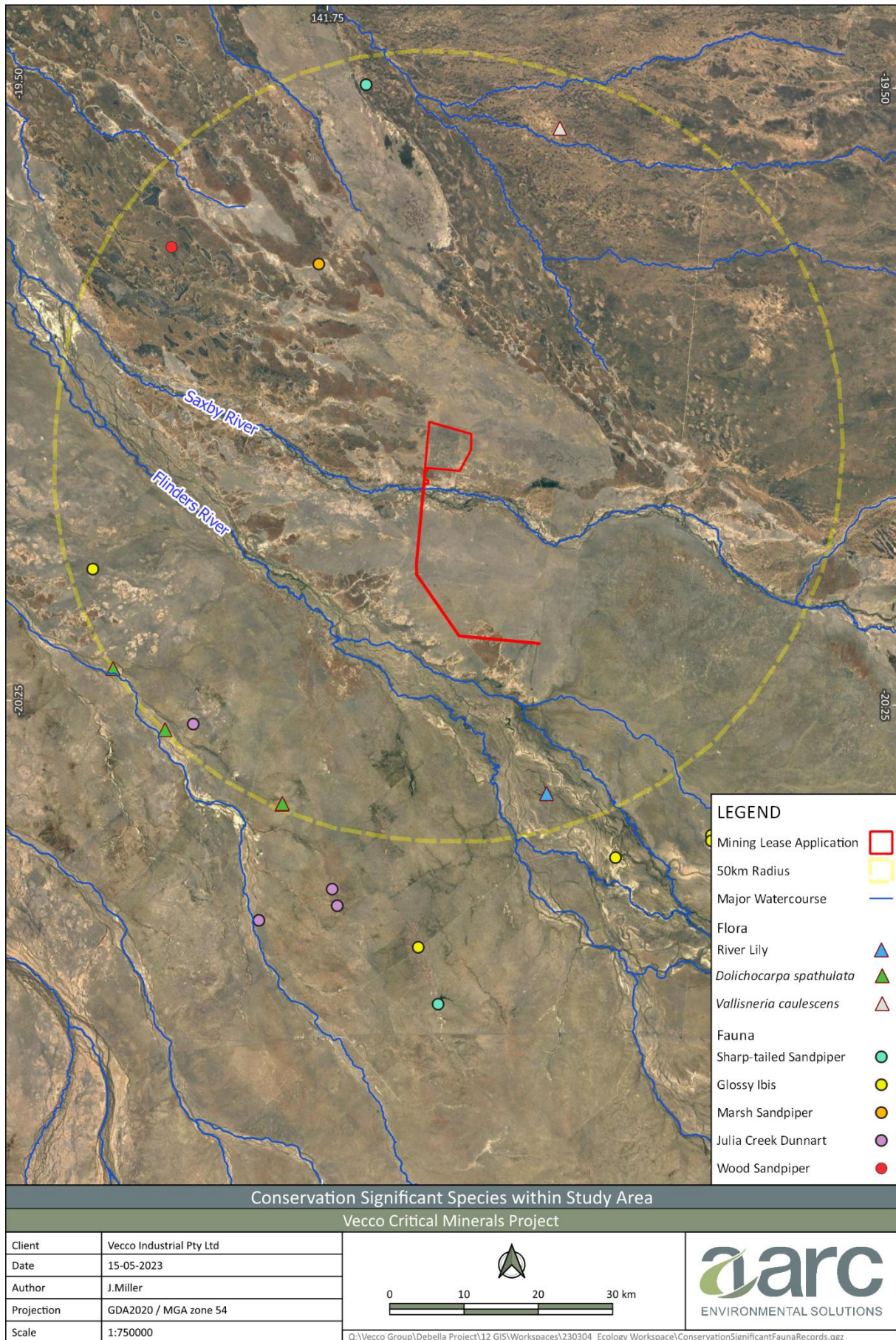


Figure 8: Conservation Significant Species within study area

4.3 Conservation significant species likelihood of occurrence

Conservation significant species under the EPBC Act and the NC Act identified by the desktop assessment were assigned a likelihood of occurrence based on the criteria provided in Table 3. The likelihood assessment is based on the knowledge of ecologists, species’ distribution, potential habitat suitability, known records, and scientific literature and is provided in Appendix D (flora) and Appendix E (fauna).

Table 3: Criteria adopted for likelihood of occurrence determination

Likelihood of Occurrence	Criteria
Known	There are confirmed species records within the study area*.
Likely	Preferred habitat occurs within the study area; and there are confirmed species records in the nearby surrounds, however the species is not yet confirmed as occurring within the study area.
Potential	Potential habitat may occur within the study area and the species is known to occur in the wider surrounds.
Unlikely	Due to a lack of suitable habitat within the study area and/or the absence of records from the wider surrounds, the species is considered to have a low likelihood of occurring within the study area.

*Note that the likelihood assessment was conducted in consideration of the desktop assessment and prior to field survey.

Conservation significant flora and fauna species were identified by the desktop assessment and assessed for likelihood of occurrence informed the design the Project field surveys. Of the ten flora species of conservation significance identified, three species were noted as potentially occurring in the Study area, while seven were classed as unlikely to occur. Of the 27 fauna species of conservation significance identified, five species were noted as potentially occurring within the Study area, while 22 were classed as unlikely to occur.

A summary of the species assessed to potentially occur within the Study area can be found in Table 4 while full description and likelihood assessments can be found in Appendix D (flora) and Appendix E (fauna).

The species assessed as potentially occurring in the study area were targeted by the flora and fauna surveys.

Table 4: Conservation significant flora and fauna potentially occurring within the study area

Family	Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
			NC Act	EPBC Act	
Flora					
Amaryllidaceae	<i>Crinum pedunculatum</i>	River Lily	SL	-	Potential
Equisetopsida	<i>Dolichocarpa spathulata</i>	N/A	E	-	Potential
Hydrocharitaceae	<i>Vallisneria caulescens</i>	N/A	SL	-	Potential
Fauna					
Dasyuridae	<i>Sminthopsis douglasi</i>	Julia Creek Dunnart	E	V	Potential
Scolopacidae	<i>Tringa glareola</i>	Wood Sandpiper	SL	Mi	Potential
Scolopacidae	<i>Tringa stagnatilis</i>	Marsh Sandpiper	SL	Mi	Potential

Family	Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
			NC Act	EPBC Act	
Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	SL	Mi	Potential
Threskiornithidae	<i>Plegadis falcinellus</i>	Glossy Ibis	SL	Mi	Potential

5 Survey Methodology

This section describes the terrestrial flora and fauna survey methodology, including survey timing and prevailing climatic conditions, the selection of survey sites and survey techniques utilised.

The field surveys were designed and conducted in accordance with the following guidelines:

Commonwealth Guidelines:

- 'Survey guidelines for Australia's threatened reptiles' (DSEWPac 2011a).
- 'Survey guidelines for Australia's threatened birds' (DEWHA 2010a).
- 'Survey guidelines for Australia's threatened mammals' (DSEWPac 2011b).
- 'Survey guidelines for Australia's threatened bats' (DEWHA 2010b).
- 'Draft referral guideline for 14 migratory birds listed under the EPBC Act' (DoE 2015a).

Targeted surveys for EPBC Act listed species considered likely to occur, or have the potential to occur, were also conducted in consideration of the requirements outlined within the 'Species Profile and Threats Database' (SPRAT Database).

State Guidelines:

- 'Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland (V5.1)' (Neldner *et al.* 2019).
- 'Flora Survey Guidelines - Protected Plants (V2.01)' (DES 2020).
- 'Management of endangered plants' (Cropper 1993).
- 'Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (V3.0)' (Eyre *et al.* 2018).

This report uses nationally accepted taxonomy for flora from the Australian Plant Census (APC 2023) and the nomenclature for fauna follows the Australian Biological Resources Study Faunal Directory (ABRS 2022).

5.1 Survey timing and conditions

Terrestrial flora and fauna surveys were conducted for the Project in September 2021 (13-17 September), and April 2022 (7-13 April).

The survey timing was consistent with the 'Terrestrial Vertebrate Fauna Survey Guidelines for Queensland V3.0' (Eyre et al. 2018), to account for temporal and seasonal changes in faunal assemblages while avoiding the hottest and coldest months.

Weather conditions were obtained from SILO/LongPaddock for 141.90 °E, -19.95 °S (Queensland Government n.d.). During the September 2021 survey, the weather conditions experienced were typical for the region. Rainfall in the three-month period preceding the survey was slightly lower than the 20-year average (1 mm vs 13 mm), with no rainfall occurring during the survey period. The minimum temperature during the survey period ranged from 14.4°C to 18.9°C, which is in parity with the 20-year September minimum temperature average for the same period (16.1°C). The maximum temperature ranged from 35.5°C to 38.5°C, well above the 20-year September maximum temperature average (34.2°C).

Weather conditions during the April 2022 survey were typical for the region. Rainfall in the three-month period preceding the survey was approximately 20% lower than the 20-year average (176 mm vs 216 mm), with no rainfall occurring during the survey period. The minimum temperature during the survey period was variable, ranging from 18.5°C to 26.1°C, consistent with the 20-year April minimum temperature average (19.3°C). The maximum temperature ranged from 37.4°C to 39.5°C, well above the 20-year April maximum temperature average of 34.4°C.

Table 5: *Temperatures and rainfall for the survey periods*

Survey Dates	Minimum Temperature (°C)	Maximum Temperature (°C)	Rainfall (mm)
13 September 2021	18.9	38.5	0
14 September 2021	17.9	35.5	0
15 September 2021	17.1	37	0
16 September 2021	14.5	37.9	0
17 September 2021	14.4	37.5	0
7 April 2022	18.5	38.3	0
8 April 2022	21.3	38.6	0
9 April 2022	19.2	39.1	0
10 April 2022	23.7	39.5	0
11 April 2022	26.1	39.2	0
12 April 2022	23.9	38.8	0
13 April 2022	23.5	37.4	0

5.2 Flora surveys

5.2.1 Site selection

Aerial imagery and a review of Government RE mapping were used to identify suitable sites to survey the vegetation communities present, target threatened flora species and communities, and provide a

comprehensive flora species inventory for the study area. Sites were selected to provide a representative sample set for each vegetation community. The location and number of flora survey sites was adjusted in the field to account for variations from the Regulated Vegetation RE map.

5.2.2 Flora survey methods

5.2.2.1 Vegetation community mapping

Vegetation communities were mapped on the ground in accordance with the 'Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland (V5.1)' (Neldner *et al.* 2019). This methodology uses different types of sites to survey, map, and validate RE mapping. Quaternary and vegetation transect sites were used to determine the vegetation communities and their corresponding REs within the study area. All RE's are described in accordance with the Queensland Regional Ecosystem Description Database (DES 2021) classification system. Vegetation community boundaries were validated in the field using a Global Positioning System (GPS) and refined using the latest aerial imagery available for the study area. Data from the flora survey was used in conjunction with topographical and geological maps to produce a ground verified vegetation map.

5.2.2.2 Vegetation Transects

A total of 23 vegetation transect sites were surveyed within the study area or surrounds in accordance with the 'Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland (V5.1)' (Neldner *et al.* 2019) and the BioCondition Manual (Eyre *et al.* 2015). The location of the vegetation transects are shown on Figure 9.

These detailed flora assessments 100 m x 50 m were undertaken to classify and provide descriptions of the vegetation communities (and associated REs) present within the study area. The following information was collected at each vegetation transect:

- site identifier information (e.g. GPS Location, site name, collector, corresponding photographs);
- site photographs (including start and end transect photos and central north, east, south, and west orientation photos);
- field verified REs;
- remnant status of the vegetation (e.g. non remnant, remnant, regrowth);
- vegetation structural formation (e.g. woodland, open woodland, forest);
- vegetation stratum details (including list of species present and dominance, stratum height);
- vegetation structure details (including foliage projection cover percentage, ground cover species percentage composition, stem density counts, basal area of vegetation [Bitterlich Stick methodology²], diameter at breast height assessments);
- identification of ecologically dominant layer;
- land zone descriptions (including landform, slope and aspect and soil characteristics); and
- disturbance notes (e.g. presence of weed species, cattle grazing etc).

5.2.2.3 Quaternary sites

A total of 108 quaternary sites were sampled within the study area in accordance with the methods detailed in Neldner *et al.* (2019). The locations of the quaternary sites are shown on Figure 9.

The following information was recorded at each quaternary site:

² A method for determining the proportional basal area of vegetation. Where the basal area is the area of the cross section of a tree taken at the height of 1.3 m.

- site identifier information (e.g. GPS Location, site name, collector, corresponding photographs);
- site photographs (taken of the vegetation with mostly north, east, south, and west orientation);
- remnant status of the vegetation (e.g. non remnant, remnant, regrowth);
- vegetation structural formation (e.g. woodland, open woodland, grassland);
- vegetation stratum details (including list of main species present and dominance, stratum height);
- identification of ecologically dominant layer;
- land zone descriptions (including landform and soil characteristics); and
- disturbance notes (e.g. presence of weed species, cattle grazing).

5.2.2.4 Targeted surveys for conservation significant species

Conservation significant flora species identified by the desktop assessment (Appendix D) were targeted during the flora surveys. Traverses (meanders) (Cropper 1993; DES 2020) of potentially suitable habitat for flora of conservation significance were undertaken throughout the study area, where habitat features were identified.

Field observations for conservation significant flora were also conducted while conducting the flora field survey methods described above. The timing of the surveys was appropriate to record these species were they to occur.

5.2.2.5 Threatened ecological community mapping

As described in Section 4.2.2.1, the desktop assessment identified one TEC listed under the EPBC Act with the potential to occur within the study area. Vegetation surveys collected sufficient data to verify the absence of 'The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin' within the study area.

5.2.2.6 Flora species list

A comprehensive flora species list, including native and introduced species, was compiled for the study area. The flora species list incorporated all species encountered within the Project area from assessments of vegetation transects, quaternary sites, targeted searches and from incidental observations whilst traversing the site.

Where a flora species could not be positively identified to species level, a voucher specimen was collected for identification by the Queensland Herbarium.

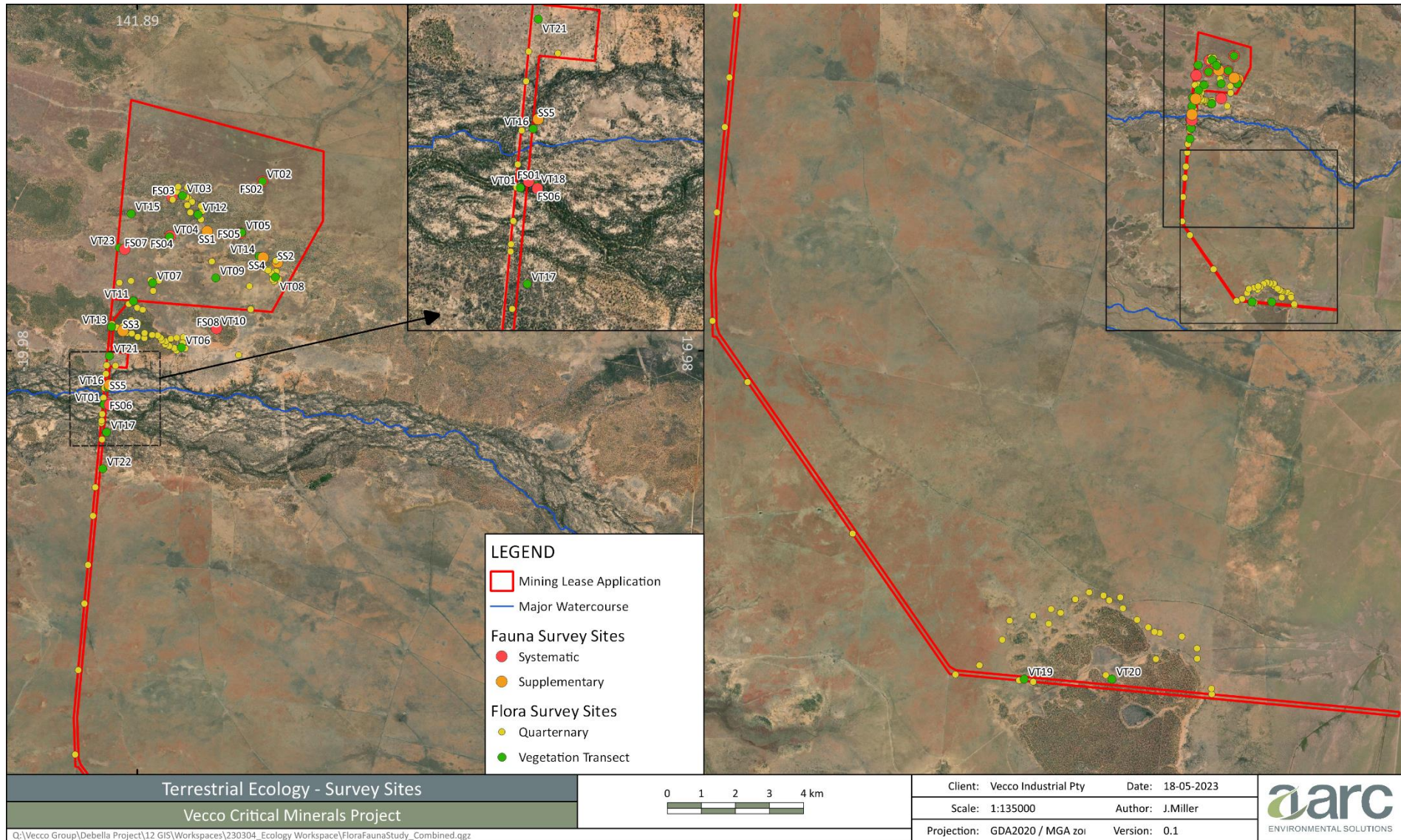


Figure 9: Location of survey sites

5.3 Fauna surveys

5.3.1 Site selection

Aerial imagery and a review of Government RE and broad vegetation group mapping (DES 2021) were used to identify potential habitat types and suitable survey site locations.

The desktop assessment and initial site assessment identified three major habitat types occurring within the study area. These major habitat types were used to design the initial fauna surveys and included:

- Mixed dry woodlands;
- Riparian woodlands on alluvial soils; and
- Tussock grasslands.

A description of the characteristics of each major habitat type within the study area is provided in Section 7.1. Fauna surveys were designed in consideration of the vegetation communities and habitat features identified on site during the initial survey. Eight systematic survey sites and five supplementary sites were established within the major habitat types (Figure 9). The survey efforts made at each site is outlined further in Section 5.3.3. A description of each systematic survey site and supplementary survey site is provided in Appendix F.

5.3.2 Fauna survey methods

The fauna survey methods utilised by the study were consistent with various Commonwealth and State fauna survey guidelines including the 'Terrestrial Vertebrate Fauna Survey Guidelines for Queensland' (Eyre *et al.* 2018). The fauna survey methods are described below. The survey effort at each site within the study area is detailed in Section 5.3.3.

Elliott trapping

Elliott A traps are aluminium boxes (8 x 10 x 33 cm) were used to target small ground-dwelling mammals. Twenty baited Elliott traps were installed at 10 m intervals at systematic survey sites for a duration of four days. Traps were strategically positioned under shrubs or beside logs to reduce exposure of trapped animals to the sun, wind and rain and maximise trap success. Traps were checked soon after dawn and captured animals were identified and released. Traps at each site were then closed during the heat of the day and reset before dusk, repeating for four nights.

Pitfall trapping

A pitfall trap line was established at the systematic survey sites to target small ground-dwelling taxa (e.g. amphibians, reptiles, and small terrestrial mammals). Four 20 litre buckets were buried at 7.5 m intervals flush with the soil surface along a pitfall trap line constructed with a T-shape design and 45 m drift fence. A small amount of soil, vegetation litter, a damp sponge and a small plastic pipe were placed in the bottom of each bucket to provide shelter and moisture for captured wildlife. Pitfall traps were checked soon after dawn and before dusk, and captured animals identified and released. The traps were left open for four days and nights.

Funnel trapping

Funnel traps are elongated box-shaped traps made of wire and fine mesh which were installed at systematic survey sites to catch amphibians and medium to large reptiles. Six funnel traps were positioned approximately 3 m from the ends of the pitfall trap drift fence. The traps were covered with a hessian bag and contained a damp sponge to provide protection and moisture for captured wildlife. Traps were checked soon after dawn and captured animals were identified and released. Traps at each site were then closed during the heat of the day and reset before dusk, repeating for four nights.

Automated camera trapping

Automated camera is a less invasive method of surveying medium and large-sized nocturnal terrestrial species and is an effective survey method used widely instead of cage trapping (Eyre *et al.* 2018). One camera was attached to a tree at each systematic survey site. A bait tube filled with raw chicken was positioned in clear view of the camera. When the motion-sensing technology in the camera detected movement, it triggered a photograph to be taken. The cameras were set up for four consecutive nights.

Diurnal bird surveys

Bird surveys were conducted during early mornings during peak avian activity to provide a direct census of diurnal bird species occurrence and abundance. Bird surveys included observations of all bird taxa visible from the survey site including aerial hunters/feeders/scavengers such as raptors, wood swallows and bee-eaters. Bird surveys were undertaken, for a minimum of 30 minutes at each systematic site (on two separate occasions). Bird surveys were conducted at all systematic and supplementary survey sites.

Spotlighting

Spotlighting was carried out in the early evenings at the survey sites to maximise nocturnal wildlife's encounter rate, such as amphibians, reptiles, nocturnal birds and nocturnal arboreal mammals. Spotlight searches were undertaken for a one-person hour at each systematic and supplementary site. The survey sites were randomly traversed with spotlights and binoculars consistent with the methodology outlined in the 'Terrestrial Vertebrate Fauna Survey Guidelines for Queensland' (Eyre *et al.* 2018). Where survey site habitat was suitable for species likely to be detected through call playback, spotlighting was undertaken following call playback to maximise the chance of detecting these species.

Call playback

Call playback was used to detect nocturnal bird species that are highly cryptic, call infrequently, are wide-ranging and occur at naturally low population densities. The Masked Owl (*Tyto novaehollandiae*) was the only species targeted with call playback. The species selected for call playback at each site were determined through assessment of the surrounding habitat, microhabitat features and the ecology of each species.

Habitat searches

Diurnal habitat searches were conducted at systematic survey sites and elsewhere within the study area based on habitat suitability to detect fauna that are active during the day. This survey method was used to target diurnal reptiles, amphibians, and large mammals where preferred habitat was located (e.g. cracking soil or dense ground debris). These habitat searches included recording evidence of fauna through the detection of tracks, scats, and traces (e.g. tree trunk scratches). Habitat searches were typically undertaken during the late morning to allow for reptile activity to increase with rising temperatures, but before the maximum heat of the day. At systematic and supplementary survey sites, searches were undertaken for a minimum of one person-hour.

Microchiropteran bat echolocation detection surveys

Microbats rely primarily on echolocation for orientation and navigation in flight and to hunt for food. The use of echolocation call detectors is a non-invasive method used to record the echolocation calls. One Anabat was set at each systematic survey site for three to four nights. An additional microbat echolocation detection was conducted at supplementary site SS05 for three consecutive nights.

Threatened species habitat assessment and mapping

During April 2022, a stand-alone targeted survey for the threatened Julia Creek Dunnart (*Sminthopsis douglasi*) and potential habitat was undertaken within the study area. Further details and survey outcomes can be identified in a separate report (Ecosmart Ecology 2023), with no further mention to the species in this report.

Incidental (opportunistic) observations

The study area was traversed on foot and by vehicle throughout each survey to conduct flora and fauna survey activities. All incidental observations of fauna were recorded whilst moving around the study area.

5.3.3 Fauna survey effort

In total eight systematic survey sites were established over the course of the field surveys for the study area. Five systematic survey sites (FS01 – FS05) were established during the September 2021 field survey, and three sites (FS06 – FS08) during the April 2022 field survey.

Survey sites consisted of the following trap configurations, or a similar variant:

- 20 Elliott A traps;
- 4 pitfall traps;
- 6 funnel traps;
- an automated camera trap; and
- an echolocation call detector.

Additionally, ecologists undertook targeted surveys within various habitats for cryptic fauna species and for species of conservation significance. These supplementary surveys were conducted across the study area at suitable locations, often concurrently with flora survey activities. In total, five opportunistic sites were established throughout the two field surveys. These survey locations included targeted bird surveys, spotlighting, echolocation call detection, habitat searches and camera trapping,

Across all survey sites, the total survey effort comprised:

- 640 total trap nights of Elliott trapping
- 124 total trap nights of pitfall trapping;
- 192 total trap nights of funnel trapping;
- 36 total trap nights of automated camera trapping;
- 35 total echolocation call detection nights;
- 12.5 total person hours of bird surveys;
- 14.25 total person hours of spotlighting;
- 8 call playback sessions; and
- 15.5 total person hours of habitat searches.

A detailed summary of the survey effort undertaken per survey method is provided in Table 6.

Table 6: Summary of fauna survey site survey effort

Survey method	Survey effort		Total survey effort
	September Survey 2021	April Survey 2022	
Fauna sites			
Elliott trapping	5 sites (FS01 - FS05) x 20 traps x 4 nights = 400	3 sites (FS06 – FS08) x 20 traps x 4 nights = 240	640 total trap nights
Pitfall trap lines	5 sites (FS01 - FS05) x 4 pitfalls x 4 nights = 80	[(1 site (FS06) x 3 pitfalls) + (2 sites (FS07 – FS08) x 4 pitfalls)] x 4 nights = 44	124 total trap nights
Funnel trapping	5 sites (FS01 - FS05) x 6 funnels x 4 nights = 120	3 sites (FS06 – FS08) x 6 funnels x 4 nights = 72	192 total trap nights
Automated camera trapping	5 sites (FS01 - FS05) x 1 camera x 4 nights = 20	3 sites (FS06 – FS08) x 1 camera x 4 nights = 12	32 total trap nights
Bird surveys	1 person hour per site x 5 sites (FS01 - FS05) = 5 person hours	1 person hour per site x 3 sites (FS06 – FS08) = 3 person hours at fauna sites	8 total person hours
Spotlight searches	1 person hour per site x 5 sites (FS01 - FS05) = 5 person hours	1 person hour per site x 3 sites (FS06 – FS08) = 3 person hours at fauna sites	8 total person hours
Call playback sessions	1 session per site x 5 sites (FS01 - FS05) = 5 sessions	1 session per site x 3 sites (FS06 – FS08) = 3 sessions	8 sessions
Habitat searches	1 person hours per site x 5 sites (FS01 - FS05) = 5 person hours	1 person hours per site x 3 sites (FS06 – FS08) = 3 person hours	8 total person hours
Echolocation call detection	[(2 sites (FS03 - FS04) x 5 nights) + (3 sites (FS01, FS02, FS05) x 4 nights)] x 1 bat detector per site = 22 detection nights	3 sites (FS06- FS08) x 1 bat detector x 3 nights = 9 detection nights	31 total detection nights
Supplementary surveys			
Bird surveys	~1.5 person hours of bird surveying	3 person hours of bird surveying	4.5 person hours
Spotlight searches	~3.25 person hours of spotlighting	3 person hours of spotlighting	6.25 person hours
Habitat searches	~4.5 person hours of habitat searching	3 person hours of habitat searching	7.5 person hours
Automated Camera trapping	4 nights of camera trapping	N/A	4 total trap nights
Echolocation call detection	N/A	4 detection nights	4 total detection nights

6 Flora results

6.1 Vegetation communities

The entire study area is classified as remnant vegetation, split into ten identified vegetation communities. These vegetation communities are summarised in Table 7 and described in Section 6.1.1 to Section 6.1.3

The distribution of these field verified vegetation communities is shown in Figure 10 and Figure 11.

Table 7: Field verified vegetation communities within the study area

Map Unit	Vegetation Community	Associated RE	VM Act Status ¹	BD Status ²
1: Low dry woodlands				
VC 1a	Wild Plum/Beefwood/Bloodwood woodland on gently undulating sand plains	2.5.1a	Least Concern	Least Concern
VC 1b	Western bloodwood low woodland on sandy soil	2.5.12a	Least Concern	Least Concern
VC 1c	<i>Melaleuca spp.</i> low open woodland on alluvial plains	2.5.33	Least Concern	Least Concern
2: Woodlands on alluvial soils				
VC 2a	Coolibah woodland on alluvial plains	2.3.17a	Least Concern	Of Concern
VC 2b	Gidgee low woodland on alluvial plains	2.3.7a	Least Concern	Least Concern
3: Tussock grasslands				
VC 3a	Tussock grassland on Tertiary clay deposits.	2.4.2b	Least Concern	Least Concern
VC 3b	<i>Aristida spp./Sporobolus spp.</i> grassland on alluvial deposits	2.3.69a	Least Concern	Of Concern
VC 3c	Common Native Couch and <i>Sporobolus spp.</i> dominant grassland on silty clays	2.3.69b	Least Concern	Of Concern
VC 3d	<i>Feathertop Wiregrass and Common Native Couch</i> grassland on sandy loam	2.5.35	Least Concern	Least Concern
VC 3e	Seasonal swamp dominated by Common Native Couch in circular depressions in sand plains	2.3.33b	Least Concern	Of Concern

¹ Endangered; Of Concern; Least Concern

² Endangered; Of Concern; No Concern at Present

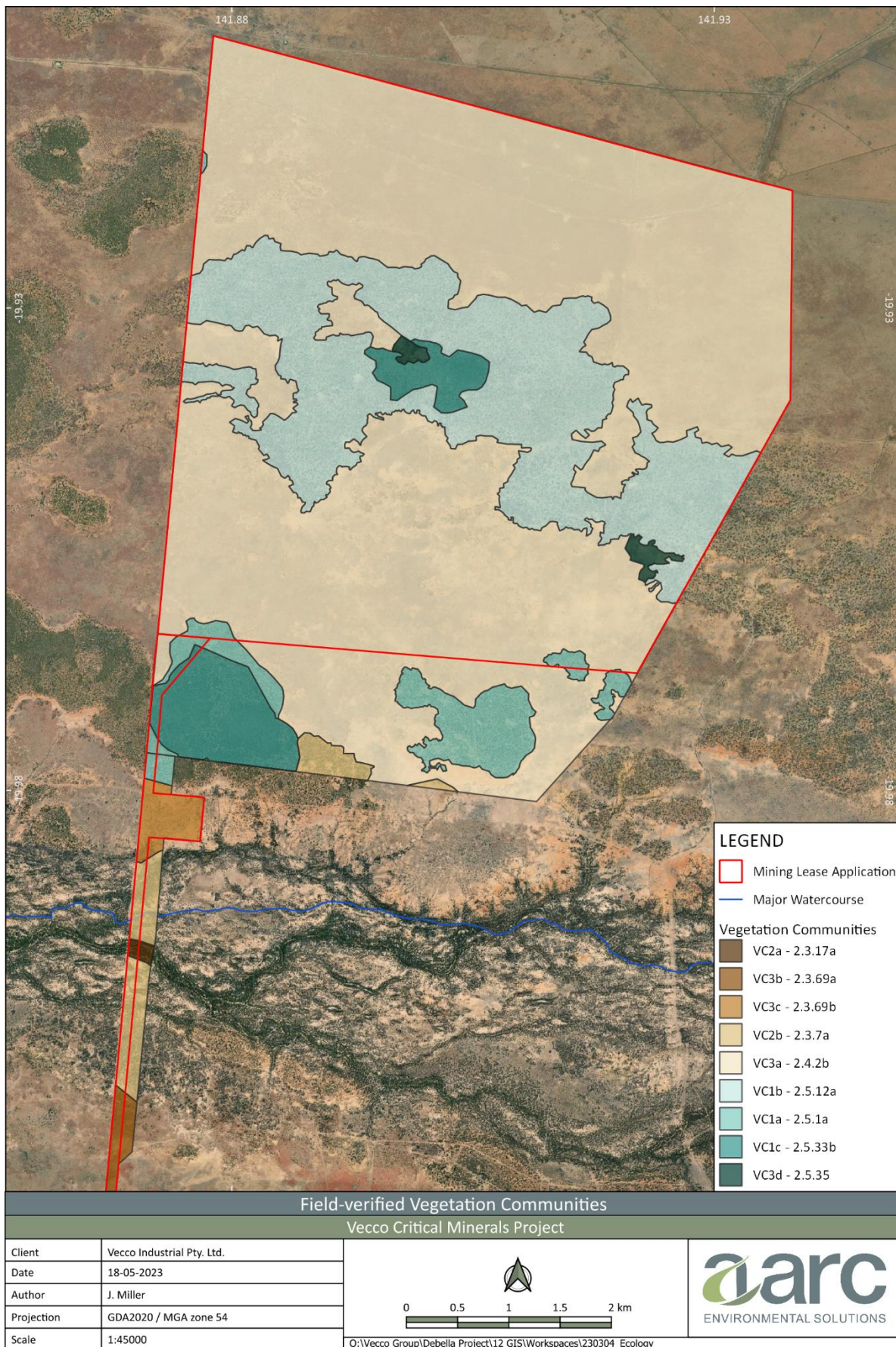


Figure 10: Field verified vegetation communities within the main Project area

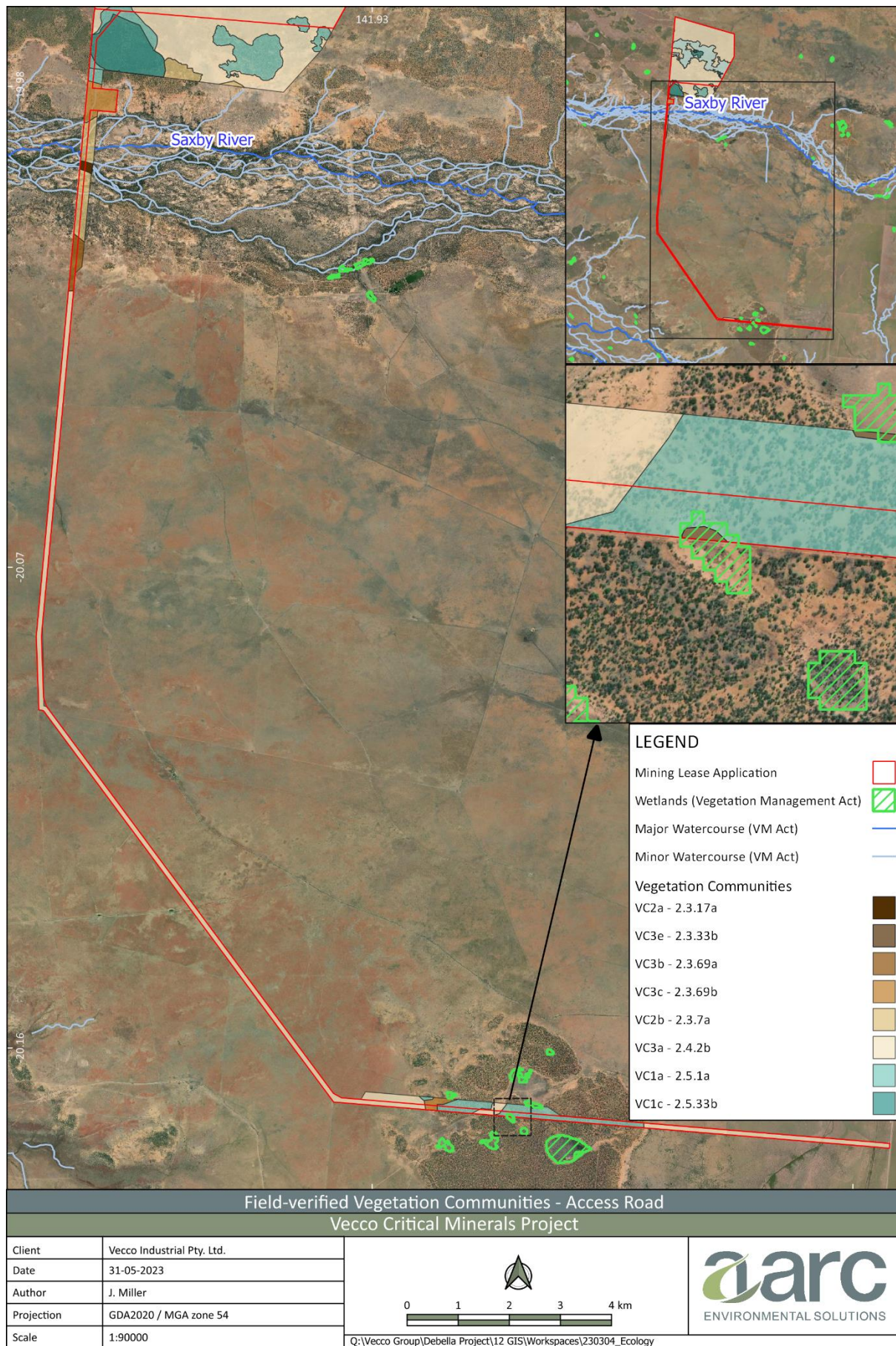


Figure 11: Field-verified vegetation communities within access road

6.1.1 Low dry woodlands

Four vegetation communities associated with low dry woodlands were identified within the study area. A description of their distribution within the study area and their floristic characteristics is provided in Section 6.1.1.1 to Section 6.1.1.3.

6.1.1.1 Wild Plum/Beefwood/Bloodwood woodland on gently undulating sand plains (VC 1a)

Vegetation community VC1a occurs within the study area, close to the Saxby River, and within the southern part of the Transport MLA. This vegetation community is consistent with the description of RE 2.5.1a (DES 2021) and covers an area of approximately 63.6 ha (1.8%) across the Project, Transport and Infrastructure MLs.

This vegetation community is a low woodland dominated by Wild Plum (*Terminalia platyphylla*) and Beefwood (*Grevillea striata*), with Western Bloodwood (*Corymbia terminalis*) and Whitewood (*Atalaya hemiglauca*) associated in the upper canopy, and *Melaleuca spp.* in the sub-canopy (Figure 12).

The canopy height within this community ranges from 5 – 7 m with a canopy cover of 12 – 29%. The shrub layer is dominated by Currant Bush (*Carissa lanceolata*), with occasional *Flueggea virosa*, averaging approximately 2 m tall with a 5% cover. The ground layer is sparse, with around 50% bare ground, and patches of litter and tussock grasses scattered throughout. The grasses on the ground layer are primarily Feathertop Wiregrass (*Aristida latifolia*) and Silky Browntop (*Eulalia aurea*), making up approximately 32% of the total groundcover.



Figure 12: Wild Plum/Beefwood/Bloodwood woodland on sand plains (VC1a)

6.1.1.2 Western bloodwood low woodland on sandy soil (VC 1b)

This vegetation community is best represented by RE 2.5.12a (DES 2021) and it is the dominant woodland vegetation within the study area, consisting of one large continuous patch of approximately 772.4 ha (approximately 22%) of the total ML area.

The Western Bloodwood low woodland on sandy soil vegetation community canopy is typically dominated by Western Bloodwood, though other *Corymbia* species such as Cabbage Gum (*Corymbia grandifolia*) and Broad-leaved Gum (*C. confertiflora*) were also present, sometime forming an emergent layer (Figure 13).

The canopy is typically 9 m high, with a sparse cover density ranging from 1-15%. The subcanopy is similarly variable with a cover density ranging from 1-22%, made up primarily of Common Hakea (*Hakea arborescens*), *Melaleuca* spp., and Beefwood approximately 4 m high. The shrub layer is sparse with only 1% cover density, consisting of Currant Bush and *Flueggea virosa*, while the ground vegetation cover ranged from 20-80% cover dominated by Feathertop Wiregrass, with Silky Browntop and Golden Beardgrass (*Chrysopogon fallax*) associated. On average, bare ground accounted for 35% of ground cover, while litter accounted for 20%.



Figure 13: Western bloodwood low woodland on sandy soil (VC1b)

6.1.1.3 *Melaleuca* spp. low open woodland on alluvial plains (VC 1c)

The *Melaleuca* spp. low open woodland on alluvial plains vegetation community is found in two patches within the study area totalling 56.3 ha (approximately 1.6%) of the total ML area and is best represented by RE 2.5.33b (DES 2021).

This vegetation community is a low open woodland dominated by species of *Melaleuca*, including *M. citrolens*, *M. nervosa*, with other species such as *Terminalia platyphylla* and Cabbage Gum also present in the canopy and emergent layer (Figure 14).

The canopy of VC1c is lower and more dense than other woodland vegetation communities recorded within the study area, averaging only above 5 m high with a canopy cover ranging from 4-35%. The shrub layer is similar to those in the other recorded woodland communities, consisting of Currant Bush and *Flueggea virosa*, and cover density from 9-30%.

The ground layer is less dense than other woodland communities, with living matter making up from 6-55% of the total groundcover. Living matter is dominated by Feathertop Wiregrass, with Northern Wanderrie Grass (*Eriachne obtusa*) and the introduced Buffel Grass (*Cenchrus ciliaris*) associated. On average, bare ground accounts for approximately 45% of ground cover, while litter accounts for approximately 30%.



Figure 14: *Melaleuca* spp. low open woodland on alluvial plains (VC 1c)

6.1.2 Woodlands on alluvial soils

Two vegetation communities associated with woodlands on alluvial soil were identified within the study area. A description of their distribution within the study area and their floristic characteristics is provided in Sections 6.1.2.1 and 6.1.2.2.

6.1.2.1 Coolibah woodland on alluvial plains (VC 2a)

Within the study area, this riparian vegetation community is found along the Saxby River, making up only 1.83 ha (approximately 0.05%) of the total ML area. This vegetation community is best represented by RE 2.3.17a (DES 2021).

Both canopy and subcanopy dominated by Coolibah (*Eucalyptus microtheca*) and River Red Gum (*E. camaldulensis*), with *Terminalia platyphylla*, *Lysiphyllum cunninghamii*, and *Psyrax* spp. also associated. Both canopies are taller and more dense than other vegetation communities within the study area, with tree heights of 12 m and 7 m the subcanopy, and canopy covers of 35% and 28% within the upper and lower canopies respectively.

The shrub layer is almost non-existent, though individuals of Whitewood, *Terminalia aridicola*, *Flueggea* spp., and the environmental weed Mimosa Bush (*Vachellia farnesiana*) were scattered throughout, averaging approximately 1m in height. The ground layer is more prominent than in other vegetation communities, with living matter accounting for 50-75% of total ground cover and dominated by Silky Browntop.



Figure 15: Coolibah woodland on alluvial plains (VC 2a)

6.1.2.2 Gidgee low woodland on alluvial plains (VC 2b)

The Gidgee low woodland on alluvial plains is located in small patches within the study area, covering a total of 21.7 ha (0.6%) of the total ML area. This vegetation community is best represented by RE 2.3.7a.

This vegetation community is defined by an upper and lower canopy almost completely dominated by Gidgee (*Acacia cambagei*). The species *Grevillea striata* and *Psyrax* spp. are occasionally present in the canopy. While the upper canopy is quite robust with an average height of 7 m and canopy cover of 25-40%, the lower canopy has a cover density of 3-8%, and only 3 m in height.

The shrub layer is mostly non-existent, with only occasional young Gidgee or Whitewood present. The ground layer is variable, with large portions of bare ground (averaging 63%), broken up by patches of Fairy Grass (*Sporobolus caroli*) and Katoora Grass (*Sporobolus actinocladius*), and sporadic succulents such as Slender Pigweed (*Portulaca filifolia*), Red Spinach (*Trianthema triquetra*), and Black Pigweed (*Trianthema portulacastrum*).



Figure 16: Gidgee low woodland on alluvial plains (VC 2b)

6.1.3 Tussock grasslands

Four tussock grassland communities were identified within the study area, most of which defined by the dominance of Feathertop Wiregrass with other species making up the mosaic. More detailed descriptions of their distributions and makeups within the study area are provided in Sections 6.1.3.1 to 6.1.3.5.

6.1.3.1 Tussock grassland on Tertiary clay deposits (VC 3a)

VC 3a is the most prevalent vegetation community within the Study area, both within the primary area of planned infrastructure and along the proposed access road, accounting for a total of 2552.8 ha (approximately 72%) of the total ML area. The community is best represented by RE 2.4.2b (DES 2021).

The ground layer is dominated primarily by Feathertop Wiregrass, with Silky Browntop, Mitchell Grass (*Astrelba* spp.) and *Eragrostis* spp. also associated and occasionally, locally dominant. The dominance in the grass species seems to correlate to the differences in the soil, where areas with darker soil, with less sandy in the surface were dominated by Mitchell Grass.

The tree layer is almost entirely absent, though there is the occasional emergent Whitewood and Beefwood. The shrub layer is similar in its coverage, also dominated by Whitewood and the environmental weed Mimosa Bush.

Vegetation varied throughout the year, influenced by grazing pressure and climate variation, recording a range from 25% to 90% grass cover. Visual observations and transects data indicate that under favourable conditions, the vegetation cover is in the higher end of the range, whilst under grazing pressure and dry conditions, the ground cover is in the lower part the range.



Figure 17: Tussock grassland on Tertiary sandy clay deposits during the post-wet season survey (VC 3a)

6.1.3.2 *Aristida* spp. / *Sporobolus* spp. grassland on alluvial deposits (VC3b)

The *Sporobolus* spp. and *Aristida* spp. grassland on alluvial deposits community occurred south of where the Saxby River intercepts with the access road, making up approximately 11.6 ha (0.3 %) of the total ML area. This community is best represented by the RE 2.3.69a (DES 2021).

The ground layer is dominated by Feathertop Wiregrass, with Katoora Grass as associated. Vegetation cover is fairly low, making up an average of 30%, less than half the average bare ground percentage.

The tree layer is barely present and only 2 m tall, with scattered Gutta-percha (*Excoecaria parvifolia*) individuals. The shrub layer is dominated by scattered individuals of Currant Bush.



Figure 18: *Aristida spp./Sporobolus spp.* grassland on alluvial deposits (VC 3b)

6.1.3.3 Common Native Couch and *Sporobolus spp.* dominant grassland on silty clays (VC 3c)

VC 3c is a grassland community found adjacent to watercourses within the study area, making up 33.7 ha (0.95%) of the total ML area. This community is best represented by RE 2.3.69b (DES 2021).

The ground layer is dominated by Common Native Couch (*Brachyachne convergens*) Katoora Grass, with Feathertop Wiregrass associated. Vegetation groundcover varied from site to site, ranging from 25% to 90% coverage, likely due to climatic variation and grazing pressure, while the organic litter is nearly absent.

The tree layer is minimal, consisting of scattered individuals of Whitewood, Gidgee and Beefwood with no measurable canopy cover. The shrub layer is similarly bare, with only a few individuals of Currant Bush present.



Figure 19: Common Native Couch /*Sporobolus spp.* dominant grassland on silty clays (VC 3c)

6.1.3.4 Feathertop Wiregrass and Common Native Couch grassland on sandy loam (VC 3d)

This vegetation community accounts for approximately 17 ha (approximately 0.5%) of the total ML area, and it is best represented by the RE 2.5.35 (DES 2021).

The Feathertop Wiregrass and Common Native Couch grassland on sandy loam community is quite similar to those represented in VC 3b and VC 3c, except that it occurs on residual Quaternary sand deposits rather than active Quaternary alluvial deposits.

The ground layer is dominated by Feathertop Wiregrass, with Common Native Couch and Leafy Nineawn (*Enneapogon polyphyllus*) associated, with a groundcover percentage averaging 20% whilst the bare ground averages circa 80%. The tree and shrub layer were both non-existent.



Figure 20: *Feathertop Wiregrass and Common Native Couch grassland on sandy loam (VC 3d)*

6.1.3.5 Seasonal swamp dominated by Common Native Couch in circular depressions in sand plains (VC3e)

The seasonal swamp community within the study area occurred only in small areas along the access road, making up approximately 0.2 ha (0.005 %) of the total ML area. This community is best represented by the RE 2.3.33b (DES 2021).

The ground layer is dominated by Common Native Couch. Vegetation cover reached an approximate 50%, with a 38% of the bare ground percentage.

Similar to VC3b and opposed to the RE description, the tree and shrub layers are barely present. The tree layer is only 2 m tall, with scattered Gutta-percha (*Excoecaria parvifolia*) individuals whilst the shrub layer is dominated by scattered individuals of Currant Bush.

This vegetation community gets seasonally inundated but has no links to groundwater. The Transport ML intersects 0.45 ha of one such minor depression, also mapped as VM Wetland (Section 4.2.3.1) along the access road.



Figure 21: Seasonal swamp dominated by Common Native Couch in circular depressions in sand plains (VC 3e)

6.2 Vegetation condition

The condition of vegetation and the nature of disturbance present within the vegetation communities was assessed. Disturbances noted during the field surveys included previous vegetation clearing for agricultural activities, cattle grazing activities, roads/tracks, man-made canals for irrigation and the occurrence of weeds.

Evidence of cattle grazing was observed at all sites and habitats, in the form of tracks, pats, and direct observation. The environmental weed Mimosa Bush was present at half of all sites, while other introduced species such as Spike Mallow (*Malvastrum americanum*), and Sticky Stylo (*Stylosanthes viscosa*) were observed within VC 2a. Noogoora Burr was identified within VC1c in the survey site BC18. Bare ground and litter cover however only accounted for 1% of vegetation coverage within the affected communities, with the exception of the occurrence of Buffel Grass within VC 2.5.33a, 8% of the ground layer within survey site BC13. There was also evidence of debris resulting from storm damage within VC 2a recorded in the post-wet season survey.

6.3 Native flora species

A total of 89 native flora species were recorded during the field surveys representing 26 families and 63 genera. The dominant family group was Poaceae (22 species) with Leguminosae (16 species) and Myrtaceae (9 species) also prominent. The dominant family groups demonstrate the overall composition and condition of the vegetation communities surveyed, with the ground layer being the most diverse. A complete list of flora species recorded is provided in Appendix G, together with their native or introduced status.

No Critically Endangered, Endangered, Vulnerable, or Near Threatened Flora species under the NC Act or the EPBC Act were identified within the study area.

6.4 Introduced flora species

Nine introduced flora species were recorded within the study area in low to moderate abundance.

- 1) Black Pigweed (*Trianthema portulacastrum*)
- 2) Caribbean stylo (*Stylosanthes hamata*)
- 3) Sticky Stylo (*Stylosanthes viscosa*)
- 4) Townsville Stylo (*Stylosanthes humilis*)
- 5) Noogoora Burr (*Xanthium occidentale*)
- 6) Mimosa Bush (*Vachellia farnesiana*)
- 7) Spike Mallow (*Malvastrum americanum*)
- 8) Buffel Grass (*Cenchrus ciliaris*)
- 9) Pigweed (*Portulaca oleracea*)

None of these species are listed as prohibited matters, or restricted matters under the Biosecurity Act (Qld).

Introduced flora species may also be classified by the Federal Government as Weeds of National Significance (WoNS) if they present a serious threat to industry, water supply, human health/safety, plant communities and/or cultural values. None of the species identified within the study area are classed as WoNS.

A complete list of the flora species, indicating their native or introduced status, is provided in Appendix G.

6.5 Conservation significant vegetation communities

No vegetation communities identified in the study area are listed as Of Concern or Endangered under the VM Act.

Four vegetation communities identified in the study area were identified as having a Biodiversity Status - Of Concern. Biodiversity Status is based on an assessment of the condition of remnant vegetation in addition to the criteria used to determine VM Act classes and it is used on a range of planning and management applications including the Biodiversity Planning Assessments and to determine environmentally sensitive areas. The environmental value of these REs, three of which are located within or adjacent to the Saxby River, linked to the biodiversity corridor along the Saxby River (Figure 4). The fourth is partly associated with a mapped VM Act wetlands which intersects the Transport ML. It should be noted that Biodiversity Status is not a prescribed matter.

The Transport ML intersects with 0.45 ha of the above mentioned mapped VM Wetland. This wetland corresponds mostly to a small area of VC3e (as described in Section 6.1.1.1) and the rest to the surrounding VC1a. As described in Section 3.2.5 remnant vegetation intersecting a VM Wetland is a prescribed matter. An impact assessment to this prescribed matter is discussed in Section 9.2.1.1

6.6 EPBC Act Threatened Ecological Communities

The EPBC Act Protected Matters Search Tool identified one TEC with the potential to occur within the study area. 'The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin' TEC, is defined as a combination of native species, not necessarily linked to a RE. Natural discharge from the Great Artesian Basin may occur as springs, mound springs, mud springs, boggomoss springs, spring pools or groundwater seeps (DCCEEW 2021). As detailed in Section 4.2.2.1, no springs have

been mapped within the study area, further, no natural discharge from the Great Artesian Basin has been identified within the study area during the surveys.

No vegetation that could represent TEC's were identified during the field surveys.

6.7 Conservation significant flora species

As described in Section 5.2.2.4, conservation significant flora species identified by the desktop assessment were targeted during the flora surveys. No conservation significant flora species were recorded during the field surveys.

7 Fauna results

7.1 Major habitat types

Field surveys identified three major habitat types for fauna within the study area. The major habitat types within the study area are shown in Figure 23 and Figure 24 and are described in Section 7.1.1 to Section 7.1.3.

7.1.1 Mixed dry woodland

The mixed dry woodland major habitat type includes grassy woodlands occurring on sandy soils with a sparse tree layer made up of a variety of species, most notably Wild Plum, Western Bloodwood, Whitewood, and Gidgee with Beefwood and *Melaleuca* spp. present and occasionally dominant. The shrub layer within this habitat type is minimal, comprised primarily of Currant Bush and *Flueggea virosa*. The ground layer is largely dominated by Feathertop Wiregrass, though other grass species including Silky Browntop, Golden Beardgrass, and *Sporobolus* spp. are also present amidst mixed bare ground. This habitat type is widespread across the study area, covering approximately 26% of the ML (Figure 23) and provides connectivity and refuge for neighbouring grassland habitats.

Regional Ecosystems associated with the mixed dry woodlands major habitat type within the study area include RE 2.5.1a, RE 2.5.12a, RE 2.5.33, and RE 2.3.7a.

Key habitat characteristics include a variety of shelter such as a low number of small, medium, and large hollows, exfoliating bark, stags, leaf litter and grass cover (Figure 22). This habitat type provides suitable shelter and foraging habitat for a range of reptiles, woodland bird species, and ground-dwelling mammals. Sections of this habitat with a denser tree layer provide a seasonal high level of organic litter. This habitat has been subject to light grazing related disturbance and light clearing for tracks. The invasive Mimosa Bus was present in low densities throughout this habitat.



Figure 22: Mixed dry woodland on sandy soils

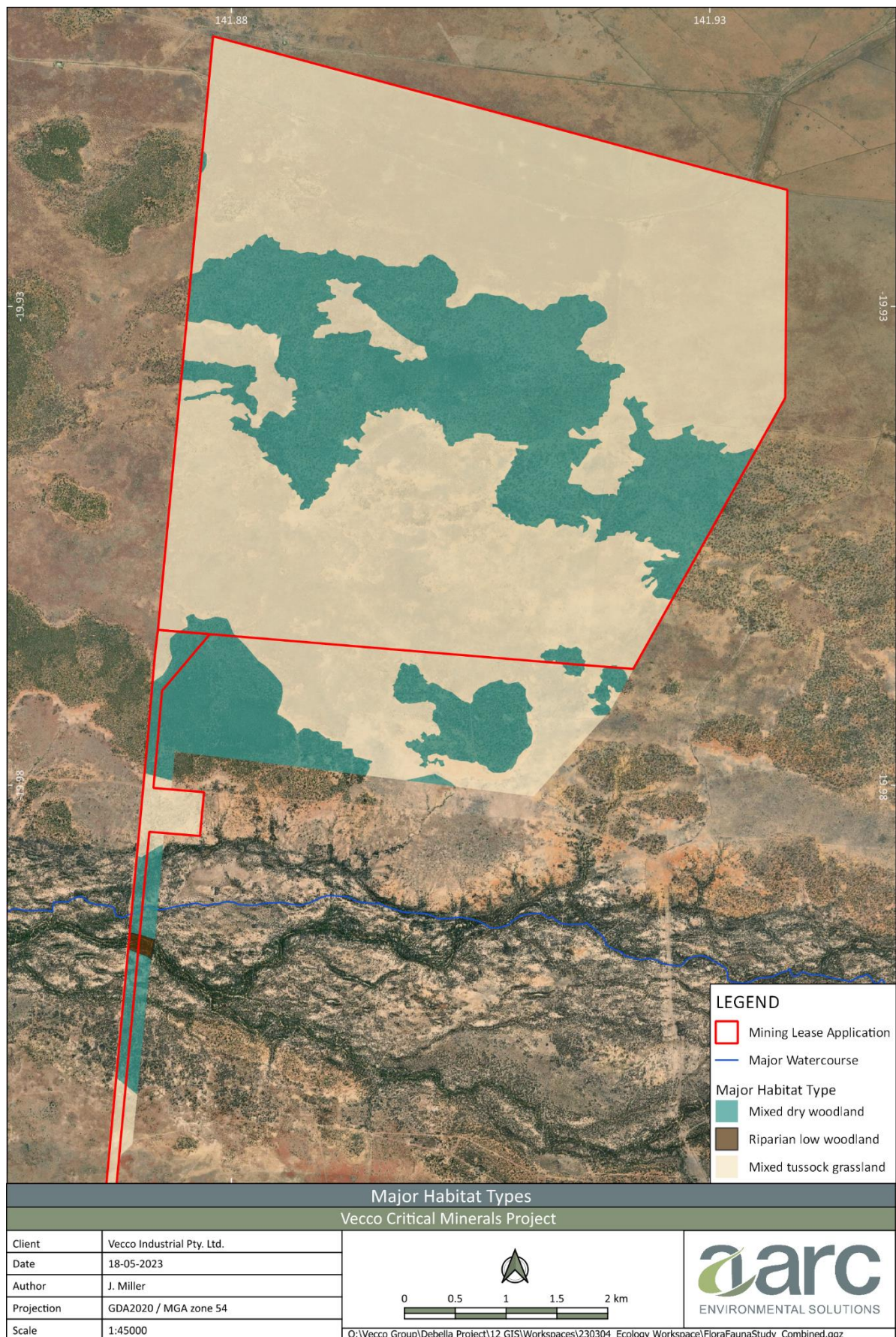


Figure 23: Major fauna habitat types within the main Project area

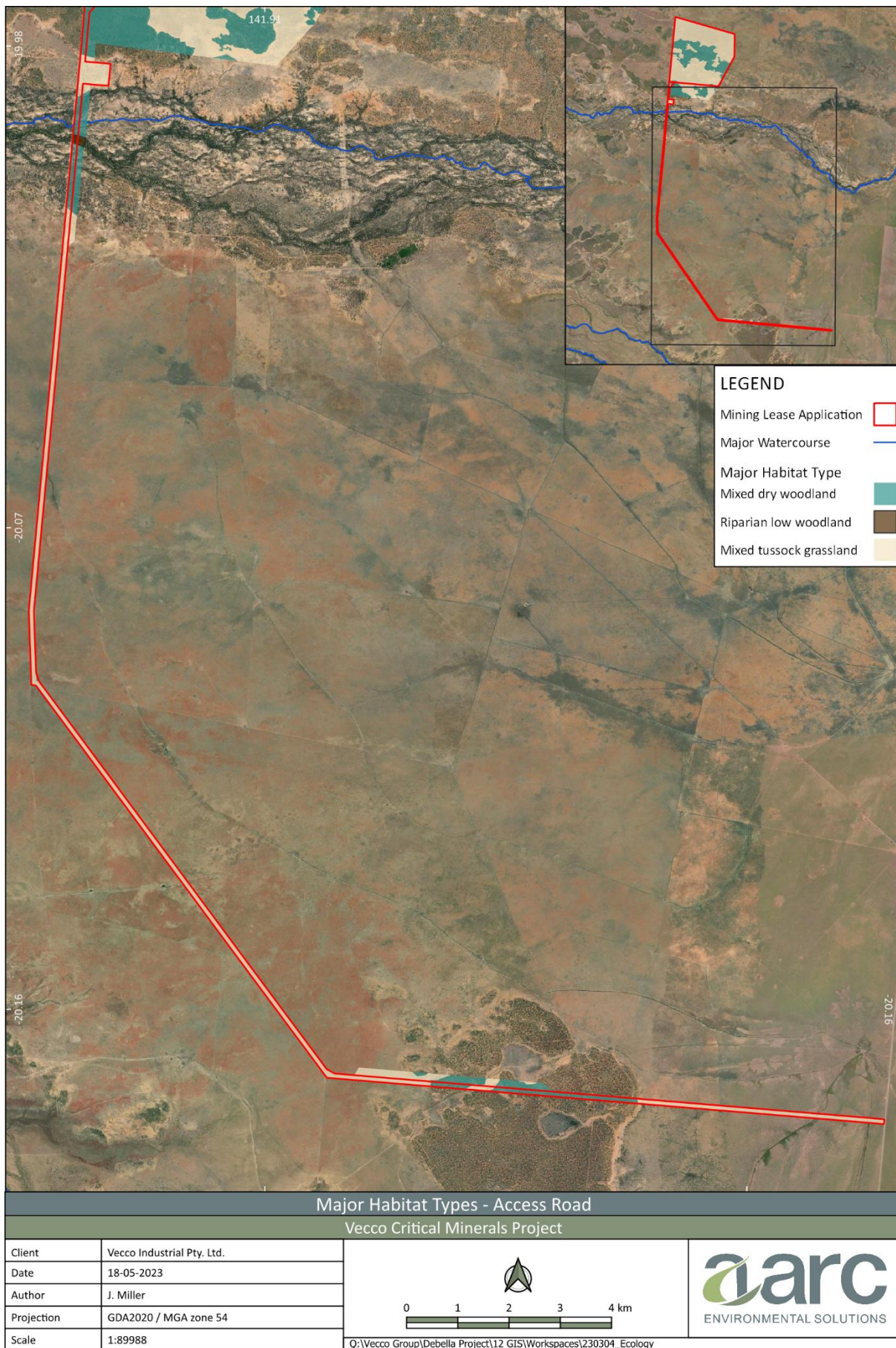


Figure 24: Major fauna habitat types within the access road area

7.1.2 Riparian low woodland

This habitat type sits on alluvial soil, adjacent to large ephemeral waterway channels and tributaries. The tree layer is denser than the other recorded habitat types. Along the riparian areas adjacent to more defined watercourses, the tree layer is dominated by Coolibah and the Red River Gum, with *Terminalia platyphylla*, *Bauhinia* spp. and *Melaleuca* spp. also present. The shrub layer along riparian zones is entirely absent, while the ground layer was denser than other habitat types, dominated by Silky Browntop and some forbs such as *Uraria lagopodioides* and *Tephrosia* spp.

The riparian low woodland major habitat type is represented only by RE 2.3.17a within the study area, accounting for 1.8 ha (0.05%) of the ML. The riparian vegetation is identified as part of the state significant corridors connecting to state significant riparian vegetation along the Saxby and the Flinders Rivers. The riparian vegetation and channels provide habitat for amphibians, reptiles and ground-dwelling mammals through a moderately high presence of small and medium hollows, some large hollows, exposed tree roots, leaf litter and coarse woody debris. The wooded areas provide foraging habitat for birds and arboreal mammals. Presence of crab exoskeletons suggests sufficient water during the wet season to sustain a crab population, and the high presence of grasshoppers and other insects indicate a rich food source for insectivorous species.

Light grazing and cattle access related disturbance were observed within the vegetation associated with this habitat type, using the streambed as a track. The environmental weed Mimosa Bush is present in low densities throughout the habitat.



Figure 25: Riparian low woodland

7.1.3 Mixed tussock grassland

The mixed tussock grassland is the predominant habitat type within the study area, accounting for circa 74% of the ML. The ground layer is dominated by native tussock grass species, while the shrub and tree layer are typically absent with only isolated shrubs such as Whitewood, Beefwood or Mimosa Bush. There are two main types of tussock grassland within the study area, grasslands on active Quaternary alluvial deposits, sandy clay soil and grassland on residual Quaternary sand deposits. The areas with clay soil are expected to retain water for a longer period of time after rain events (e.g. the grassland areas located both sides of the riparian low woodland habitat, contained seasonal pools of water as a result of water passing through the clay soils slower than the nearby sandy streambed).

The habitat value of the grassland areas is limited by the lack of shelter/cover and the disturbance from grazing. However, these open areas provide hunting habitat for birds of prey and provide some foraging habitat for ground-dwelling mammals. Large areas of the grassland are characterised by sandy clay and provide habitat for a range of ground-dwelling mammals, amphibian species and reptiles. As detailed in Section 6.1.3.1, the dominance of the vegetation varies with patches locally dominated by *Aristida* spp. or Mitchell Grass, giving it a mosaic appearance. This variation seems to be related to the soil composition, in particular to the abundance of sand on the surface.



Figure 26: Mixed Tussock Grassland

7.2 Native fauna species

A total of 123 native vertebrate species were identified within the study area during the field surveys, comprising 1 amphibian, 22 reptiles, 85 birds and 15 mammals (9 of them confirmed micro-bat species). A description of the amphibian, reptile, bird and mammal assemblages within the study area is provided in Section 7.2.1 to Section 7.2.4. A complete list of fauna species recorded is provided in Appendix H, together with their conservation status under the EPBC Act and NC Act.

7.2.1 Amphibians

One native amphibian species was identified by the field surveys, the *Litoria caerulea* from the Hylidae family. This tree dwelling species is not listed under the EPBC Act but is listed as Least Concern species under the NC Act and is found commonly throughout the region. The species recorded was generally observed along creek lines, or within areas with sandy clay soils.

7.2.2 Reptiles

Twenty-two native reptile species were recorded during field surveys within the study area. One individual from the *Carlia* genus and one from the *Diporiphora* genus were only able to be identified to the genus level. The reptile assemblage included eight skink species, six gecko species, four dragon species, two monitor species, one legless lizard, one snake species, and one turtle. The reptile species found are not listed under the EPBC Act but are listed as Least Concern species under the NC Act, and found commonly throughout the region, with the exception of *Lerista zonulata*, which was found ~234 km west of its currently recorded range. *Lerista zonulata* was identified by the Queensland museum via voucher specimen.

The study area provided a variety of habitat types to promote reptile diversity, such as vegetated drainage features, woodlands and grasslands. This range of habitat provided microhabitats such as fallen timber, bark crevices, decorticating bark, ponds and soil cracks, providing shelter from extreme climate, protection from aerial predators and foraging habitat.

7.2.3 Birds

A total of 85 bird species were recorded during the field surveys. A variety of avian feeding guilds were observed within the study area, with the avian assemblage including carnivores, insectivores, granivores, omnivores, nectarivores, and frugivores. No species of conservation significance were recorded within the study area.

Avian assemblages are generally determined by factors such as food sources (e.g. fruit, nectar, seeds and insects) as well as a mosaic of habitat structures such as grasslands and open woodlands, with variation in vertical habitat complexity. Generally, the more heterogenous the habitat and the more food sources available, the more diverse the avifauna will be. The study area doesn't present a high variety of habitats, nor vertical complexity, nevertheless, it can support a variety of native avian species.

7.2.4 Mammals

A total of 15 native mammal species were recorded within the study area, comprising three macropods, two ground-dwelling mammals, one flying fox and nine confirmed micro-bat species. No species of conservation significance were recorded within the study area.

The study area provided a variety of habitat types suitable for small ground-dwelling mammals, the mixed dry woodland, the riparian low woodland and mixed tussock grassland.

Micro-bats are reliant on roosting sites such as thick foliage, loose decorticating bark, rock caves or cavities and tree hollows (Churchill 2008). Potential roosting sites in the study area included tree hollows and decorticating bark, which were limited to the woodland vegetation communities.

The potential presence of the Julia Creek Dunnart and associated habitat was addressed in a separate targeted survey (Ecosmart Ecology 2023).

7.3 Introduced fauna species

Five introduced fauna species have been recorded within the study area through the detection of scats, tracks, sensor camera detection and/or direct observation:

- 1) Cane Toad (*Rhinella marina*)
- 2) European Cattle (*Bos taurus*)
- 3) Wild Dog (*Canis familiaris*)
- 4) Feral Cat (*Felis catus*)
- 5) Feral Pig (*Sus scrofa*)

Three of the introduced species, the Feral Cat, the Feral Pig and the Wild Dog are listed as a restricted matter, and none are a prohibited matter under the Biosecurity Act (Qld).

7.4 Conservation significant fauna species

As described in Section 5.3, conservation significant fauna species identified by the desktop assessment were targeted during the fauna surveys. No conservation significant fauna species were recorded during the field surveys.

The potential presence of the Julia Creek Dunnart and associated habitat was addressed in a separate targeted (Ecosmart Ecology 2023).

8 Potential impacts and avoidance, mitigation and management

The proposed Project development can be split into three Project stages, each with identifiable impacts. The areas impacted by each stage are presented in Figure 27, with the activities of the three stages including:

- Stage 1– project construction—occurs over approximately 1 year (Project Year 1);
- Stage 2– open cut pit, mining along the ore deposit—occurs over approximately 26 years (Project Year 2 to Project Year 26); and
- Stage 3– decommission and removal of mine infrastructure, rehabilitation completion—occurs over approximately 10 years (Project Year 26 to Project Year 36).

The potential impacts of the Project on terrestrial flora and fauna and their habitats will occur under each Project stage:

- direct impacts through vegetation clearance and habitat disturbance;
- indirect impacts including:
 - fragmentation and edge effects;
 - weeds and pests;
 - noise and vibration;
 - dust;
 - artificial lighting;
 - hydrological; and
 - bushfires.

The potential impacts of the Project and the measures developed to avoid, mitigate and manage impacts on terrestrial flora and fauna are described in Section 8.1. Section 9 describes the potential impacts and avoidance, mitigation and management measures specific to MNES and MSES and assesses the significance of the impacts on these matters.

8.1 Direct impacts

8.1.1 Vegetation clearance and habitat disturbance

A total of 1,385.6 ha of remnant vegetation will be cleared as a result of the Project, including the access road. This represents some 33% of remnant vegetation within the study area. Table 8 details the proposed clearance of each vegetation community identified in the study area.

The project footprint in relation to the vegetation communities within the study area is shown in Figure 27.

Table 8: Field verified vegetation communities within the study area

Map Unit	Vegetation Community	Associated RE	Extent within ML (ha)	Area of disturbance (ha)
1: Low dry woodlands				
VC 1a	Wild Plum/Beefwood/Bloodwood woodland on gently undulating sand plains	2.5.1a	63.56 ha	25.95 ha
VC 1b	Western bloodwood low woodland on sandy soil	2.5.12a	772.37 ha	446.5 ha
VC 1c	<i>Melaleuca spp.</i> low open woodland on alluvial plains	2.5.33b	56.34 ha	47.8 ha
2: Woodlands on alluvial soils				
VC 2a	Coolibah woodland on alluvial plains	2.3.17a	1.83 ha	0.9 ha
VC 2b	Gidgee low woodland on alluvial plains	2.3.7a	21.74 ha	12.1 ha
3: Tussock grasslands				
VC 3a	Tussock grassland on Tertiary clay deposits.	2.4.2b	2,552.8 ha	809 ha
VC 3b	<i>Aristida spp./Sporobolus spp.</i> grassland on alluvial deposits	2.3.69a	11.57 ha	5.9 ha
VC 3c	Common Native Couch dominant grassland on silty clays	2.3.69b	33.67 ha	30.9 ha
VC 3d	<i>Feathertop Wiregrass and Common Native Couch</i> grassland on sandy loam	2.5.35	17 ha	6.2 ha
VC 3e	Seasonal swamp dominated by Common Native Couch in circular depressions in sand plains	2.3.33b	0.2 ha	0.2 ha

The vegetation within the study area provides terrestrial fauna with opportunities for foraging, breeding, nesting, predator avoidance and movement between areas, facilitates dispersal/migration and promotes genetic diversity by providing connectivity within the broader area. These opportunities could potentially be reduced for fauna by clearance activities associated with the Project. Where practicable, Project infrastructure has been located to avoid and minimise impacts to the woodland communities with connectivity values. Table 9 details the proposed clearance of each major habitat type identified in the study area.

Table 9: Field verified vegetation communities within the study area

Vegetation Community	Extent within study area (ha)	Area of disturbance (ha)
Mixed dry woodlands	1,240.9 ha	532.3 ha
Riparian low woodlands	4.7 ha	0.9 ha
Mixed Tussock Grassland	2,953 ha	852.2 ha

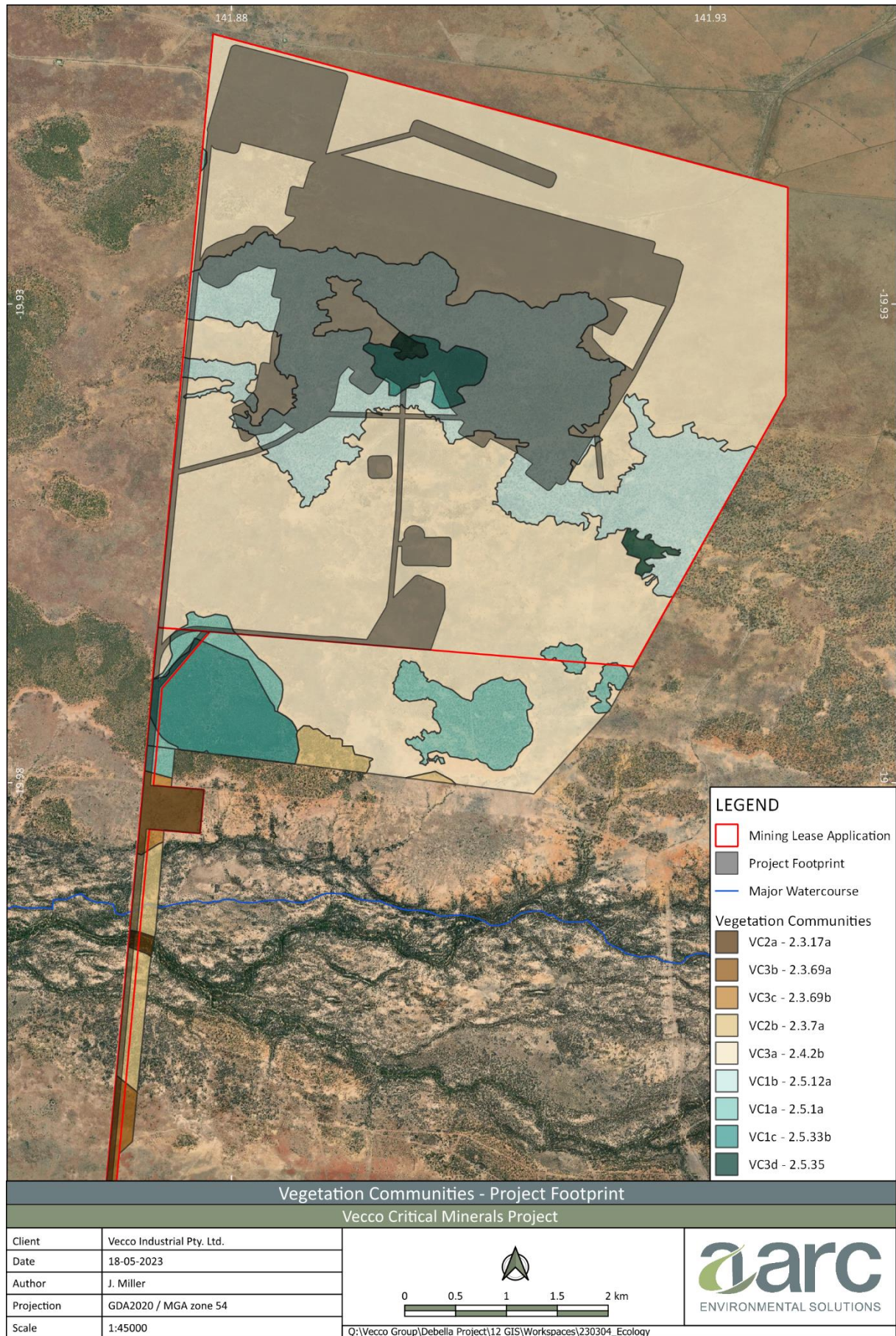


Figure 27: Vegetation communities and Project footprint within the main Project area

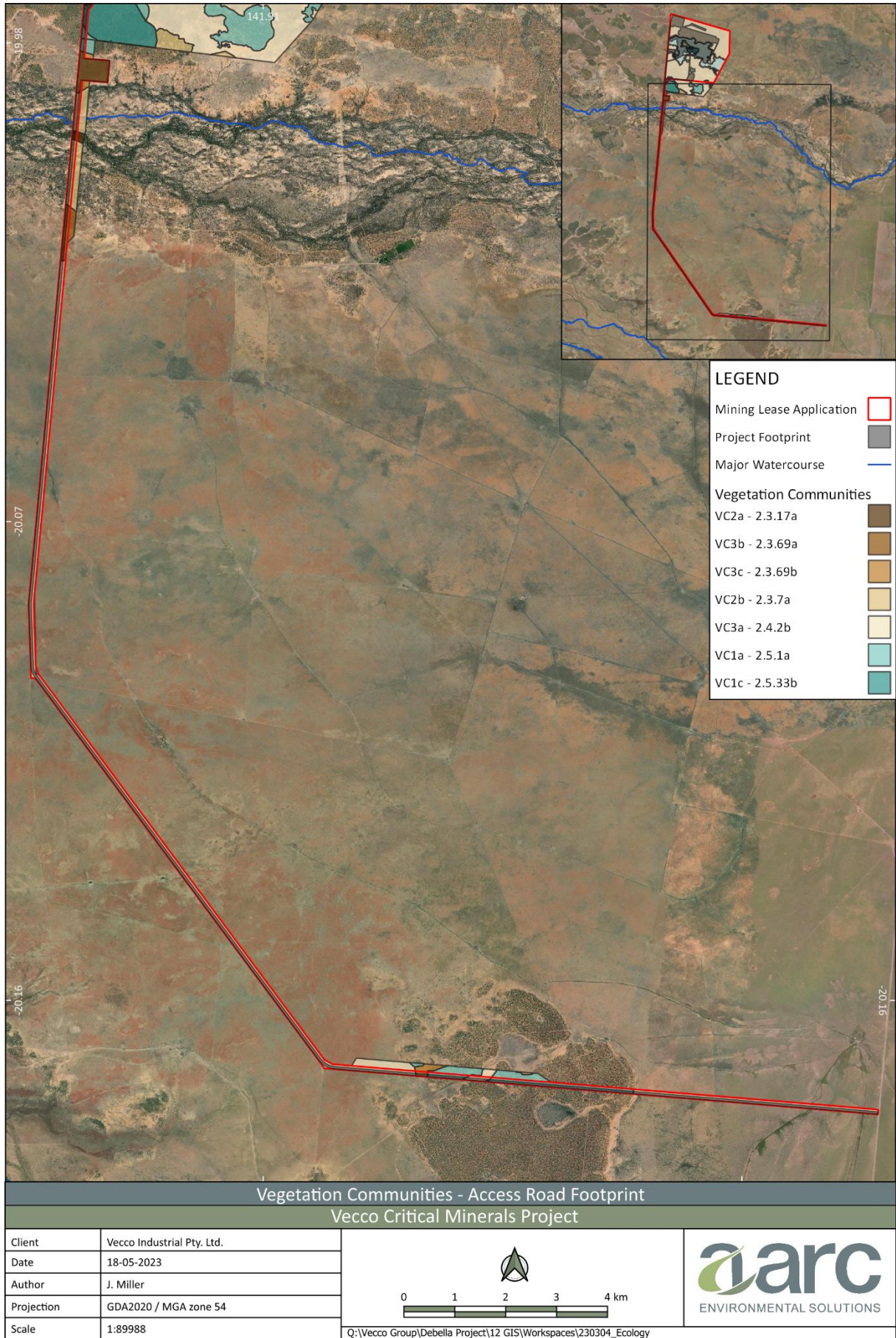


Figure 28: Vegetation communities and Project footprint within the access road area

8.1.1.1 Vegetation clearance protocols

The following management measures will be implemented where vegetation clearance is necessary:

- Clearing activities will be undertaken progressively in accordance with the mine schedule and Project requirements and not before.
- Vegetation/habitat adjoining proposed clearance areas will be delineated and clearly marked to prevent accidental damage through a 'Permit to Disturb' process.
- Areas to be cleared will be inspected to identify fauna at direct risk from clearing activities.
- Vegetation will be felled in the direction of the clearance zone to avoid impacts to adjoining retained vegetation and habitat.
- Clearing operations will be managed to maximise the reuse of cleared vegetative material. This will include the salvage and reuse of select habitat resources from the cleared vegetation (e.g. logs) for habitat enhancement either in the rehabilitation program or elsewhere on site.

Management measures for areas of temporary disturbance include the following criteria:

- Existing tracks will be used to access sites to minimise the disturbance of soils and creation of new tracks.
- Vegetation clearance will be restricted to the slashing of vegetation (i.e. leaving the lower stem and roots *in-situ* to maximise the potential for natural regrowth), where practicable.
- Branches will be lopped, rather than removing trees, where practicable.
- The amount of soil disturbance will be limited to the minimum required for the mobilisation, placement and operation of equipment and for maintaining access to equipment.
- Rehabilitation measures will be implemented in the event that natural regeneration is considered not to be progressing (e.g. weed control measures or active planting). Details of proposed rehabilitation measures are provided in the Project PRC Plan.

8.1.1.2 Clearing Management Program

A Clearing Management Program will be prepared for the Project by a suitably qualified ecologist in accordance with guidelines prior to Project clearance activities.

The Clearing Management Program will include the following criteria:

- Measures will be implemented to minimise disturbance and salvage and reuse of select habitat features in accordance with the vegetation clearance protocols.
- Protocols will be implemented to handle fauna encountered prior to or during clearing activities, including their relocation as necessary to suitable habitat.
- An appropriately qualified fauna spotter/catcher will be present during clearing.
- Protocols will be implemented to handle injured wildlife, including emergency euthanasia.

8.1.1.3 Rehabilitation

Land disturbed by mining activities will be rehabilitated progressively as it becomes available. Details of the proposed rehabilitation program are provided in the Progressive Rehabilitation and Closure Plan (PRC Plan) prepared for the Project. In accordance with the Queensland government's policy objectives defined in the 'Mined land rehabilitation policy' (Queensland Government 2018), the general rehabilitation goals for the Project are to leave an area that is safe and stable, does not cause environmental harm and is able to sustain the post-mining land use approved in the PRC Plan.

8.2 Indirect impacts

8.2.1 Habitat fragmentation and connectivity

Vegetation clearing can result in a variety of environmental consequences, including habitat fragmentation reducing connectivity and reduced habitat value (through the impact of edge effects). Habitat fragmentation can impact both flora and fauna species. Often clearing activities form barriers that restrict and impair the movement of fauna species, resulting in lowered habitat connectivity.

Edge effects are impacts that occur along the boundary of natural or remnant vegetation and cleared or developed land. This boundary is exposed to increased light, wind shear and weed invasions augmenting the local environment (e.g. altered species and structural composition).

Riparian corridors associated with Saxby River provide east–west fauna movement opportunities through the landscape. The riparian vegetation along this stream is mapped as state significant corridors connecting to state significant riparian vegetation along the Saxby and the Flinders Rivers. This riparian corridor associated provide species with opportunities for movement and dispersal. While the Project infrastructure corridor primarily traverses grassland areas, the access road will traverse the riparian corridor of the Saxby River at a point where an existing access track crosses the Saxby River. The crossing of the Saxby River will be primarily bed level with box culverts on larger channels. The road crossing will be perpendicular to the river channel, minimising disturbance within the riparian ecosystem. The risk to connectivity from the access road crossing is considered low.

The avoidance, mitigation and management measures that have been described for direct vegetation clearance/habitat disturbance are also relevant to minimising habitat fragmentation and impacts on connectivity.

8.2.2 Weeds and pests

Introduced flora species are effective competitors for resources and have the potential to reduce the floristic structure and diversity of native plant communities.

Nine introduced flora species have been recorded within the Study area (see Appendix G). However, none of these species is listed as restricted matters under the Biosecurity Act (Qld) and/or as WONS.

Activities that could introduce or spread weeds include soil disturbance and vehicle movements. Vegetation clearing can also result in 'edge effects', when the clearing activities cause modifications to the interface with natural habitats.

Five introduced fauna species that present risk to native fauna and their habitat have been recorded in the study area:

- 1) Cane Toad (*Rhinella marina*)
- 2) European Cattle (*Bos taurus*)
- 3) Wild Dog (*Canis familiaris*)
- 4) Feral Cat (*Felis catus*)
- 5) Feral Pig (*Sus scrofa*)

Three of the introduced species, the Feral Cat, the Feral Pig and the Wild Dog are listed as a restricted matter, and none are a prohibited matter under the Biosecurity Act (Qld)

Relative to these introduced species, the following are listed as key threatening processes under the EPBC Act³:

- biological effects, including lethal toxic ingestion, caused by Cane Toads;
- predation by Feral Cats; and
- predation, habitat degradation, competition and disease transmission by Feral Pigs.

The provision of scavenging areas (e.g. discarded food scraps and other rubbish) has the potential to increase populations of introduced fauna species in and around the Project area.

A Project Pest and Weed Management Plan will be prepared when appropriate to incorporate pest and weed management measures for the Project. The Pest and Weed Management Plan will include:

- inspections within the ML to identify areas requiring weed management to be implemented;
- weed management measures (e.g. mechanical removal and application of approved herbicides) in consideration of weed control strategies outlined by the Department of Agriculture and Fisheries and the 'North West Queensland Regional Biosecurity Plan 2022–2027' (North West Queensland Regional Council 2022);
- requirements for follow up inspections to assess the effectiveness of the weed management measures implemented and requirement for any additional management measures;
- requirements for maintenance of a clean, rubbish-free environment to discourage scavenging and reduce the potential for colonisation of these areas by introduced fauna;
- requirements for storage of domestic waste in appropriate receptacles and locations;
- feral animal control strategies in consideration of pest control strategies outlined by the Department of Agriculture and Fisheries, 'North West Queensland Regional Biosecurity Plan 2022–2027' (North West Queensland Regional Council 2022) and Threat Abatement Plans applicable to the EPBC Act listed key threatening processes; and
- requirements for minimisation of the period that areas remain in disturbed and or unvegetated condition.

It is considered unlikely that the Project will increase the occurrence or diversity of weeds or feral pests with the given management measures to be implemented.

8.2.3 Noise and vibration

Noise and vibration associated with construction and operation of the Project has the potential to disrupt the routine activities of fauna species.

Areas close to the source of vibration and noise production have the potential to become unused by certain fauna species. Any avoidance of these areas is likely to result from the intensity of the vibrations exceeding the tolerance levels of the species.

Potential sources of noise or vibration in the proposed mining area include the vehicle movements and the operation of equipment (e.g. haulage trucks, loaders, dozers, drill rigs, compressors and other drilling-related equipment).

The indirect noise impacts on the woodland and other habitats from the mining activities proposed to be undertaken or from vehicle movements on the haul road, will be minor given fauna often readily habituate to continuous noise. While sudden noise (e.g. blasting activities) has the potential to startle native fauna, animals are likely to adapt to the disturbance and/or move to similar habitats in the surrounding landscape.

³ A threatening process is defined as a key threatening process under the EPBC Act if it threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community.

8.2.4 Dust

Project operations have the potential to generate dust which may impact fauna and flora through increased atmospheric dust concentrations and dust deposition.

Studies have shown that excessive dust generation can impact the health and viability of surrounding vegetation (Reach Environmental 2020, Farmer 1993). High dust loads on vegetation adjacent to operations may result in reduced light absorption and increased leaf temperature, potentially impacting plant functioning (Chaston 2006). However, recent studies on the impacts of dust from unsealed roads on vegetation and fauna (Cumberland Ecology 2015; Jones *et al.* 2016) found no evidence that dust has any detrimental impacts on vegetation or fauna abundance. Notwithstanding, personnel and contractors will be required to observe speed limits when driving on access roads within mining area and surrounds to minimise the generation of dust.

A range of dust control measures will be employed at the Project including the watering of potential dust generating surfaces.

8.2.5 Artificial lighting

Artificial lighting will be established in the Project area. Project lighting has the potential to affect behavioural patterns of some species. Some bird and bat species, for example, are attracted to insects around lights and could become prey for larger predators (e.g. owls). Artificial lighting can also attract predators and invasive pests, both of which may pose a threat to native fauna (DoEE 2020).

The exterior lighting will be designed to provide a safe working environment. Australian Standard AS/NZS 4282:2019 'Control of the obtrusive effects of outdoor lighting' recognises the impact of artificial light on biota (DoEE 2020). To minimise potential impacts of artificial lighting, the placement, configuration and direction of lighting for the Project will be implemented in consideration of AS 4282:2019 'Control of the obtrusive effects of outdoor lighting' (Standards Australia 2019).

8.2.6 Vehicle strike

The movement of vehicles has the potential to increase the incidence of fauna mortality *via* vehicular strike. Ground-dwelling fauna are most susceptible to this potential impact. The risk of injury or mortality from vehicle strike is greatest where roads cross fauna movement corridors, such as the Saxby River.

Contributing risk factors for vehicle strike are the speed of vehicles on roads and tracks, and limiting speed can reduce the threat of vehicle strike to fauna species. Speed limits will be imposed on roads and tracks within the Project area to reduce the risk of vehicle strike on native fauna. Safe driving procedures will also be incorporated into site inductions to increase awareness of the risk of vehicle strike.

8.2.7 Hydrological changes

8.2.7.1 Surface water

A bed level crossing over the Saxby River was designed to have minimal impact on flow events, with a culvert over the main channel that will enable continued low flow and fish passage (Engeny 2023). As a result of this design principle, no hydrological changes and therefore no impacts on terrestrial ecology values, are expected from the crossing.

8.2.7.2 Flooding

There are no predicted changes to the flooding regime as a result of the Project (Engeny 2023), therefore, no impacts on terrestrial ecology values are expected.

8.2.7.3 Groundwater Dependent Ecosystems (GDEs)

Where wetlands (including riverine wetlands) exhibit a degree of dependence on groundwater for survival, drawdown from the mine may result in poorer ecosystem condition, changes to vegetation composition or dieback. Although a drawdown has been predicted as a result of the Project, the extent of drawdown is contained, in all sensitivity cases, to a small lateral area surrounding the mining void. Drawdown is not predicted to extend to the Saxby River alluvium, or any known wetland areas. Furthermore, the groundwater study has identified a geological disconnect between the Saxby Alluvium and the mine. Further assessment of the risk to GDEs is included in the groundwater assessment (JBT 2023). No drawdown related impacts to potential GDEs are expected.

8.2.8 Bushfire

While plants and animals have a range of mechanisms to survive individual fires, accidental bushfires could potentially occur if mine activities are not appropriately managed. Bushfire prevention and management measures will be implemented for the Project, and fire awareness will be included in the induction of personnel and contractors to minimise the risk of bushfire. Given the implementation of management measures, the Project is unlikely to increase the bushfire potential within the surrounding landscape.

8.2.9 Erosion and sedimentation

Vegetation clearing and land disturbance may result in topsoil exposure and erosion. In addition, disturbance within proximity to the Saxby River may also reduce bank stability and increase soil erosion and elevated sediment levels in downstream receiving waters.

The Project has the potential to result in erosion of disturbed areas and sedimentation of waterways through the clearing of vegetation for the development of open-cut pits and the construction of haul roads and other infrastructure.

Vegetation clearance protocols and erosion and sediment control measures will be implemented to minimise potential impacts, as described in Section 8.1.1.

9 Impact assessments

9.1 Matters of National Environmental Significance

No risk to MNES other than the potential presence of migratory species (Section 9.1.1) were identified within the study area.

The potential presence of the Julia Creek Dunnart and associated habitat was addressed in a separate targeted report (Ecosmart Ecology 2023).

9.1.1 Migratory species

9.1.1.1 Desktop analysis and description

Desktop analysis has been conducted of relevant databases to determine records of migratory species within the vicinity of the Project, including Wildlife Online and Atlas of Living Australia occurrence records. The desktop assessment also includes reviews of an ecological survey and assessments of nearby developments for information and records relating to migratory species.

Although no species listed as migratory under the EPBC Act were identified within the study area during the surveys, four have been identified by the desktop assessment as having known records within the wider region (50 km search area from the Project) (Section 4.2.2.2) and have the potential to occur within the study area. A description of distribution, habitat, ecology and an assessment of their likelihood of occurrence for each species of conservation significance (threatened or migratory) is provided in Appendix E.

All these species were targeted by the field surveys as described in Section 5.3:

- 1) Sharp-tailed Sandpiper;
- 2) Marsh Sandpiper;
- 3) Wood Sandpiper; and
- 4) Glossy Ibis.

9.1.1.2 Survey effort

Seasonal fauna surveys have been undertaken in September 2021 (13-17 September), and April 2022 (7-13 April), consistent with Commonwealth and Queensland survey guidelines.

Section 5.3.3 describes the survey effort undertaken and how the survey effort compares to relevant Commonwealth and State guidelines and best practice survey guidelines for each migratory species. In summary, survey methods and effort generally complied with survey guidelines and included, but was not limited to:

- 8 systematic survey sites;
- 16 person hours of active searching;
- 12.5 person hours of diurnal bird surveys;
- opportunistic observations; and
- survey and inspection of farm dam and wetlands.

While other survey methods have been employed during the terrestrial ecology surveys, those mentioned above are the most relevant for the detection of the migratory birds potentially occurring within the study area.

9.1.1.3 Survey outcomes

No migratory species listed under the EPBC Act have been recorded within the study area during the field surveys.

9.1.1.4 Habitat assessment

The wetland areas, farm dam and/or inundated paddocks within the study area provide potential foraging habitat for occasional migratory species that utilise wetland habitats, particularly when climatic conditions are suitable.

This is the case for the species known or assessed as potentially occurring within the study area:

- 1) Sharp-tailed Sandpiper;
- 2) Marsh Sandpiper;
- 3) Wood Sandpiper; and
- 4) Glossy Ibis.

The study area does not provide potential breeding habitat for migratory species, with many being non-breeding visitors to Australia.

9.1.1.5 Impact assessment

As described above, wetland areas, farm dams and/or inundated paddocks within the study area provide potential intermittent foraging habitat for occasional migratory species that utilise wetland habitats. Approximately 0.4 ha of this habitat will be cleared by the Project. The Project will not fragment habitat for mobile migratory species.

There are no significant changes to flood levels expected as a result of the Project (Engeny 2023). Therefore, no impact of changes to flooding regimes on migratory species is expected.

An assessment of the significance of the Project impacts on migratory species is provided in Section 9.1.1.1.

9.1.1.6 Avoidance, mitigation and management

The study area does not provide large permanent waterbodies, critical to migrating avian species. Nevertheless, the Project has been designed to avoid and mitigate impacts to migratory species where practicable.

9.1.1.1 Significant impact assessment

Table 10 provides an assessment of the likelihood of significant impacts on migratory species that have the potential to occur in the study area in accordance with the Commonwealth 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' (DoE 2013a).

An area of 'important habitat' for a migratory species is (DoE 2013a):

- a) *habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or*
- b) *habitat that is of critical importance to the species at particular life-cycle stages, and/or*
- c) *habitat utilised by a migratory species which is at the limit of the species range, and/or*
- d) *habitat within an area where the species is declining.*

Important habitats in Australia for migratory shorebirds under the EPBC Act include those recognised as nationally or internationally important (DCCEEW 2021-2023). Wetland habitat is considered *internationally important* if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird or a total abundance of at least 20,000 waterbirds. *Nationally important habitat* for migratory shorebirds regularly supports 0.1% of the flyway population of a single species of migratory shorebird, or 2,000 migratory shorebirds or 15 migratory shorebird species.

The ‘Revision of the East Asian-Australasian Flyway Population Estimates for 37 Listed Migratory Shorebird Species’ (Hansen *et al.* 2016) provides population estimates for 37 migratory shorebirds to help define ‘important habitat’ for these species. Important habitat for the Marsh and Wood Sandpiper is described as areas that have previously been identified as internationally important for the species or areas that support at least 130 individuals of the species, and 85 individuals for the Sharp-tailed Sandpiper (Hansen *et al.* 2016).

The potential habitat available to migratory species in the study area is unlikely to provide important habitat for any migratory species. The area is unlikely to support an ecologically significant proportion of the population of a migratory species.

Table 10: Migratory Species significance impact assessment

Significance criteria	Assessment of significance
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The study area is unlikely to represent an area of important habitat for any migratory species. The Project will not substantially modify, destroy or isolate an area of important habitat for a migratory species.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The study area is unlikely to represent an area of important habitat for a migratory species. Predation by feral species, such as the Feral Cat, recorded in the study area, is a recognised threat to bird species. The Project is unlikely to increase these threats or result in invasive species becoming established in potential habitat for migratory species.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The Project is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of a population of a migratory species.
Conclusion	The Project will not result in a significant impact to migratory species listed under the EPBC Act.

9.2 Matters of State Environmental Significance

Sections 9.2.1 to 9.2.2 provide an assessment of impacts on matters of state environmental significance in accordance with the ‘Queensland Environmental Offsets Policy Significant Residual Impact Guideline’ (DEHP 2014) (Significant Residual Impact Guideline). Matters of state environmental significance identified within the Study area include:

- regulated vegetation – clearing within the buffer of a VM Act mapped watercourse and wetland area; and
- connectivity.

The impact assessments consider the potential impacts of the Project and the avoidance, mitigation and management measures described in Section 8.

The impacts to wetlands and watercourses are assessed separately within the surface water assessment and groundwater assessment of the Project.

9.2.1 Regulated Vegetation

9.2.1.1 Clearing in the portion of a RE that lies within a VM Act mapped wetland

Offsets are required under the EO Act for significant residual impacts on remnant REs that lie within a mapped vegetation management wetland.

For an activity to have a significant residual impact on a RE that is within a mapped wetland, the following thresholds must be exceeded:

- clearing within 50 m of the defining bank of a VM Act wetland; and
- clearing of greater than:
 - 25 m in a grassland REs or clearing of greater than 20 m in sparse (structural category) REs for a linear infrastructure; or
 - 5 ha in a grassland REs or clearing of greater than 2 ha in sparse (structural category) REs for other than and linear infrastructure.

One VM Act wetlands, will be impacted by the access road (Figure 7). The field verified vegetation community associated with this wetland are VC1a (RE 2.5.1a) and VC3e (RE 2.3.33b), defined as sparse structural category and grassland respectively. The disturbance for the access road, a linear infrastructure, is greater than 25 m, therefore impact to this RE exceed the threshold for state offsets.

9.2.1.2 Regional Ecosystems within a defined distance of a VM Act watercourse

The Queensland Government vegetation management watercourse map shows watercourses defined under the VM Act that are used to regulate vegetation clearing in proximity of watercourses (DEHP 2014). The Saxby River, with braided channel, is a defined watercourse under the VM Act (Figure 7) within the study area.

Offsets may also be required under the EO Act for significant residual impacts on remnant REs located within defining banks of a VM Act watercourse. For an activity to have a significant residual impact, the following thresholds must be exceeded:

- clearing within 5 m of the defining bank of a VM Act watercourse; and
- clearing of greater than:
 - 25 m in a grassland REs or clearing of greater than 20 m in sparse (structural category) REs for a linear infrastructure; or
 - 5 ha in a grassland REs or clearing of greater than 2 ha in sparse (structural category) REs for other than and linear infrastructure.

Appendix 3 of the 'Queensland Environmental Offsets Policy', lists the defined distance of REs for measuring significance of impacts to watercourse vegetation. Within the non-coastal regions, for 1st and 2nd order streams, the defined distance is 25 m from the defining banks. For 3rd and 4th order streams, the defined distance is 50 m from the defining banks. For 5th order streams or larger, the defined distance is 100 m from the defining banks.

Remnant vegetation of REs within the defined distance of VM Act watercourses in the study area that will be cleared by the access road include:

- 4.6 ha of RE 2.3.7a (sparse structural category);

- 0.9 ha of RE 2.3.17a (sparse structural category); and
- 2.8 ha of RE 2.3.69b (grassland).

The disturbance for the access road, a linear infrastructure, is greater than 25 m. Offsets will be required for these impacts to vegetation within the defined distance of a watercourse.

9.2.2 Connectivity Areas

In accordance with the Significant Residual Impact Guideline, the Landscape Fragmentation and Connectivity Tool has been used to assess the significance of impact on connectivity areas.

An impact on connectivity areas is determined to be significant if:

- the change in the core remnant ecosystem extent at the local scale (post impact) is greater than a threshold determined by the level of fragmentation at the regional scale; or
- any core area that is greater than or equal to 1 ha is lost or reduced to patch fragments (core to non-core).

The assessment has determined that the Project change in the core remnant ecosystem extent at the local scale is below the threshold of regional fragmentation. The assessment has also determined that the number of core remnant areas occurring on the site will not be reduced by the Project. The assessment has concluded that any impact on connectivity areas is not significant. The Landscape Fragmentation and Connectivity Tool output is provided in Appendix I.

10 Environmental offsets requirements

10.1 Summary of MNES offset requirements

The assessment of significance for MNES are provided in Section 9.1.1.1 indicates that the Project is unlikely to result in a significant impact on the migratory birds. Therefore, offsets in accordance with the 'Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy' (DSEWPaC 2012b) won't be required.

The potential presence of the Julia Creek Dunnart and associated habitat was addressed in a separate targeted survey (Ecosmart Ecology 2023).

10.2 Summary of MSES offset requirements

Offsets will be required for the Project for significant residual impacts on regulated vegetation (REs within mapped vegetation management wetlands and REs within the defined distance of a vegetation management watercourse), and on connectivity in accordance with the EO Act and Queensland Environmental Offsets Policy.

For all prescribed environmental matters, the size and scale of an offset is that which is necessary to achieve a conservation outcome.

Under the Queensland Environmental Offsets Policy, there are three offset delivery options, which include:

- 1) Proponent-driven offset: A proponent-driven offset may take the form of a traditional land-based offset; be undertaken through actions under a Direct Benefit Management Plan; or a combination of both. For a proponent-driven offset, the offset delivery liability remains with the proponent and the offset must be delivered in accordance with an Offset Delivery Plan approved by the administering agency.
- 2) Financial settlement offset: For financial settlement offsets, the payment amount must be calculated in accordance with the methodology set out in the QEOP. A web-based 'financial settlement offset calculator' is available on the Queensland government website that can assist in this process. The State is responsible for delivering a conservation outcome from the financial settlement offset payment.
- 3) A combination of a proponent-driven offset and financial settlement offset may be utilised. However, the Direct Benefit Management Plan can only contribute up to 10% of the offset delivery.

For land-based offsets, the Queensland Environmental Offsets Policy sets multipliers for prescribed environmental matters, with a maximum multiplier of four, or potentially lower if offsetting with regrowth vegetation. A multiplier is defined as "a number used to calculate the size of the offset requirement, given the significant residual impact area, for a given prescribed environmental matter". The offset area is calculated by multiplying the area of impact by the prescribed multiplier:

Offset Area = Area of Impact x Multiplier

For regulated vegetation, the offset requirement is set at a multiplier of four and for connectivity impacts, the offset requirement is set at a multiplier of one.

An Environmental Offset Strategy will be prepared for the Project that presents the offset requirements for the MSES and proposed provision of offsets for impacted matters.

Table 11: Summary of Impacts to MSES

Matter of State Environmental Significance			Extent of disturbance (ha)	Offset required
Regulated vegetation	REs within mapped vegetation management wetlands	RE 2.3.33b	0.2	Yes, for 0.2 ha
		RE 2.5.1a	0.25	Yes, for 0.25 ha
	REs within the defined distance of a vegetation management watercourse	RE 2.3.7a	4.6	Yes, for 4.6 ha
		RE 2.3.17a	0.9	Yes, for 0.9 ha
		RE 2.3.69b	2.8	Yes, for 2.8 ha

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Appendix A. Desktop Searches Results

Appendix B. Flora Species of Conservation Significance Known from the Surrounding Region

Family	Scientific Name	Common Name	Status		WildNet ³ / Wildlife Online ⁴		Atlas of Living Australia ⁵		Previous Surveys
			NC Act ¹	EPBC Act ²	10 km	50 km	10 km	50 km	
Rubiaceae	<i>Dolichocarpa spathulata</i>	N/A	E	LC		x		x	
Equisetopsida	<i>Crinum pedunculatum</i>	N/A	SL	LC				x	
Hydrocharitaceae	<i>Vallisneria caulescens</i>	N/A	SL	LC		x		x	

¹ NC Act Conservation status: E - Endangered; V - Vulnerable; NT - Near Threatened; LC - Least Concern.

² EPBC Act Conservation status: E - Endangered; V - Vulnerable.

³ Department of Environment and Science (DES) 2021-2022f, *WildNet Wildlife Records - Published - Queensland*, Department of Environment and Science, viewed 2021-2022

⁵ Atlas of Living Australia (ALA) 2021-2022, *Occurrence Records Search*, Atlas of Living Australia, viewed 2021-2022

⁶ Epic Environmental Pty Ltd, *Saint Elmo Vanadium Project – Terrestrial Ecology Technical*, prepared by Epic Environmental Pty Ltd for Multicom Resources Ltd

Appendix C. Fauna Species of Conservation Significance Known from the Surrounding Region

Scientific Name	Common Name	Status		EPBC Act Protected Matters Report ³		WildNet ⁴ / Wildlife Online ⁵		Atlas of Living Australia ⁶		Previous Surveys
		NC Act ¹	EPBC Act ²	10 km	60 km	10 km	50 km	10 km	50 km	St Elmo Vanadium Project
Reptiles										
<i>Acanthopis hawkei</i>	Plains Death Adder	V	V		x					
Birds										
<i>Actitis hypoleucos</i>	Common Sandpiper	SL	Mi	x	x					
<i>Apus pacificus</i>	Fork-tailed Swift	SL	Ma, Mi	x	x					x
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	SL	Ma, Mi	x	x		1		6	x
<i>Calidris ferruginea</i>	Curlew Sandpiper	CR	CE, Mi	x	x					
<i>Calidris melanotos</i>	Pectoral Sandpiper	SL	Mi	x	x					
<i>Charadrius veredus</i>	Oriental Plover	SL	Mi	x	x					x
<i>Chloebia gouldiae</i>	Gouldian Finch	E	E, Mi	x	x					
<i>Cuculus optatus</i>	Oriental Cuckoo	SL	Mi	x	x					
<i>Erythrotriorchis radiatus</i>	Red Goshawk	E	V	x	x					
<i>Falco hypoleucos</i>	Grey Falcon	V	V	x	x					
<i>Gallinago hardwickii</i>	Latham's Snipe	SL	Ma, Mi	x	x					
<i>Glareola maldivarum</i>	Oriental Pratincole	SL	Mi	x	x					
<i>Grantiella picta</i>	Painted Honeyeater	V	V	x	x					

Scientific Name	Common Name	Status		EPBC Act Protected Matters Report ³		WildNet ⁴ / Wildlife Online ⁵		Atlas of Living Australia ⁶		Previous Surveys
		NC Act ¹	EPBC Act ²	10 km	60 km	10 km	50 km	10 km	50 km	St Elmo Vanadium Project
<i>Hirundo rustica</i>	Barn Swallow	SL	Mi	x	x					
<i>Motacilla cinerea</i>	Grey Wagtail	SL	Mi	x	x					
<i>Motacilla flava</i>	Yellow Wagtail	SL	Mi	x	x					
<i>Neochmia ruficauda ruficauda</i>	Star Finch (Eastern Subspecies)	E	E	x	x					
<i>Plegadis falcinellus</i>	Glossy Ibis	SL	Mi				1		3	x
<i>Rostratula australis</i>	Australian Painted Snipe	E	E	x	x					
<i>Tringa glareola</i>	Wood Sandpiper	SL	Mi				1		2	
<i>Tringa stagnatilis</i>	Marsh Sandpiper	SL	Mi				2		2	x
<i>Tyto novaehollandiae kimberli</i>	Masked Owl (Northern Subspecies)	V	V	x	x					
Mammals										
<i>Macroderma gigas</i>	Ghost Bat	E	V	x	x					
<i>Macrotis lagotis</i>	Greater Bilby	E	V		x					
<i>Sminthopsis douglasi</i>	Julia Creek Dunnart	E	V	x	x		1		1	

¹ NC Act Conservation status: CR – Critically Endangered; E - Endangered; V - Vulnerable; NT - Near Threatened; LC - Least Concern.

² EPBC Act Conservation status: E - Endangered; V – Vulnerable; Mi – Migratory

³ Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2021-2023 - EPBC Act Protected Matters Search Tool, viewed 2021-2022

⁴ Department of Environment and Science (DES) 2021-2022f, *WildNet Wildlife Records - Published - Queensland*, Department of Environment and Science, viewed 2021-2022

⁵ Atlas of Living Australia (ALA) 2021-2022, *Occurrence Records Search*, Atlas of Living Australia, viewed 2021-2022

⁶ Epic Environmental Pty Ltd, *Saint Elmo Vanadium Project – Terrestrial Ecology Technical*, prepared by Epic Environmental Pty Ltd for Multicom Resources Ltd.

Appendix D. Flora Species of Conservation Significance – Likelihood of Occurrence

Species	Status		Description	Desktop Likelihood of Occurrence
	NC Act1	EPBC Act2		
<i>Dolichocarpa spathulata</i>	E	LC	This species is known to occur within north-west Queensland. It grows all year round, primarily in seasonally dry tropical biomes (Royal Botanic Gardens 2022)	<u>Potential</u> - Habitat may occur within the study area, and there are records of the species within 50 km of the study area, but not within 10 km
<i>Crinum pedunculatum</i>	SL	LC	Within Queensland, this species is primarily found along the eastern coast, however, it has been identified in western Queensland also (ALA 2021-2022). The species can grow in a range of conditions from full sun to half shade, tolerating poor drainage and clay soils, or growing underneath eucalypt trees. The flowers occur between November and March (ANPSA 2022).	<u>Potential</u> - Habitat may occur within the study area, and there are records of the species within 50 km of the study area, but not within 10 km
<i>Vallisneria caulescens</i>	SL	LC	The species occurs in northern Australia, north of Mackay within Queensland (ALA 2021-2022). It is a hydroperennial, growing primarily in seasonally dry tropical biomes (Royal Botanic Gardens 2022).	<u>Potential</u> - Habitat may occur within the study area, and there are records of the species within 50 km of the study area, but not within 10 km

Appendix E. Fauna Species of Conservation Significance – Likelihood of Occurrence

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
Reptiles				
<i>Acanthophis hawkei</i> Plains Death Adder	V	V	<p>Distribution The exact distribution of the species is unclear. Based on the presence of suitable habitat, the potential geographic range of the plains death adder extends from Western Queensland, across the north of the Northern Territory to north-east Western Australia. Fragmented populations of the plains death adder are known to occur in the Mitchell Grass Downs of western Queensland, the Barkly Tableland on the Northern Territory / Queensland border and east of Darwin in the Northern Territory (DCCEE 2022). The distribution of this species overlaps with the EPBC Act-listed threatened ecological community ‘The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin’ (DoE 2011).</p> <p>Habitat Suitable habitat for the plains death adder consists of flat, treeless, cracking-soil riverine floodplains (DoE 2011).</p>	<u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
Birds				
<i>Actitis hypoleucos</i> Common Sandpiper	SL	Mi	<p>Distribution The Common Sandpiper is widespread in small numbers. It is known to occur along all coastlines in Australia, and in many areas inland (DCCEEW 2022-2023). In Queensland, this species has been recorded in South-eastern Gulf of Carpentaria and Cairns Foreshore (DCCEEW 2022-2023). It migrates to Australia during the non-breeding season, migrating to Queensland from August (DCCEEW 2022-2023).</p> <p>Habitat The Common Sandpiper can occur in a broad range of coastal and inland wetlands with varying levels of salinity (DCCEEW 2022-2023). It is mostly found around muddy margins or rocky shores, which may be narrow and or steep (DCCEEW 2022-2023). Rarely found on mudflats (DCCEEW 2022-2023).</p> <p>Foraging Generally this species forages on bare soft mud at the edges of wetlands in shallow water, often in areas where objects protrude from the substrate (rocks or pneumatophores) (DCCEEW 2022-2023). Sometimes the Common Sandpiper will venture into grassy areas adjoining wetlands in search of food for extensive periods (molluscs, bivalves, crustaceans and a variety of insects) (DCCEEW 2022-2023).</p> <p>Breeding/Roosting Roost sites are typically on rocks or in roots/ branches of vegetation, especially mangroves (DCCEEW 2022- 2023).</p> <p>Dispersal The southern migration passage is said to be mostly diurnal, whereas the northern passage mainly occurs by night (DCCEEW 2022-2023).</p>	<u>Unlikely</u> - Potential habitat has not been identified within the study area, and there are no confirmed records within 10 km
<i>Apus pacificus</i> Fork-tailed Swift	SL	Ma, Mi	<p>Distribution The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia (DCCEEW 2022-2023). It is widespread throughout Queensland, with sightings common from February–March (DCCEEW 2022- 2023).</p> <p>Habitat This species does not have specific habitat requirements and is found across a range of habitats, from inland open plains to wooded and coastal areas, where it is exclusively aerial (DCCEEW 2022-2023).</p> <p>Foraging The Fork-tailed Swift forages aerially, up to hundreds of meters above the ground (DCCEEW 2022-2023). They often occur in areas of updraughts and along the edges of low-pressure systems eating small bees, wasps, termites and moths (DCCEEW 2022-2023).</p>	<u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
			<p>Breeding/Roosting It is thought that this species roosts aerially but are occasionally observed to land (DCCEEW 2022-2023).</p> <p>Dispersal It is not known to have specific dispersal habitat requirements.</p>	
<p><i>Calidris acuminata</i> Sharp-tailed Sandpiper</p>	SL	Ma, Mi	<p>Distribution The Sharp-tailed Sandpiper is a non-breeding visitor to all states and territories of Australia (DCCEEW 2022- 2023). It is widespread throughout Queensland, arriving in large numbers in September (DCCEEW 2022-2023).</p> <p>Habitat This species prefers fresh or saltwater shallow wetlands with muddy edges (DCCEEW 2022-2023), with the presence of inundated or emergent sedges, grass, saltmarsh, or other low vegetation (DCCEEW 2022- 2023). This includes swamps, lakes, lagoons, and pools near the coast, and waterholes, soaks, dams, bore drains and bore swamps, saltpans, and hypersaline salt lakes inland (DCCEEW 2022- 2023). Sometimes they occur on rocky shores and rarely on exposed reefs (DCCEEW 2022- 2023).</p> <p>Foraging They forage at the edge of the water of wetlands or intertidal mudflats, either on bare wet mud or sand, or in shallow water (DCCEEW 2022-2023). This species can also forage among inundated vegetation of saltmarsh, grass, or sedge, eating seeds, worms, molluscs, crustaceans, and insects (DCCEEW 2022-2023).</p> <p>Breeding/Roosting Roosting occurs at edges of shallow wetlands, on wet open mud or sand, or in short sparse vegetation, such as grass or saltmarsh (DCCEEW 2022-2023). Mangroves and on rocks in water are some other locations this species has been seen roosting (DCCEEW 2022-2023).</p> <p>Dispersal Movements occur during the non-breeding period, moving to temporary or flooded wetlands and leaving them when they dry (DCCEEW 2022-2023).</p>	<p><u>Potential</u> - Habitat may occur within the study area, and there are records of the species within 50 km of the study area, but not within 10 km</p>
<p><i>Calidris ferruginea</i> Curlew Sandpiper</p>	CR	CE, Mi	<p>Distribution Widespread in small numbers, this species is known to occur around coasts in Australia and in many areas inland during the non-breeding season (DCCEEW 2022-2023). In Queensland, this species has been recorded in the Gulf of Carpentaria, with widespread records along the coast, south of Cairns (DCCEEW 2022-2023).</p> <p>Habitat Inhabiting wetland environments, the Curlew Sandpiper mainly occurs on intertidal mudflats in sheltered</p>	<p><u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km</p>

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
			<p>coastal areas, (estuaries, bays, inlets, and lagoons), as well as around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms (DoE 2015a). Small numbers have been recorded living inland around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand (DoE 2015a).</p> <p>Foraging Curlew Sandpipers forage on mudflats and nearby shallow water at the edge of shallow pools, wading through water 15-60 mm deep (DCCEEW 2022-2023). At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated salt flats (DCCEEW 2022-2023).</p> <p>Breeding/Roosting Roosting occurs on bare dry shingle, shell, or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands (DCCEEW 2022-2023). Occasionally roosting occurs in dunes during very high tides and sometimes in saltmarsh (DCCEEW 2022-2023). Substantial numbers of Curlew Sandpipers remain in northern Australia throughout the nonbreeding season, arriving around September (DCCEEW 2022-2023).</p>	
<p><i>Calidris melanotos</i> Pectoral Sandpiper</p>	SL	Mi	<p>Distribution The Pectoral Sandpiper occurs around Cairns in Queensland (DCCEEW 2022-2023). There are scattered records elsewhere, mainly from east of the Great Divide between Townsville and Yeppoon (DCCEEW 2022- 2023). A few inland records have also been recorded at Mount Isa, Longreach, and Oakley (DCCEEW 2022-2023).</p> <p>Habitat This species prefers shallow wetlands with varying levels of salinity, in coastal or near coastal habitat (DCCEEW 2022-2023). It is sometimes found further inland in the following habitat types, coastal lagoons, swamps, lakes, inundated grasslands, estuaries, bays, saltmarshes, river pools, creeks, floodplains, and artificial wetlands (DCCEEW 2022-2023). Its preferred habitat is wetlands that have open fringing mudflats and low, emergent, or fringing vegetation, such as grass or samphire (DCCEEW 2022-2023). It has also been recorded in swamp overgrown with lignum (DCCEEW 2022-2023).</p> <p>Foraging Foraging occurs in shallow water or soft mud at the edge of wetlands where they consume algae, seeds, crustaceans, arachnids, and insects (DCCEEW 2022-2023).</p> <p>Breeding/Roosting It is not known to have specific dispersal or roosting habitat requirements, and this species is found in Australia from September to June (DCCEEW 2022-2023).</p>	<p><u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km</p>

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
<p><i>Charadrius veredus</i> Oriental Plover</p>	SL	Mi	<p>Distribution Within Queensland, the species is found in the north-western part of the state (the Gulf Country), both in coastal and inland areas (DCCEEW 2022-2023).</p> <p>Habitat Within Queensland, the Oriental Plover spends several weeks in coastal habitats such as estuarine mudflats, sandbanks, beaches, reefs, and near-coastal grasslands. They then move further inland, inhabiting areas such as flat, open, semi-arid grasslands where grass is sparse and interspersed with bare ground. During the wet season they may move into lightly wooded grasslands (DCCEEW 2022-2023).</p> <p>Foraging Little is known about the diet of the Oriental Plover, though it has been recorded eating a variety of insects, including beetles, grasshoppers and crickets. They forage among short grass or stony bare ground in a running, stopping and pecking action (DCCEEW 2022-2023).</p> <p>Breeding/Roosting This species does not breed in Australia (DCCEEW 2022-2023).</p> <p>Dispersal The species arrives in north-western Australia in early to mid-September. Within Australia, they may disperse in response to wet conditions and cold weather. They leave Australia between February and April (DCCEEW 2022-2023).</p>	<p><u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km</p>

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
<i>Chloebia gouldiae</i> Gouldian Finch	E	E	<p>Distribution The Gouldian finch is found in northern Australia, ranging from the Cape York Peninsula through north-west Queensland, and the north of the Northern Territory to the Kimberley Region of Western Australia (TSSC 2016a).</p> <p>Habitat The species tends to inhabit open woodland dominated by Eucalyptus trees and a ground cover of Sorghum and other annual or perennial grasses. They also require a waterhole or spring within 2-3 km, and unburnt hollows for breeding (TSSC 2016a).</p> <p>Foraging The species can be found individually, travelling in pairs, or traveling in groups of anywhere from three to hundreds, or even in mixed flocks comprised of other finches (TSSC 2016a). They feed almost exclusively on grass seed and rely on a small number of grass species, feeding on freshly ripened seeds in the wet season, and on older dormant seeds during the dry season (TSSC 2016a).</p> <p>Breeding/Roosting They nest in tree hollows between April and July, laying roughly five eggs per clutch though they may raise several clutches each season (TSSC 2016a).</p>	<u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km
<i>Cuculus optatus</i> Oriental Cuckoo	SL	Mi	<p>Distribution Distributed throughout the northern parts of Western Australia, Northern Territory and Queensland, as well as along the Queensland and New South Wales coastline (DCCEEW 2022-2023).</p> <p>Habitat Nonbreeding habitat occurs within rainforest margins, monsoon forest, vine scrubs, riverine thickets, wetter, densely canopied eucalypt forests or open Casuarina, Acacia or Eucalyptus woodlands (DoE 2015a).</p> <p>Foraging Not much is known on the ecology of this species</p>	<u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
<i>Erythrotriorchis radiatus</i> Red Goshawk	E	V	<p>Distribution Endemic to Australia, the Red Goshawk is sparsely dispersed across coastal and sub-coastal Australia, from western Kimberley Division to north-eastern New South Wales, and occasionally on continental islands (DCCEEW 2022-2023, TSSC 2015). Three recently confirmed sightings of dispersive individuals suggest that this species also occurs in central Australia, across South-east Queensland to the western slopes of the Great Dividing Range (DERM 2012, DCCEEW 2022-2023).</p> <p>Habitat The Red Goshawk prefers forest and woodland with a mix of vegetation types, including eucalypt woodland, tall open forest, gallery rainforest, swamp sclerophyll forest, and at the edge of rainforest (DCCEEW 2022). In partly cleared areas of eastern Queensland, it is associated with gorge and escarpment country (TSSC 2015). <i>E. radiatus</i> avoid very dense or very open habitats and prefer areas where large prey populations (birds) and permanent water exist (DCCEEW 2022-2023).</p> <p>Foraging Forests of intermediate density or ecotones between habitats of differing densities (e.g. between rainforest and eucalypt forest, between gallery forest and woodland) are preferred for foraging (DCCEEW 2022-2023). This species ambushes its prey when hunting, feeding on medium to large birds (DCCEEW 2022-2023).</p> <p>Breeding/Roosting Nests are located within large trees, within 1 km of permanent water (DCCEEW 2022-2023). Nest trees have been noted to be significantly taller (>20 m) than surrounding trees, with larger crown diameters and greater girth at breast height (95. 2.9 m) (DCCEEW 2022-2023, TSSC 2015, DERM 2012, DEWHA 2010a).</p> <p>Dispersal Movement patterns of the Red Goshawk are poorly known (DCCEEW 2022-2023). They have been observed individually, in pairs and in family groups (DEWHA 2010a).</p>	<u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km
<i>Falco hypoleucos</i> Grey Falcon	V	V	<p>Distribution This species distribution is sparsely distributed throughout arid and semi-arid Australia where annual rainfall is <500 mm, except for wet years followed by drought where the Grey Falcon may become more widespread throughout its range (Birdlife International 2021, TSSC 2020). In Queensland this species appears to be absent in areas East of the Great Dividing Range (TSSC 2020).</p> <p>Habitat The Grey Falcon prefers lightly timbered and bare lowland plains in acacia shrublands crossed by tree lined watercourses (Birdlife International 2021, TSSC 2020). It is also known to occur in grassland, sand dune and</p>	<u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
			<p>open woodland habitats, and has been observed hunting in treeless areas (Birdlife International 2021, TSSC 2020).</p> <p>Foraging The Grey Falcon feeds almost exclusively on birds such as doves, pigeons, small parrots and finches while breeding (TSSC 2020). It has also been seen consuming small mammals and lizards (TSSC 2020).</p> <p>Breeding/Roosting Breeding occurs from June to November in the old nests of other birds particularly raptor or corvid nests (TSSC 2020). These nests are usually located in the tallest tree along watercourses in tree species such as River Red Gum (<i>Eucalyptus camaldulensis</i>) and Coolabah (<i>Eucalyptus coolabah</i>) (TSSC 2020).</p>	
<p><i>Gallinago hardwickii</i> Latham's Snipe</p>	SL	Ma, Mi	<p>Distribution The Latham's Snipe is a non-breeding visitor to south-eastern Australia, and a passage migrant through northern Australia (DCCEEW 2022-2023). In Queensland, their range extends inland over the eastern tablelands in south-eastern Queensland (and occasionally from Rockhampton in the north), and to west of the Great Dividing Range (DCCEEW 2022-2023).</p> <p>Habitat This species prefers open freshwater permeant and ephemeral wetlands, typically with low dense vegetation (DCCEEW 2022). It can be found in a variety of vegetation communities including but not limited to tussock grasslands, coastal and alpine heathlands, tea-tree scrub, and open forests (DCCEEW 2022- 2023).</p> <p>Foraging The foraging habitat of the Latham's Snipe consist of areas of mud (exposed or beneath very shallow water) with low, dense vegetation present (DCCEEW 2022-2023).</p> <p>Breeding/Roosting They roost near their foraging sites, in areas that provide some shelter (clumps of vegetation, in drainage ditches, among boulders, or in shallow water if cover is not available) (DCCEEW 2022-2023).</p> <p>Dispersal Latham's Snipe is dispersive during its stay in Australia, arriving from July to November. The snipe is thought to disperse in response to rainfall and the availability of food (DCCEEW 2022-2023).</p>	<p><u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km</p>
<p><i>Glareola maldivarum</i> Oriental Pratincole</p>	SL	Mi	<p>Distribution Within Queensland, the species is found in the north-western part of the state (the Gulf Country), both in coastal and inland areas (DCCEEW 2022-2023).</p> <p>Habitat Within Queensland, the Oriental Pratincole inhabits open plains, floodplains, or short grasslands with large</p>	<p><u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km</p>

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
			<p>patches of bare ground. They are found near wetlands, lakes, creeks, and artificial wetlands such as reservoirs, saltworks and sewage farms. In costal areas they are found on beaches, mudflats, and islands (DCCEEW 2022-2023).</p> <p>Foraging The species is insectivorous, feeding on dragonflies, cicadas, beetles, ants, flies, grasshoppers and wasps, usually foraging in flocks, searching between 0 m and 300 m off the ground (DCCEEW 2022-2023).</p> <p>Breeding/Roosting This species does not breed in Australia (DCCEEW 2022-2023).</p> <p>Dispersal The species arrives in north-western Australia in early to late October during their non-breeding season, usually coinciding with storm events that increase the number of insects. They typically leave in late March (DCCEEW 2022-2023).</p>	
<p><i>Grantiella picta</i> Painted Honeyeater</p>	V	V	<p>Distribution The species is sparsely distributed from south-eastern Australia to north-western Queensland and eastern Northern Territory, with the highest concentration found in the Great Dividing Range, between Grampians, Victoria, and Roma (DoE 2015b).</p> <p>Habitat The Painted Honeyeater uses mistletoe trees as host trees, found within eucalypt forests/woodlands, riparian woodlands, acacia-dominated woodlands, paperbark forests and residential areas, preferring those areas with higher densities of mature trees. It is more commonly found in wider blocks of remnant woodland, but will use narrow strips for breeding if sufficient mistletoe trees are present (DoE 2015b)</p> <p>Foraging The most specialised of Australia's honeyeaters, the species diet primarily consists of mistletoe fruits, however is supplemented by nectar and arthropods (DoE 2015b)</p> <p>Breeding/Roosting The species occurs in singles or pairs, with breeding occurring between October and March when the mistletoe fruits are most available. The species builds a nest from plant fibres and spider webs between 3 and 20 m high in trees (DoE 2015b)</p> <p>Dispersal The species moves seasonally north-south with the fruiting of mistletoe. After breeding, many individuals move to semi-arid regions such as north-eastern South Australia, Western Queensland, and central Northern Territory (DoE 2015b). The species is considered to have a single population.</p>	<p><u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km</p>

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
<i>Hirundo rustica</i> Barn Swallow	SL	Mi	<p>Distribution In Queensland, the species occurs along the north coast and down to Fraser Island. Its range continues along the top of Australia, down along the western side to the Pilbara. (DCCEEW 2022-2023).</p> <p>Habitat When in Australia, the species is found in open country in coastal lowlands, often near water, towns and cities, in addition to freshwater wetlands, paperbark woodland, mesophyll shrub thickets and tussock grassland. (DCCEEW 2022-2023)</p> <p>Foraging The species is primarily insectivorous, feeding on flying insects by skimming them from the water surface, or by simple aerial pursuit while flying low over the ground. (DCCEEW 2022-2023)</p> <p>Breeding/Roosting This species does not breed in Australia (DCCEEW 2022-2023).</p> <p>Dispersal The species breeds in the northern hemisphere in temperate regions, travelling south to Australia to spend the boreal winter, staying from November to March (DCCEEW 2022-2023).</p>	<u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km
<i>Motacilla cinerea</i> Grey Wagtail	SL	Mi	<p>Distribution The species occurs along much of the coast, ranging west from Adelaide, all the way around to Townsville, with a patch of non-occurrence north of Cairns in Queensland (DCCEEW 2022-2023).</p> <p>Habitat Both in and out of Australia the species is highly associated with water. In Australia they are most commonly found in creeks, rivers, and waterfalls (DCCEEW 2022-2023).</p> <p>Foraging They are known to forage within rocky tidal flats during migration, but will forage in their primary habitat otherwise, feeding on a variety of insects, molluscs, crustaceans, small fish and tadpoles, depending on what is available (DCCEEW 2022-2023).</p> <p>Breeding/Roosting The species does not breed in Australia (DCCEEW 2022-2023).</p> <p>Dispersal The species regularly travels to from Russia to Australia, staying from late October to March (DCCEEW 2022-2023).</p>	<u>Unlikely</u> - Potential habitat has not been identified within the study area, and there are no confirmed records within 10 km
<i>Motacilla flava</i> Yellow Wagtail	SL	Mi	<p>Distribution This species may occur throughout Australia during the non-breeding season (DCCEEW 2022-2023).</p>	<u>Unlikely</u> - Potential habitat has not been identified

Species	Status		Description	Desktop Likelihood of Occurrence
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			<p>Habitat The Yellow Wagtail prefers mostly well-watered open grasslands and the fringes of wetlands (DCCEEW 2022-2023).</p> <p>Foraging The species roosts in mangroves and other dense vegetation (DoE 2015a).</p>	within the study area, and there are no confirmed records within 10 km
<p><i>Neochmia ruficauda ruficauda</i></p> <p>Star Finch (Eastern Subspecies)</p>	E	E	<p>Distribution The eastern sub species for the Star Finch is known to occur in Central Queensland only (DCCEEW 2022- 2023). Its distribution extends north to Bowen, west to Winton and, south to Wowa (DCCEEW 2022-2023, DEWHA 2008), within the Desert Channels, Burdekin, and Fitzroy Natural Resource Management Regions (DCCEEW 2022-2023). The distribution of the Star Finch (eastern) is very poorly known (DCCEEW 2022- 2023).</p> <p>Habitat The Star Finch occurs in damp grasslands, sedgelands and grassy woodlands, near permanent water, and often in or near suburban areas (DCCEEW 2022-2023, DEWHA 2008). Common species associated with these areas include Eucalyptus coolabah, E. tereticornis, E. tessellaris, Melaleuca leucadendra, E. camaldulensis and Casuarina cunninghamii (DCCEEW 2022-2023).</p> <p>Foraging Little is known about the foraging ecology of this species (DCCEEW 2022). It has been seen eating insects in fig trees and is said to forage in the shade of Eucalyptus trees (DCCEEW 2022). This species predominantly eats seeds taken from a range of grasses including Arundinella, Brachyachne, Chloris, Chrysopogon, Digitaria, Echinochloa, Heterachne, Iseilema, Oryza, Panicum, Setaria, Sorghum, Themeda and Urochloa (DCCEEW 2022-2023).</p> <p>Breeding/Roosting Nests are bottle-shaped made from grass, often placed in trees 3-9 m above the ground, in a shrub or tree or amongst grass, sedges or reeds (DCCEEW 2022-2023).</p> <p>The Star Finch is sedentary or resident species that may undertake some local dispersal at the completion of the breeding season. This species is not known to have specific dispersal requirements (DCCEEW 2022- 2023).</p>	<u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km

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<p><i>Plegadis falcinellus</i> Glossy Ibis</p>	SL	Mi	<p>Distribution Within Australia, the Glossy Ibis is generally located east of the Kimberley in Western Australia and Eyre Peninsula in South Australia (DCCEEW 2022-2023). This species is known to breed in select locations, which include the Channel Country in Queensland (DCCEEW 2022-2023).</p> <p>Habitat Fresh water marshes at the edges of lakes and rivers, lagoons, floodplains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation are the preferred foraging and breeding habitats for this species. They are also occasionally found in coastal locations such as estuaries, deltas, saltmarshes, and coastal lagoons (DCCEEW 2022-2023). It is known to occur in large densities in drying Top End grass/sedge swamps and Channel Country grass/forb meadows (DCCEEW 2022-2023).</p> <p>Foraging The species feeds in very shallow water, probing the water/ mud in search of its preferred food source (aquatic invertebrates/insects) (DCCEEW 2022-2023). Preferred foraging habitat mentioned above.</p> <p>Breeding/Roosting Australian breeding habitat types include wooded and shrubby swamps in the semi-arid and arid regions, including the Channel Country in Queensland (DCCEEW 2022-2023). Glossy Ibis roost in trees or shrubs usually near water bodies (DCCEEW 2022-2023). The breeding season is from mid spring to the end of summer; however reproduction may extend to September to April if persistent food resources are available at breeding sites (DCCEEW 2022-2023).</p> <p>Dispersal Within Australia, the species moves in response to good rainfalls, expanding its range (DCCEEW 2022- 2023). It often moves north in autumn, then return south to the main breeding areas in spring and summer (DCCEEW 2022-2023).</p>	<p><u>Potential</u> - Habitat may occur within the study area, and there are records of the species within 50 km of the study area, but not within 10 km</p>
<p><i>Rostratula australis</i> Australian Painted Snipe</p>	E	E	<p>Distribution Known to occur within wetlands within all states of Australia (DCCEEW 2022-2023). This species is most common in eastern Australia, where it has been recorded throughout much of Queensland, New South Wales, Victoria, and south-eastern South Australia at scattered locations (DCCEEW 2022-2023).</p> <p>Habitat The Australian Painted Snipe generally inhabits shallow freshwater (sometimes brackish) wetlands, including temporary and permanent lakes, swamps and claypans (DCCEEW 2022-2023). It has also been known to occupy inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains (DCCEEW 2022-2023). These areas usually include emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum Muehlenbeckia, Canegrass or Tea-tree</p>	<p><u>Unlikely</u> - Potential habitat has not been identified within the study area, and there are no confirmed records within 10 km</p>

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
			<p>(<i>Melaleuca</i> sp.) (DCCEEW 2022-2023). Areas lined with trees, or that have some scattered fallen or washed-up timber are sometimes also used (DCCEEW 2022-2023).</p> <p>Foraging This species generally remains in dense cover when feeding, although may forage over nearby mudflats and other open areas such as ploughed land or grassland (DCCEEW 2022-2023). This species requires suitable wetland areas even in drought conditions (DCCEEW 2022-2023). Most nest records are from or near small islands in freshwater wetlands, which contain a combination of very shallow water, exposed mud, dense low cover and sometimes some tall dense cover (DCCEEW 2022-2023). This species is mainly crepuscular (active at dawn and dusk) and highly cryptic (DCCEEW 2022-2023).</p> <p>Breeding/Roosting Breeding habitat requirements are specific: shallow wetlands with areas of bare wet mud and both upper and canopy cover (low and sometimes tall and dense) nearby (DCCEEW 2022-2023). This species may breed in response to wetland conditions rather than during a season (DCCEEW 2022-2023).</p> <p>Dispersal The Australian Painted Snipe is possibly dispersive or migratory (DCCEEW 2022-2023). Dispersive movements have been attributed to local conditions: moving to flooded areas; moving from drying to permanent wetlands; moving away from areas affected by drought (DCCEEW 2022-2023).</p>	
<p><i>Tringa glareola</i> Wood Sandpiper</p>	SL	Mi	<p>Distribution Within Queensland, the species is sparsely scattered from Cairns and south to the state border, primarily along the coastline (DCCEEW 2022-2023).</p> <p>Habitat The Wood Sandpiper uses well-vegetated, shallow freshwater wetlands such swamps, billabongs, lakes, pools, and waterholes, typically with emergent plants or grass with taller fringing vegetation. The are also founded in flooded grasslands, short herbage, wooded floodplains, artificial wetlands such as reservoirs, dams, and irrigated crops (DCCEEW 2022-2023).</p> <p>Foraging The species is primarily carnivorous, eating insects and molluscs, though are known to eat seeds, algae, worms, fish and frogs outside of Australia. It forages on moist or dry mud at the edges of wetlands, along the shore, amongst aquatic vegetation, or in clear shallow water (DCCEEW 2022-2023).</p> <p>Breeding/Roosting This species does not breed in Australia (DCCEEW 2022-2023).</p> <p>Dispersal This species breeds throughout Eurasia, with the Australian population thought to breed in Siberia. It arrives in Australia in August, and migrate from Queensland in May (DCCEEW 2022-2023).</p>	<p><u>Potential</u> - Habitat may occur within the study area, and there are records of the species within 50 km of the study area, but not within 10 km</p>

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
<i>Tringa stagnatilis</i> Marsh Sandpiper	SL	Mi	<p>Distribution The Marsh Sandpiper is found on coastal and inland wetlands throughout Australia and is widespread in coastal Queensland (DCCEEW 2022-2023). This species is also recorded in all regions of New South Wales and is found in coastal Victoria (DCCEEW 2022-2023). Scattered records of this species have been found across Western Australia, Northern Territory and South Australia (DCCEEW 2022-2023).</p> <p>Habitat This species lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, salt pans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats (DCCEEW 2022-2023). The species is less often found at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes (DCCEEW 2022-2023).</p> <p>Foraging The Marsh Sandpiper usually forages in shallow water at the edge of wetlands. They probe wet mud of mudflats or feed among marshy vegetation (Higgins & Davies 1996). This species is carnivorous and has been recorded eating insects, molluscs, and crustaceans (DCCEEW 2022-2023).</p> <p>Breeding/Roosting This species is a non-breeding visitor to Australia and is known to breed from eastern Europe to eastern Siberia (DCCEEW 2022-2023). This species has been recorded potentially roosting on tidal mudflats, near low saltmarsh, and around inland swamps (DCCEEW 2022-2023).</p> <p>Dispersal This species is known to arrive in Australia from September and disperse across Australia from September to December (DCCEEW 2022-2023). The Marsh Sandpiper begins to migrate north in March and April, with temporary influxes of populations occurring at some sites along the eastern coast (DCCEEW 2022-2023).</p>	<u>Potential</u> - Habitat may occur within the study area, and there are records of the species within 50 km of the study area, but not within 10 km
<i>Tyto novaehollandiae kimberli</i> Masked Owl (Northern Subspecies)	V	V	<p>Distribution The distribution of this species is poorly known, but estimated extent of occurrence is 1 800 00 km², though is assumed to be declining (DCCEEW 2022-2023). In Queensland, they have been recorded in the Normanton region, and on the Pascoe, Archer, Chester and Watson Rivers in the Cape York Peninsula, extending to the Atherton Tablelands and Einasleigh-Burdekin divide, possibly as far south as Mackay or Coomooboolaroo Station (DCCEEW 2022-2023).</p> <p>Habitat They have been found to occur in riparian forest, open forest, Melaleuca swamps and the edges of mangroves (DCCEEW 2022-2023). There have also been recordings along the margins of sugar cane field (DCCEEW 2022-2023). They appear to live in low densities so require an expansive area for hunting prey, with trees large enough to form appropriate hollows (DCCEEW 2022-2023). Their core area is</p>	<u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50 km

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
			<p>approximately 155 ha, while their home range during the non-breeding season can extend as far as 1178 ha (DCCEEW 2022-2023).</p> <p>Foraging The masked owl is sedentary and territorial of its core area, moving out into its home area to hunt mammals or for finding a mate (DCCEEW 2022-2023). The female will occupy the nest for up to 10 weeks prior to laying – expectedly between March and October – the female lays two to three eggs and incubates them in a large hollow (DCCEEW 2022-2023). Both before and after hatching the male will hunt for the female and the chicks, then both will hunt after 3 weeks of brooding, the young being dependent for approximately 2 months (DCCEEW 2022-2023). This being the case, the masked owl can usually be seen singly but can also be found in pairs or family groups (DCCEEW 2022-2023).</p>	
Mammals				
<p><i>Macroderma gigas</i> Ghost Bat</p>	E	V	<p>Distribution The Ghost Bat is endemic to Australia, occurring in Queensland, northern Pilbara and Kimberley in Western Australia, and the top end of the Northern Territory (TSSC 2016b, Hourigan 2011). In Queensland, this species is currently distributed in 4-5 highly disjunct populations along the coast and inland from the McIlwraith Range in Cape York to Rockhampton, with the biggest colony occurring at Mount Etna (Hourigan 2011). Habitat modelling studies suggest that the Ghost Bat is a geographically remnant species in southern, arid landscapes, present only because caves provide suitable roost microclimates (TSSC 2016b).</p> <p>Habitat This species occupies a variety of habitats ranging from arid Pilbara to tropical savanna woodlands and rainforests. During the daytime they roost in caves, rock crevices and old mines. (TSSC 2016b).</p> <p>Foraging Foraging areas are approximately 60 ha in size (TSSC 2016b). Their diet consists of large insects, small mammals, reptiles, birds and bats, and prey availability is thought to influence foraging habitat for this species (Hourigan 2011). Ghost Bats usually require several caves to move between seasonally or as dictated by weather conditions (TSSC 2016b). It is known to forage up to 2 km from its daytime roost area and will use the same foraging area each night (TSSC 2016b, Hourigan 2011).</p> <p>Breeding/Roosting Roost sites consist of caves, rock crevices and disused mine entrances (TSSC 2016b). Permanently used roost sites are generally deep natural caves or disused mines with a relatively stable temperature of 23°–28°C, with a moderate to high relative humidity of 50–100% and the ceiling at least 2 m above the</p>	<p><u>Unlikely</u> - Potential habitat may occur within the study area, however there are no records within 50km</p>

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
			floor (TSSC 2016b, Hourigan 2011). Individuals aggregate in these maternity roosts during spring and summer (Hourigan 2011).	
<i>Macrotis lagotis</i> Greater Bilby	E	V	<p>Distribution The range of the Bilby has declined northwards and the decline is continuing. Wild populations are restricted predominantly to the following locations:</p> <ul style="list-style-type: none"> • Northern Territory: The Tanami Desert. • Western Australia: The Gibson Desert, Little Sandy Desert, Great Sandy Desert and parts of the Pilbara and Southern Kimberley (TSSC 2016c). • Queensland: One isolated population in South-west Queensland, approximately in the area between Boulia and Birdsville (TSSC 2016c). <p>Habitat The Greater Bilby is a solitary species that shelters in burrows during daylight (and intermittently during the night). The Greater Bilby is an omnivore that primarily digs for food. Diet consists of invertebrates such as lepidopteran larvae, termites, ants, grasshoppers, spiders and beetles, and other items such as seeds, bulbs (<i>Cyperus bulbosus</i>), and fungi (TSSC 2016c).</p> <p>The remaining populations of the greater bilby occupy three main habitats: open tussock grassland on uplands and hills, <i>Acacia aneura</i> (mulga) woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas. Males range more widely than females from their home burrows, and home ranges can vary considerably in size in different locations. Greater bilbies can use up to 18 of these burrows concurrently over several months, as well as construct a new burrow on average every 2.5 weeks (TSSC 2016c).</p> <p>Breeding/Roosting Breeding varies depending on seasonal conditions and food availability, with litters mostly of one or two but sometimes three. Pouch life is approximately 75-80 days, with females tending their young in a burrow for another two weeks. Longevity can be up to 11 years, however in the wild, most animals are unlikely to survive that long. Females commence breeding at five months and males at eight months. Generation time is assumed to be c. 4 years (TSSC 2016c).</p>	Unlikely - Potential habitat may occur within the study area, however there are no records within 50 km

Species	Status		Description	Desktop Likelihood of Occurrence
	EPBC Act ^{1,2}	NC Act ³		
<p><i>Sminthopsis douglasi</i> Julia Creek Dunnart</p>	E	V	<p>Distribution The species is only found in the Mitchell Grasslands of north-west Queensland, ranging from downs country east of Cloncurry, south-east to Barcaldine (DCCEEW 2022-2023).</p> <p>Habitat The Julia Creek Dunnart occurs in areas with cracking clay soils dominated by grass, sheltering in soil cracks in the dry season, and amongst vegetation during the wet season when the cracks are closed (DCCEEW 2022-2023).</p> <p>Foraging The species feeds on insects such as silverfish, cockroaches and crickets, in addition to spiders, centipedes, skinks, and Long-tailed Planigales (DCCEEW 2022-2023).</p> <p>Breeding/Roosting The species breeds in spring and summer, building nests within grass tussocks. Eight young are produced per litter, with up to two litters being produced over an extended season when conditions are suitable (DCCEEW 2022-2023).</p> <p>Dispersal The species establishes home ranges up to 7.125 ha in size, though they move up to 10 km to establish new ranges, following higher availability of invertebrates and grass cover (DCCEEW 2022-2023).</p>	<p><u>Potential</u> - Habitat may occur within the study area, and there are records of the species within 50 km of the study area, but not within 10 km</p>

Appendix F. Fauna Survey Site Descriptions



Site Name	FS01
Associated Project Site	Vecco Critical Minerals Project
Site Location (Zone, Easting, Northing)	54, 591686, 7788883
Habitat type	Woodlands on alluvial soil
Associated RE	2.3.17a
Habitat Description	Riparian vegetation along the braided Saxby River.
Disturbance Present	Near access track, located approximately 100 m away. Grazed. No weed species recorded
Dominant Vegetation Species	Dominant Trees: <i>Eucalyptus camaldulensis</i> , <i>Eucalyptus microtheca</i> , <i>Terminalia platyphylla</i> Dominant Ground Cover: <i>Eulalia aurea</i>



Site Name	FS02
Associated Project Site	Vecco Critical Minerals Project
Site Location (Zone, Easting, Northing)	54, 596297, 7795734
Habitat type	Tussock grassland
Associated RE	2.4.2b
Habitat Description	Grassland on sandy clay
Disturbance Present	Near access track, located approximately 200 m away. Grazed. No weed species recorded
Dominant Vegetation Species	Dominant Trees: NA Dominant Shrubs: <i>Carissa lanceolata</i> Dominant Ground Cover: <i>Aristida</i> spp., <i>Eulalia aurea</i>



Site Name	FS03
Associated Project Site	Vecco Critical Minerals Project
Site Location (Zone, Easting, Northing)	54, 593637, 7795260
Habitat type	Tussock grassland
Associated RE	2.4.2b
Habitat Description	Grassland on sandy clay
Disturbance Present	Grazed. Weed <i>Vachellia farnesiana</i> (Mimosa bush) recorded
Dominant Vegetation Species	Dominant Trees: NA Dominant Shrubs: <i>Carissa lanceolata</i> Dominant Ground Cover: <i>Aristida</i> spp., Mitchell Grass



Site Name	FS04
Associated Project Site	Vecco Critical Minerals Project
Site Location (Zone, Easting, Northing)	54, 593577, 7794051
Habitat type	Low dry woodlands
Associated RE	2.5.1b
Habitat Description	Sparse low woodland on sandy soil
Disturbance Present	Near access track, located approximately 100 m away. Grazed. Weed <i>Vachellia farnesiana</i> (Mimosa bush) recorded
Dominant Vegetation Species	Dominant Trees: <i>Corymbia terminalis</i> , <i>Melaleuca nervosa</i> Dominant Shrubs: <i>Carissa lanceolata</i> Dominant Ground Cover: <i>Aristida</i> spp.



Site Name	FS05
Associated Project Site	Vecco Critical Minerals Project
Site Location (Zone, Easting, Northing)	54, 595632, 7794123
Habitat type	Low dry woodlands
Associated RE	2.5.1b
Habitat Description	Sparse low woodland on sandy soil
Disturbance Present	Near access track, located approximately 100 m away. Grazed. Weed <i>Vachellia farnesiana</i> (Mimosa bush) recorded
Dominant Vegetation Species	<p>Dominant Trees: <i>Corymbia terminalis</i>, <i>Corymbia confertifolia</i></p> <p>Dominant Shrubs: <i>Carissa lanceolata</i></p> <p>Dominant Ground Cover: <i>Aristida</i> spp.</p>



Site Name	FS06
Associated Project Site	Vecco Critical Minerals Project
Site Location (Zone, Easting, Northing)	54, 591765, 7788819
Habitat type	Woodlands on alluvial soil
Associated RE	2.3.17a
Habitat Description	Riparian vegetation along the braided Saxby River.
Disturbance Present	Near access track, located approximately 100 m away. Grazed. No weed species recorded
Dominant Vegetation Species	Dominant Trees: <i>Eucalyptus camaldulensis</i> , <i>Eucalyptus microtheca</i> , <i>Terminalia platyphylla</i> Dominant Ground Cover: <i>Eulalia aurea</i>



Site Name	FS07
Associated Project Site	Vecco Critical Minerals Project
Site Location (Zone, Easting, Northing)	54, 592237, 7793646
Habitat type	Tussock grassland
Associated RE	2.4.2b
Habitat Description	Grassland on sandy clay
Disturbance Present	Grazed. Weed <i>Vachellia farnesiana</i> (Mimosa bush) recorded
Dominant Vegetation Species	Dominant Trees: NA Dominant Ground Cover: <i>Aristida</i> spp., Mitchell Grass.



Site Name	FS08
Associated Project Site	Vecco Critical Minerals Project
Site Location (Zone, Easting, Northing)	54, 594923, 7791170
Habitat type	Low dry woodlands
Associated RE	2.5.1b
Habitat Description	Sparse low woodland on sandy soil
Disturbance Present	Near access track, located approximately 100 m away. Grazed. Weed <i>Vachellia farnesiana</i> (Mimosa bush) recorded
Dominant Vegetation Species	Dominant Trees: <i>Terminalia platyphylla</i> , <i>Grevillea striata</i> Dominant Shrubs: <i>Carissa lanceolata</i> Dominant Ground Cover: <i>Aristida</i> spp.

Appendix G. Flora Species List

Family	Species	Endemic	Pest Status	NC Act	2021 Spring Flora									2022 Autumn Flora												
					BC01	BC02	BC03	BC04	BC05	BC06	BC07	BC08	BC09	BC10	BC11	BC12	BC13	BC14	BC15	BC16	BC17	BC18	BC19	BC20	BC21	BC22
Aizoaceae	<i>Trianthema portulacastrum</i>	I	Weed	LC	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
Aizoaceae	<i>Trianthema triquetra</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Amaranthaceae	<i>Achyranthes aspera</i>	N	N/A	LC	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthaceae	<i>Alternanthera denticulata</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Amaranthaceae	<i>Alternanthera sp.</i>	N/A	N/A	N/A	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apocynaceae	<i>Carissa lanceolata</i>	N	N/A	LC	0	1	0	1	1	1	0	0	0	0	1	1	1	0	0	0	0	0	1	1	1	1
Asteraceae	<i>Xanthium occidentale</i>	I	Weed	LC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Boraginaceae	<i>Ehretia saligna</i>	N	N/A	LC	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boraginaceae	<i>Heliotropium cunninghamii</i>	N	N/A	LC	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capparaceae	<i>Capparis mitchellii</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Combretaceae	<i>Terminalia aridicola</i>	N	N/A	LC	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combretaceae	<i>Terminalia platyphylla</i>	N	N/A	LC	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Convolvulaceae	<i>Evolvulus alsinoides</i>	N	N/A	LC	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Cyperaceae	<i>Bulbostylis barbata</i>	N	N/A	LC	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	<i>Cyperus iria</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Cyperaceae	<i>Fimbristylis dichotoma</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Ebenaceae	<i>Diospyros humilis</i>	N	N/A	LC	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0
Equisetopsida	<i>Oxalis sp.</i>	N/A	N/A	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Equisetopsida	<i>Uraria lagopodioides</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Euphorbiaceae	<i>Excoecaria parvifolia</i>	N	N/A	LC	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	1	0	1	0
Leguminosae	<i>Acacia cambagei</i>	N	N/A	LC	1	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0
Leguminosae	<i>Acacia holosericea</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Leguminosae	<i>Bauhinia sp.</i>	N/A	N/A	N/A	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Leguminosae	<i>Bonamia media</i>	N	N/A	LC	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leguminosae	<i>Indigofera linneai</i>	N	N/A	LC	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Leguminosae	<i>Neptunia gracilis</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	1
Leguminosae	<i>Neptunia sp.</i>	N/A	N/A	N/A	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Poaceae	<i>Aristida latifolia</i>	N	N/A	LC	0	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	1	1	0	
Poaceae	<i>Aristida ramosa</i>	N	N/A	LC	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
Poaceae	<i>Astrebula sp.</i>	N/A	N/A	N/A	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
Poaceae	<i>Astrebula squarrosa</i>	N	N/A	LC	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Poaceae	<i>Brachyachne convergens</i>	N	N/A	LC	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	0
Poaceae	<i>Cenchrus ciliaris</i>	I	Weed	N/A	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
Poaceae	<i>Chloris divaricata</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
Poaceae	<i>Chrysopogon fallax</i>	N	N/A	LC	1	0	1	1	1	0	1	0	1	1	0	0	0	1	0	0	0	0	1	1	
Poaceae	<i>Dactyloctenium radulans</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
Poaceae	<i>Dicanthium sp.</i>	N/A	N/A	N/A	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
Poaceae	<i>Digitaria sp.</i>	N/A	N/A	N/A	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Poaceae	<i>Enneapogon avenaceus</i>	N	N/A	LC	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Poaceae	<i>Enneapogon polyphyllus</i>	N	N/A	LC	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	
Poaceae	<i>Enneapogon asperatus</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Poaceae	<i>Eragrostis cummingii</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
Poaceae	<i>Eragrostis xerophila</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
Poaceae	<i>Eriachne obtusa</i>	N	N/A	LC	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	
Poaceae	<i>Eulalia aurea</i>	N	N/A	LC	1	1	1	1	0	0	1	0	1	0	0	1	0	0	1	0	0	0	0	1	
Poaceae	<i>Heteropogon contortus</i>	N	N/A	LC	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Poaceae	<i>Sporobolus actinocladius</i>	N	N/A	LC	0	0	1	0	0	0	0	1	1	0	1	1	0	1	1	1	1	0	0	0	
Poaceae	<i>Sporobolus australasicus</i>	N	N/A	LC	0	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	
Poaceae	<i>Sporobolus caroli</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	
Portulacaceae	<i>Portulaca filifolia</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	
Portulacaceae	<i>Portulaca oleracea</i>	I	Weed	N/A	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
Proteaceae	<i>Grevillea striata</i>	N	N/A	LC	0	0	0	1	1	1	0	0	0	1	1	1	0	0	0	1	0	1	0	0	
Proteaceae	<i>Hakea arborescens</i>	N	N/A	LC	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	
Rhamnaceae	<i>Ventilago viminalis</i>	N	N/A	LC	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
Rubiaceae	<i>Psydrax sp.</i>	N/A	N/A	N/A	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	
Sapindaceae	<i>Atalaya hemiglaucula</i>	N	N/A	LC	1	0	1	1	1	1	1	0	1	1	1	1	0	0	0	1	0	1	0	1	
Sparrmanniaceae	<i>Corchorus trilocularis</i>	N	N/A	LC	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	

Appendix H. Fauna Species List

Family	Scientific Name	Common Name	NC Act / Biosecurity Act Status	EPBC Act status	2021 Spring Fauna							Total	
					FS01	FS02	FS03	FS04	FS05	SS1	SS2		Incidentals
Amphibians													
Hylidae	<i>Litoria caerulea</i>	Common green treefrog	LC	NL				0	0	0	0	0	0
Bufo	<i>Rhinella marina</i>	Cane Toad	LC	I	0	0	0	0	0	0	0	1	1
FERAL / DOMESTICATED / INTRODUCED SPECIES					0	0	0	0	0	0	0	1	1
NATIVE AMPHIBIANS					0	0	0	0	0	0	0	0	0
TOTAL AMPHIBIANS					0	0	0	0	0	0	0	1	1
Reptiles													
Agamidae	<i>Diporiphora australis</i>	Tommy roundhead	LC	NL				0	0	0	0	0	0
Agamidae	<i>Lophognathus horneri</i>	Gilbert's Dragon	LC	NL	1	0	0	0	0	0	0	0	1
Agamidae	<i>Tympanocryptis tetraporophora</i>	Eyrean Earless Dragon	LC	NL	0	2	0	0	0	0	0	0	2
Agamidae	<i>Diporiphora sp.</i>		LC	NL	0	1	0	0	0	0	0	0	1
Diplodactylidae	<i>Diplodactylus ameyi</i>	Eastern deserts fat-tailed gecko	LC	NL				0	0	0	0	0	0
Diplodactylidae	<i>Diplodactylus tessellatus</i>	Tessellated Gecko	LC	NL	0	2	1	0	0	0	0	0	3
Diplodactylidae	<i>Lucasium immaculatum</i>	Pale-striped ground gecko	LC	NL	0	3	0	0	0	0	0	0	3
Diplodactylidae	<i>Strophurus krisalys</i>	Kristin's spiny-tailed gecko	LC	NL	0	0	1	5	3	0	0	0	9
Gekkonidae	<i>Gehyra versicolor</i>	Tree dtella	LC	NL	5	0	0	1	6	0	7	0	19
Gekkonidae	<i>Heteronotia binoei</i>	Bynoe's Gecko	LC	NL	8	0	0	3	3	0	0	0	14
Scincidae	<i>Carlia munda</i>	Shaded-Litter Rainbow-Skink	LC	NL	7	0	0	0	0	0	0	0	7
Scincidae	<i>Carlia sp.</i>		LC	NL				0	0	0	0	0	0
Scincidae	<i>Ctenotus sp.</i>		LC	NL				0	0	0	0	0	0
Scincidae	<i>Cryptoblepharus metallicus</i>	Metallic Snake-Eyed Skink	LC	NL	1	0	0	0	0	0	0	0	1
Scincidae	<i>Lerista hobsoni</i>	Hobson's fine-line slider	LC	NL				0	0	0	0	0	0
Scincidae	<i>Lerista zonulata</i>	Girdled Slider	LC	NL				0	0	0	0	0	0
Scincidae	<i>Menetia greyii</i>	Common Dwarf Skink	LC	NL	0	2	2	2	3	0	0	0	9
Scincidae	<i>Notoscincus ornatus</i>	Ornate Soil-Crevise Skink	LC	NL	0	0	0	4	3	0	0	0	7
Varanidae	<i>Varanus tristis</i>	Black-tailed monitor	LC	NL				0	0	0	0	0	0
Varanidae	<i>Varanus panoptes</i>	Yellow-spotted monitor	LC	NL				0	0	0	0	0	0
Boidae	<i>Antaresia stimsoni</i>	Stimson's python	LC	NL	0	0	1	0	0	0	0	0	1
Chelidae	<i>Chelodina canni</i>	Cann's longneck turtle	LC	NL	0	0	0	0	0	0	0	1	1
LIZARDS					22	10	5	15	18	0	7	0	77
SNAKES					0	0	1	0	0	0	0	0	1
TURTLES					0	0	0	0	0	0	0	1	1
TOTAL REPTILES					22	10	6	15	18	0	7	1	79

Birds														
Acanthizidae	<i>Gerygone fusca</i>	Western gerygone	LC	NL				0	0	0	0	0	0	0
Acanthizidae	<i>Gerygone olivacea</i>	White-throated Gerygone	LC	NL	0	0	0	1	0	0	0	0	0	1
Acanthizidae	<i>Smicronis brevirostris</i>	Weebill	LC	NL				0	0	0	0	0	0	0
Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle	LC	NL	0	0	2	0	0	0	0	0	0	2
Accipitridae	<i>Haliastur sphenurus</i>	Whistling Kite	LC	NL	2	0	0	0	0	1	0	0	0	3
Accipitridae	<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	LC	NL	0	0	0	0	0	0	0	0	0	0
Accipitridae	<i>Milvus migrans</i>	Black Kite	LC	NL	0	0	1	0	0	1	0	0	0	2
Aegothelidae	<i>Aegotheles cristatus</i>	Owlet- Nightjar	LC	NL	0	0	0	0	0	0	0	0	0	0
Alaudidae	<i>Mirafra javanica</i>	Horsfield's Bushlark	LC	NL	0	1	0	0	0	0	0	0	0	1
Anatidae	<i>Anas superciliosa</i>	Black Duck	LC	NL	0	0	0	0	0	0	0	0	0	0
Areidae	<i>Egretta novaehollandiae</i>	White Faced Heron	LC	NL	0	0	0	0	0	0	0	0	0	0
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow	LC	NL	0	2	0	0	0	0	0	0	0	2
Artamidae	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow	LC	NL	0	0	0	2	0	0	0	0	0	2
Artamidae	<i>Artamus personatus</i>	Masked wood swallow	LC	NL	0	0	0	0	0	0	0	10	10	0
Artamidae	<i>Artamus minor</i>	Little Woodswallow	LC	NL	0	0	0	0	0	0	0	0	0	0
Artamidae	<i>Artamus superciliosus</i>	White-Browed Woodswallow	LC	NL	0	0	0	0	0	0	0	0	0	0
Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird	LC	NL	0	1	1	2	3	0	0	0	0	7
Artamidae	<i>Gymnorhina tibicen</i>	Australian Magpie	LC	NL	0	0	2	1	2	0	0	0	0	5
Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	LC	NL	0	0	1	0	1	0	0	0	0	2
Cacatuidae	<i>Cacatua sanguinea</i>	Little Corella	LC	NL	0	0	0	0	0	1	0	0	0	1
Cacatuidae	<i>Calyptorhynchus banksii</i>	Red-tailed Black Cockatoo	LC	NL	0	0	2	1	0	1	0	0	0	4
Cacatuidae	<i>Eolophus roseicapilla</i>	Galah	LC	NL	3	2	2	3	4	1	0	0	0	15
Cacatuidae	<i>Nymphicus hollandicus</i>	Cockatiel	LC	NL	1	0	1	0	1	1	0	0	0	4
Campephagidae	<i>Coracina maxima</i>	Ground Cuckoo-shrike	LC	NL	0	0	0	0	0	0	0	0	0	0
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	LC	NL	1	0	0	0	1	0	0	0	0	2
Campephagidae	<i>Lalage tricolor</i>	White-winged Triller	LC	NL	0	0	0	0	1	0	0	1	2	0
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu	LC	NL	0	0	0	1	0	0	0	0	0	1
Charadriidae	<i>Euseyonis melanops</i>	Black-fronted Dotterel	LC	NL	0	0	0	0	0	1	0	0	0	1
Charadriidae	<i>Vanellus miles miles</i>	Masked Lapwing (Northern Subspeci	LC	NL	0	0	0	0	0	0	0	0	0	0
Columbidae	<i>Geopelia cuneata</i>	Diamond Dove	LC	NL	0	0	1	3	3	0	0	0	0	7
Columbidae	<i>Geopelia placida</i>	Peaceful Dove	LC	NL	5	0	0	0	0	0	0	0	0	5
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon	LC	NL	1	2	1	1	2	1	0	0	0	8
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing	LC	NL	1	0	0	0	0	1	0	0	0	2
Columbidae	<i>Phaps histrionica</i>	Flock Bronzewing	LC	NL	0	1	0	0	0	0	0	0	0	1
Corcoraciidae	<i>Struthidea cinerea</i>	Apostlebird	LC	NL	1	0	0	0	0	0	0	0	0	1
Corvidae	<i>Corvus coronoides</i>	Australian Raven	LC	NL	3	0	3	0	2	1	0	0	0	9
Corvidae	<i>Corvus orru</i>	Torresian Crow	LC	NL	0	0	3	0	0	0	0	0	0	3
Cuculidae	<i>Cacomantis pallidus</i>	Pallid Cuckoo	LC	Ma	0	0	0	0	0	0	0	0	0	0
Estrildidae	<i>Taeniopygia bichenovii</i>	Double-barred finch	LC	NL	0	0	0	0	0	0	0	0	0	0
Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch	LC	NL	0	0	0	0	0	1	0	0	0	1
Eurostopodidae	<i>Eurostopodus argus</i>	Spotted Night Jar	LC	NL	0	0	0	0	0	0	0	1	1	0

Falconidae	<i>Falco berigora</i>	Brown Falcon	LC	NL	0	0	0	0	1	0	0	0	1
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel	LC	NL	1	0	0	0	1	0	0	0	2
Gruidae	<i>Antigone rubicunda</i>	Brolga	LC	NL	0	0	0	0	0	0	0	0	0
Halcyonidae	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher	LC	NL	0	0	0	0	0	0	0	0	0
Maluridae	<i>Malurus lamberti</i>	Variiegated fairy-wren	LC	NL	0	0	0	0	0	0	0	0	0
Maluridae	<i>Malurus melanoccephalus</i>	Red-backed Fairy-wren	LC	NL	0	0	0	0	0	0	0	0	0
Megaluridae	<i>Cincloramphus mathewsi</i>	Rufous Songlark	LC	NL	0	0	0	0	0	0	0	0	0
Megaluridae	<i>Megalurus cruralis</i>	Brown Songlark	LC	NL	0	1	0	0	0	0	0	0	1
Meliphagidae	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	LC	NL	1	0	0	0	0	0	0	0	1
Meliphagidae	<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater	LC	NL	0	0	0	0	0	0	0	0	0
Meliphagidae	<i>Epthianura tricolor</i>	Crimson Chat	LC	NL	0	0	0	0	0	0	0	0	0
Meliphagidae	<i>Conopophila rufogularis</i>	Rufous-throated Honeyeater	LC	NL	3	0	0	1	1	0	0	0	5
Meliphagidae	<i>Ptilotula flavescens</i>	Yellow-tinted Honeyeater	LC	NL	1	0	0	0	0	0	0	0	1
Meliphagidae	<i>Lichenostomus picinellatus</i>	White-plumed Honeyeater	LC	NL	1	0	0	0	0	0	0	0	1
Meliphagidae	<i>Gavicalis virescens</i>	Singing Honeyeater	LC	NL	1	0	0	0	1	0	0	0	2
Meliphagidae	<i>Lichmera indistincta</i>	Brown Honeyeater	LC	NL	4	0	0	0	0	0	0	0	4
Meliphagidae	<i>Manorina flavigula</i>	Yellow-throated Miner	LC	NL	1	0	0	0	2	1	0	0	4
Meliphagidae	<i>Philemon citreogularis</i>	Little Friarbird	LC	NL	2	0	0	0	1	0	0	0	3
Meliphagidae	<i>Ptilotula penicillata</i>	White-plumed Honeyeater	LC	NL	0	0	0	1	0	0	0	0	1
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	LC	Ma	1	0	0	0	0	0	0	0	1
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark	LC	NL	0	0	0	1	1	1	0	0	3
Monarchidae	<i>Myiagra inquieta</i>	Restless Flycatcher	LC	NL	1	0	0	0	0	0	0	0	1
Monarchidae	<i>Myiagra rubecula</i>	Leadend Flycatcher	LC	NL	1	0	0	0	0	0	0	0	1
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian pipit	LC	NL	0	0	0	0	0	0	0	10	10
Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird	LC	NL	1	0	0	1	0	0	0	0	2
Otididae	<i>Ardeotis australis</i>	Australian Bustard	LC	NL	0	0	0	0	0	0	0	0	0
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey shrike-thrush	LC	NL	0	0	0	0	0	0	0	0	0
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler	LC	NL	2	0	0	3	3	0	0	0	8
Pardalotidae	<i>Pardalotus striatus</i>	Striated pardalote	LC	NL	0	0	0	0	0	0	0	0	0
Petroicidae	<i>Microeca leucophaea</i>	Jacky Winter	LC	NL	0	0	0	1	0	0	0	0	1
Petroicidae	<i>Melanodryas cucullata</i>	Hooded robin	LC	NL	0	0	0	0	0	0	0	0	0
Petroicidae	<i>Petroica goodenovii</i>	Red-capped robin	LC	NL	0	0	0	0	0	0	0	0	0
Phasianidae	<i>Synoicus ypsilophorus</i>	Brown Quail	LC	NL	0	0	0	0	0	0	0	0	0
Podargidae	<i>Podargus strigoides</i>	tawny frogmouth	LC	NL	0	0	0	0	0	0	0	0	0
Pomatostoidae	<i>Pomatostomus temporalis</i>	Grey-crowned Babbler	LC	NL	0	0	0	4	0	1	0	0	5
Psittacidae	<i>Aprosmictus erythropterus</i>	Red-winged Parrot	LC	NL	1	0	2	0	1	0	0	0	4
Psittacidae	<i>Melopsittacus undulatus</i>	Budgerigar	LC	NL	1	0	0	0	1	0	0	0	2
Psittacidae	<i>Platycercus adsctus</i>	Pale-headed Rosella	LC	NL	0	0	0	1	0	0	0	0	1
Psittacidae	<i>Psitteuteles versicolor</i>	Varied Lorikeet	LC	NL	0	0	1	0	1	0	0	0	2
Ptilonorhynchidae	<i>Chlamydera maculata</i>	Spotted Bowerbird	LC	NL	1	0	0	1	0	0	0	0	2
Ptilonorhynchidae	<i>Chlamydera nuchalis</i>	Great Bowerbird	LC	NL	0	0	0	0	0	0	0	0	0
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail	LC	NL	2	0	0	1	3	1	0	0	7
Strigidae	<i>Ninox boobook</i>	Australian boobook	LC	Ma	0	0	0	0	0	0	0	0	0
Turnicidae	<i>Turnix velox</i>	Little Button-quail	LC	NL	0	0	0	1	0	0	0	1	2
TOTAL BIRDS					44	10	23	31	37	15	0	23	183

Family	Scientific Name	Common Name	NC Act / Biosecurity Act Status	EPBC Act status	2022 Autumn Fauna											Incidentals	Total	
					FS06	FS07	FS08	SS3	SS4	SS5	MS1	MS2	MS3	MS4	MS5			MS6
Amphibians																		
Hylidae	<i>Litoria caerulea</i>	Common green treefrog	LC	NL	3	0	0	0	0	0	0	0	0	0	0	0	0	3
Bufo	<i>Rhinella marina</i>	Cane Toad	LC	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FERAL / DOMESTICATED / INTRODUCED SPECIES					0	0	0	0	0	0	0	0	0	0	0	0	0	0
NATIVE AMPHIBIANS					3	0	0	0	0	0	0	0	0	0	0	0	0	3
TOTAL AMPHIBIANS					3	0	0	0	0	0	0	0	0	0	0	0	0	3
Reptiles																		
Agamidae	<i>Diporiphora australis</i>	Tommy roundhead	LC	NL	0	0	0	5	0	0	0	0	0	0	0	0	0	5
Agamidae	<i>Lophognathus horneri</i>	Gilbert's Dragon	LC	NL	2	0	1	0	0	0	0	0	1	0	0	0	0	4
Agamidae	<i>Tympanocryptis tetraporophora</i>	Eyrean Earless Dragon	LC	NL	0	2	0	0	0	0	0	0	1	0	0	0	0	3
Agamidae	<i>Diporiphora sp.</i>		LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diplodactylidae	<i>Diplodactylus ameyi</i>	Eastern deserts fat-tailed gecko	LC	NL	0	0	3	0	0	0	0	0	0	0	0	0	0	3
Diplodactylidae	<i>Diplodactylus tessellatus</i>	Tessellated Gecko	LC	NL	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Diplodactylidae	<i>Lucasium immaculatum</i>	Pale-striped ground gecko	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diplodactylidae	<i>Strophurus krisalys</i>	Kristin's spiny-tailed gecko	LC	NL	0	0	3	0	0	0	0	0	0	0	0	0	0	3
Gekkonidae	<i>Gehyra versicolor</i>	Tree dtella	LC	NL	0	0	3	0	0	1	0	0	0	0	0	0	0	4
Gekkonidae	<i>Heteronotia binoei</i>	Bynoe's Gecko	LC	NL	2	0	5	0	0	0	0	0	0	0	0	0	0	7
Scincidae	<i>Carlia munda</i>	Shaded-Litter Rainbow-Skink	LC	NL	10	0	0	0	0	0	0	0	0	0	0	0	0	10
Scincidae	<i>Carlia sp.</i>		LC	NL	1	0	1	1	0	0	0	0	0	0	0	0	0	3
Scincidae	<i>Ctenotus sp.</i>		LC	NL	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Scincidae	<i>Cryptoblepharus metallicus</i>	Metallic Snake-Eyed Skink	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scincidae	<i>Lerista hobsoni</i>	Hobson's fine-line slider	LC	NL	0	0	3	0	0	0	0	0	0	0	0	0	0	3
Scincidae	<i>Lerista zonulata</i>	Girdled Slider	LC	NL	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Scincidae	<i>Menetia greyii</i>	Common Dwarf Skink	LC	NL	0	0	6	0	0	0	0	0	0	0	0	0	0	6
Scincidae	<i>Notoscincus ornatus</i>	Ornate Soil-Crevice Skink	LC	NL	0	0	4	0	0	0	0	0	0	0	0	0	0	4
Varanidae	<i>Varanus tristis</i>	Black-tailed monitor	LC	NL	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Varanidae	<i>Varanus panoptes</i>	Yellow-spotted monitor	LC	NL	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Boidae	<i>Antaresia stimsoni</i>	Stimson's python	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chelidae	<i>Chelodina canni</i>	Cann's longneck turtle	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LIZARDS					15	3	31	7	0	2	0	0	0	2	0	0	0	60
SNAKES					0	0	0	0	0	0	0	0	0	0	0	0	0	0
TURTLES					0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL REPTILES					15	3	31	7	0	2	0	0	2	0	0	0	0	60

Birds																			
Acanthizidae	<i>Gerygone fusca</i>	Western gerygone	LC	NL	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Acanthizidae	<i>Gerygone olivacea</i>	White-throated Gerygone	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acanthizidae	<i>Smicrornis brevirostris</i>	Weebill	LC	NL	0	0	0	0	0	1	0	0	0	1	0	0	0	0	2
Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle	LC	NL	0	0	1	0	0	0	0	0	0	1	0	0	0	0	2
Accipitridae	<i>Haliastur sphenurus</i>	Whistling Kite	LC	NL	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Accipitridae	<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	LC	NL	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2
Accipitridae	<i>Milvus migrans</i>	Black Kite	LC	NL	1	3	1	0	0	0	0	0	0	1	0	0	0	0	6
Aegothelidae	<i>Aegotheles cristatus</i>	Owlet- Nightjar	LC	NL	2	0	2	1	0	0	1	0	0	0	0	0	0	0	6
Alaudidae	<i>Mirafra javanica</i>	Horsfield's Bushlark	LC	NL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Anatidae	<i>Anas superciliosa</i>	Black Duck	LC	NL	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Ardeidae	<i>Egretta novaehollandiae</i>	White Faced Heron	LC	NL	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow	LC	NL	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Artamidae	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow	LC	NL	2	0	0	0	0	0	0	0	0	1	0	0	0	0	3
Artamidae	<i>Artamus personatus</i>	Masked wood swallow	LC	NL	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Artamidae	<i>Artamus minor</i>	Little Woodswallow	LC	NL	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Artamidae	<i>Artamus superciliosus</i>	White-Browed Woodswallow	LC	NL	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2
Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird	LC	NL	1	1	2	1	0	0	0	0	0	1	0	0	0	0	6
Artamidae	<i>Gymnorhina tibicen</i>	Australian Magpie	LC	NL	1	0	1	0	0	0	0	0	0	1	0	0	0	3	6
Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	LC	NL	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Cacatuidae	<i>Cacatua sanguinea</i>	Little Corella	LC	NL	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Cacatuidae	<i>Calyptorhynchus banksii</i>	Red-tailed Black Cockatoo	LC	NL	0	0	2	0	0	0	0	0	0	1	0	0	0	0	3
Cacatuidae	<i>Eolophus roseicapilla</i>	Galah	LC	NL	2	2	1	0	0	1	0	0	0	1	0	0	0	6	13
Cacatuidae	<i>Nymphicus hollandicus</i>	Cockatiel	LC	NL	0	0	1	1	0	0	0	0	0	1	0	0	0	0	3
Campephagidae	<i>Coracina maxima</i>	Ground Cuckoo-shrike	LC	NL	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	LC	NL	0	0	0	0	0	1	0	0	0	1	0	0	0	0	2
Campephagidae	<i>Lalage tricolor</i>	White-winged Triller	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu	LC	NL	0	2	0	0	0	0	0	0	0	1	0	0	0	1	4
Charadriidae	<i>Euseyornis melanops</i>	Black-fronted Dotterel	LC	NL	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Charadriidae	<i>Vanellus miles miles</i>	Masked Lapwing (Northern Subspecies)	LC	NL	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Columbidae	<i>Geopelia cuneata</i>	Diamond Dove	LC	NL	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Columbidae	<i>Geopelia placida</i>	Peaceful Dove	LC	NL	3	0	1	1	0	1	0	0	0	1	0	0	0	0	7
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon	LC	NL	1	0	0	0	0	0	0	0	0	1	0	0	0	0	2
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing	LC	NL	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Columbidae	<i>Phaps histrionica</i>	Flock Bronzewing	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corcoraciidae	<i>Struthidea cinerea</i>	Apostlebird	LC	NL	0	0	0	0	0	0	0	0	0	1	0	0	0	12	13
Corvidae	<i>Corvus coronoides</i>	Australian Raven	LC	NL	8	1	2	1	0	1	0	0	0	1	0	0	0	0	14
Corvidae	<i>Corvus orru</i>	Torresian Crow	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cuculidae	<i>Cacomantis pallidus</i>	Pallid Cuckoo	LC	Ma	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Estrilidae	<i>Taeniopygia bichenovii</i>	Double-barred finch	LC	NL	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Estrilidae	<i>Taeniopygia guttata</i>	Zebra Finch	LC	NL	0	2	0	2	0	0	0	0	0	1	0	0	0	0	5
Eurostopodidae	<i>Eurostopodus argus</i>	Spotted Night Jar	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Falconidae	<i>Falco berigora</i>	Brown Falcon	LC	NL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel	LC	NL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Gruidae	<i>Antigone rubicunda</i>	Brolga	LC	NL	0	0	0	0	0	0	0	1	0	0	0	0	1	0	2
Halcyonidae	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher	LC	NL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Maluridae	<i>Malurus lamberti</i>	Variiegated fairy-wren	LC	NL	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Maluridae	<i>Malurus melanocephalus</i>	Red-backed Fairy-wren	LC	NL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Megaluridae	<i>Cincloramphus mathewsi</i>	Rufous Songlark	LC	NL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Megaluridae	<i>Megalurus cruralis</i>	Brown Songlark	LC	NL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Meliphagidae	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meliphagidae	<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater	LC	NL	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Meliphagidae	<i>Epthianura tricolor</i>	Crimson Chat	LC	NL	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Meliphagidae	<i>Conopophila rufogularis</i>	Rufous-throated Honeyeater	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meliphagidae	<i>Ptilotula flavescens</i>	Yellow-tinted Honeyeater	LC	NL	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Meliphagidae	<i>Lichenostomus pinicillatus</i>	White-plumed Honeyeater	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meliphagidae	<i>Gavicalis virescens</i>	Singing Honeyeater	LC	NL	0	0	1	1	0	1	0	0	0	0	1	0	0	0	4
Meliphagidae	<i>Lichmera indistincta</i>	Brown Honeyeater	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meliphagidae	<i>Manorina flavigula</i>	Yellow-throated Miner	LC	NL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Meliphagidae	<i>Philemon citreogularis</i>	Little Friarbird	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meliphagidae	<i>Ptilotula penicillata</i>	White-plumed Honeyeater	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	LC	Ma	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark	LC	NL	1	0	1	0	0	1	0	0	0	0	1	0	0	0	4
Monarchidae	<i>Myiagra inquieta</i>	Restless Flycatcher	LC	NL	1	0	0	0	0	0	0	0	0	0	1	0	0	0	2
Monarchidae	<i>Myiagra rubecula</i>	Leadern Flycatcher	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian pipit	LC	NL	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2
Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Otididae	<i>Ardeotis australis</i>	Australian Bustard	LC	NL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey shrike-thrush	LC	NL	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler	LC	NL	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2
Pardalotidae	<i>Pardalotus striatus</i>	Striated pardalote	LC	NL	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
Petroicidae	<i>Microeca leucophaea</i>	Jacky Winter	LC	NL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Petroicidae	<i>Melanodryas cucullata</i>	Hooded robin	LC	NL	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Petroicidae	<i>Petroica goodenovii</i>	Red-capped robin	LC	NL	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Phasianidae	<i>Synoicus ypsilophorus</i>	Brown Quail	LC	NL	0	1	0	0	0	0	0	0	0	0	1	0	0	1	3
Podargidae	<i>Podargus strigoides</i>	tawny frogmouth	LC	NL	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Pomatostoidae	<i>Pomatostomus temporalis</i>	Grey-crowned Babbler	LC	NL	0	0	2	0	0	1	0	0	0	0	1	0	0	0	4
Psittacidae	<i>Aprosmictus erythropterus</i>	Red-winged Parrot	LC	NL	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2
Psittacidae	<i>Melopsittacus undulatus</i>	Budgerigar	LC	NL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Psittacidae	<i>Platycercus adscitus</i>	Pale-headed Rosella	LC	NL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Psittacidae	<i>Psitteuteles versicolor</i>	Varied Lorikeet	LC	NL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ptilonorhynchidae	<i>Chlamydera maculata</i>	Spotted Bowerbird	LC	NL	1	0	0	0	0	0	0	0	0	0	1	0	0	0	2
Ptilonorhynchidae	<i>Chlamydera nuchalis</i>	Great Bowerbird	LC	NL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail	LC	NL	1	0	1	0	0	1	0	0	0	0	1	0	0	0	4
Strigidae	<i>Ninox boobook</i>	Australian boobook	LC	Ma	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Turnicidae	<i>Turnix velox</i>	Little Button-quail	LC	NL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
TOTAL BIRDS					29	14	22	11	0	14	2	1	5	47	3	4	23	175	

Appendix I. Landscape Fragmentation and Connectivity Tool Output

```

Department of Environment and Heritage Protection (DEHP)
Landscape Fragmentation and Connectivity (LFC) Tool version 1.4 LOGFILE
Process started at 20-04-2023 04:37:55 PM
Python version: 2.7.18.4 (default, Aug 9 2021, 23:37:24) [MSC v.1500 32 bit (Intel)]
Arcpy version: 10.9.1
Username: Lucia

INPUT PARAMETERS
Output Workspace: C:\Users\Lucia\Documents\Vecco LFC
Threshold lookup table: C:\Users\Lucia\Documents\Vecco LFC\DP_EHP_LFC_TOOL\LFC_data.gdb
\tbl_Regional_frag_local_threshold
Remnant cover layer: C:\Users\Lucia\Documents\Vecco LFC\DP_EHP_LFC_TOOL\LFC_data.gdb\QLD_VEG_RVM_100K_v2p0
Remnant cover layer edited: False
Regional buffer extent: 20 kilometres
Local buffer extent: 5 kilometres
Impact layer: C:\Users\Lucia\Documents\Vecco LFC\DisturbanceConnectivityTool_3577.shp
layer projection: GDA_1994_Australia_Albers
Raster cell resolution for analysis: 20 metres
Edge Width: 50 metres
(The distance from non-remnant landscapes through to the core ecosystem - the edge of remnant ecosystems)
Default projection: C:\Users\Lucia\Documents\Vecco LFC\DP_EHP_LFC_TOOL\scripts\QLD Albers Equal Area Conic.prj

16:37:55 Checking out the spatial analyst tool - required for LFC

16:37:55 _____BEGINNING LANDSCAPE FRAGMENTATION AND CONNECTIVITY ANALYSIS_____

16:37:55 This tool will categorise the landscape into:
{0: 'non-rem', 1: 'patch', 2: 'edge', 3: 'perforated', 4: 'core (< 100 hectares)', 5: 'core (100-500 hectares)',
6: 'core (> 500 hectares)', 7: 'water'}

16:38:09 Deleted existing files in output folder
16:38:10 Deleted existing pre-impact file geodatabase
16:38:11 Deleted existing post-impact file geodatabase
16:38:12 Copying across impact site feature(s) and calculating area in hectares (AreaHA)
16:38:12 Making a local copy of the impact site
16:38:13 Preparing remnant cover layer for analysis
16:38:13 Created regional scale buffer of 20 kilometres
16:38:14 Created local scale buffer of 5 kilometres
16:38:15 Clipped the remnant cover to the regional buffer extent
16:38:16 Unioned the pre impact remnant layer with the impact site
16:38:17 Attributed the impact area as not RVM Cat B
16:38:17 Area of RVM Cat B clearing is 1306.18 hectares
16:38:17 SQL selection used is "RVM_CAT" = 'B' and "Cover" = 'Not RVM Cat B' on shapefile
C:\Users\Lucia\Documents\Vecco LFC\main_output\clip_remcover_post.shp

16:38:17 Categorised the cover attributes in clip_remcover_pre.shp ready for raster conversion
16:38:22 Converted clip_remcover_pre.shp to raster

16:38:22 Categorised the cover attributes in clip_remcover_post.shp ready for raster conversion
16:38:26 Converted clip_remcover_post.shp to raster

16:38:26 Run Landscape fragmentation analysis on the pre impact regional landscape

REGULATED VEGETATION TYPES BEING EXTRACTED FROM LAND COVER
IDENTIFICATION OF CORE, PATCH, EDGE AND PERFORATIONS
COMBINING FRAGMENTATION CLASSES
CLASSIFYING CORE FOREST PATCHES BY AREA
COMPOSING FINAL FRAGMENTATION MAP
COMPOSING FINAL FRAGMENTATION MAP
(FRAGMENTATION CALCULATION TIME WAS 3.9 MINUTES)

16:42:23 Run Landscape fragmentation analysis on the post impact regional landscape

REGULATED VEGETATION TYPES BEING EXTRACTED FROM LAND COVER
IDENTIFICATION OF CORE, PATCH, EDGE AND PERFORATIONS
COMBINING FRAGMENTATION CLASSES
CLASSIFYING CORE FOREST PATCHES BY AREA
COMPOSING FINAL FRAGMENTATION MAP
COMPOSING FINAL FRAGMENTATION MAP
(FRAGMENTATION CALCULATION TIME WAS 3.8 MINUTES)
    
```

Extracting a local subset of lfc_regional_pre_impact
 Extracting a local subset of lfc_regional_post_impact

Collating pre and post impact statistics and trigger assessment
 16:46:28 Summarising area statistics for: lfc_localmsk_pre_impact
 16:46:28 Summarising area statistics for: lfc_localmsk_post_impact
 16:46:28 Summarising area statistics for: lfc_regional_pre_impact
 16:46:29 Summarising patch count for lfc_localmsk_pre_impact
 16:46:31 Summarising patch count for lfc_localmsk_post_impact

Analysing impact on Connectivity Areas

SIGNIFICANCE TEST ONE

The regional total area is 299447.00
 The regional extent of core remnant is 299279.92
 The regional extent of core remnant is 99.94 percent
 This level of regional fragmentation sets a local impact threshold of: 50.0 percent

The table below lists the local impact thresholds for categories of regional core remnant extent:

REGIONAL CORE CATEGORY	LOCAL IMPACT THRESHOLD
< 10	2.0
10 - 30	5.0
30 - 50	10.0
50 - 70	20.0
70 - 90	30.0
>90	50.0

Area of core at the local scale (pre impact): 54427.12
 Area of core at the local scale (post impact): 52580.28
 Percent change of core at the local scale (post impact): 3.39 percent

SIGNIFICANCE TEST TWO

The number of core remnant areas occurring on the site: 1
 The number of core remnant areas remaining on the site post impact: 1
 (Only core polygons greater than or equal to 1 hectare are included)

RESULT

16:46:36 This analysis has determined any impact on connectivity areas is NOT significant
 (A significant reduction in core remnant at the local scale is False OR a change from core to non-core remnant at the site scale is False)

The significance table has been written to: ..\main_output\lfc_significance_assessment.csv
 The local scale summary table has been written to: ..\main_output\lfc_local_scale_summary.csv
 The site scale summary table has been written to: ..\main_output\lfc_site_scale_summary.csv
 GIS layer files copied into folder \lyr_file within the project folder.
 View layers in ArcMAP using ..\C:\Users\Lucia\Documents\Vecco LFC\lyr_file\lyr_file\Connectivity Area Impact Assessment.lyr

Please scrutinise the output tables and spatial layers to confirm the desktop modelling of connectivity area impact

This analysis used an unedited copy of the Regulated Vegetation layer.

16:47:31 _____COMPLETED LANDSCAPE FRAGMENTATION AND CONNECTIVITY ANALYSIS_____